

ROBERT GREENE's

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THE INTERVIEWS

For this book, I drew not only from

history but also directly from the experiences of 9 living masters. Their fields of expertise vary from boxer to neuroscientist, fighter pilot to architect but they are all exemplars of the path to mastery outlined in the book. I spent hours interviewing and exploring the ideas with these men and women and what follows are the verbatim transcripts of our talks (edited only for length and privacy).

Contents

<u>Master Biographies</u>	3
<u>Daniel Everett</u>	9
<u>Teresita Fernández</u>	117
<u>Paul Graham</u>	187
<u>Temple Grandin</u>	305
<u>Yoky Matsuoka</u>	399
<u>Vilayanur S. Ramachandran</u>	488
<u>Freddie Roach</u>	606
<u>Santiago Calatrava</u>	643
<u>Cesar Rodriguez</u>	734

MASTER BIOGRAPHIES

Daniel Everett was born in 1951, in Holtville, California. He received a degree in foreign missions from the Moody Bible Institute of Chicago, and became an ordained minister. After studying linguistics at the Summer Institute of Languages, a Christian organization, Everett and his family were sent as missionaries to the Amazon basin, to live with a small group of hunter and gatherers known as the Pirahã, whose language is not related to any other living dialect. After spending many years among the Pirahã, Everett was finally able to crack the code of their seemingly indecipherable language, and in the process made some discoveries about the nature of human language that continue to stir controversy in linguistics. He has also conducted research, and published articles, on more than a dozen distinct Amazonian languages. Everett has a PhD in linguistics from the State University of Campinas in Brazil. He served as professor of Linguistics and Anthropology at the University of Pittsburgh, where he was also chairman of the Department of Linguistics. He has also taught at the University of Manchester (England) and Illinois State University. Everett is currently the dean of Arts and Sciences at Bentley University. He has published two books: the best-selling *Don't Sleep, There are Snakes: Life and Language in the Amazonian Jungle* (2008), and *Language: The Cultural Tool* (2012). His work with the Pirahã is the subject of a documentary, *The Grammar of Happiness* (2012).

Teresita Fernández was born in 1968, in Miami, Florida. She received a BFA from Florida International University, and her MFA from Virginia Commonwealth University. Fernández is a conceptual artist who is best known for her public sculptures and for her large-scale pieces in unconventional materials. In her work she likes to explore how psychology impacts our perception of the world around us; for this purpose, she creates immersive environments that challenge our conventional views of art and nature. Her work has been exhibited in prominent museums around the world, including the Museum of Modern Art in New York, the San Francisco Museum of Modern Art, the Corcoran Gallery of Art in Washington, D.C. Her large-scale commissions include a recent site-specific work titled *Blind Blue Landscape* at the renowned Benesse Art site in Naoshima, Japan. Fernández has received numerous awards, including a Guggenheim Fellowship, an American Academy in Rome Affiliated Fellowship, and a National Endowment for the Arts Artist's Grant. In 2005 she was awarded a MacArthur Foundation Fellowship, also known as the "genius grant." In 2011 President Barrack Obama appointed Fernández to serve on the U.S. Commission on Fine Arts.

Paul Graham was born in 1964, in Weymouth, England. His family moved to the United States when he was four, and he was raised in Monroeville, Pennsylvania. Graham obtained a BA in philosophy from Cornell University, and a PhD in computer science from Harvard University. He studied painting at the Rhode Island School of Design and the Academia di Belle Arti in Florence, Italy. In 1995 he cofounded Viaweb, the first application service provider that allowed users to set up their own Internet stores. After Yahoo! acquired Viaweb for close to \$50 million (and renamed it Yahoo! Store), Graham went on to write a highly popular series of online essays about programming, tech startups, the history of technology, and art. Inspired by the reaction to a talk he gave the Harvard Computer Society in 2005, Graham created Y Combinator, an apprenticeship system that provides seed funding, advice, and mentorship to young tech entrepreneurs. It has since become one of the most successful tech incubators in the world. Its portfolio of over two hundred companies is currently worth more than \$4 billion, and includes DropBox, Reddit, loopt, and AirBnB. He has published two books: *On Lisp* (1993) about the computer programming language, and *Hackers and Painters* (2004). his online essays can be viewed at PaulGraham.com.

Temple Grandin was born in 1947, in Boston, Massachusetts. At the age of three she was diagnosed with autism. Through special mentoring and work with a speech therapist, she slowly mastered the language skills that allowed her to develop intellectually and to attend various schools, including a high school for gifted children, where she excelled in science. Grandin went on to receive a bachelor's degree in psychology from Franklin Pierce College, a master's degree in animal science from Arizona State University, and a doctorate in animal science from the University of Illinois at Urbana-Champaign. After graduation, she worked as a designer of livestock-handling facilities. Half the cattle in the United States are handled by equipment she has designed. Her work in this area is devoted to making more humane, stress-free environments for animals in slaughterhouses. For this purpose, she has created a series of guidelines for handling cattle and pigs at meat plants that are now used by companies such as McDonald's. Grandin has become a popular lecturer on animal rights and on autism. She has written several best-selling books, including *Thinking in Pictures: My Life with Autism* (1996), *Animals in Translation: Using the Mysteries of Autism to Decode Animal Behavior* (2005), and *The Way I See It: A Personal Look at Autism and Aspergers* (2009). In 2010 she was the subject of an HBO biopic about her life, entitled *Temple Grandin*. She is currently a professor of animal science at Colorado State University.

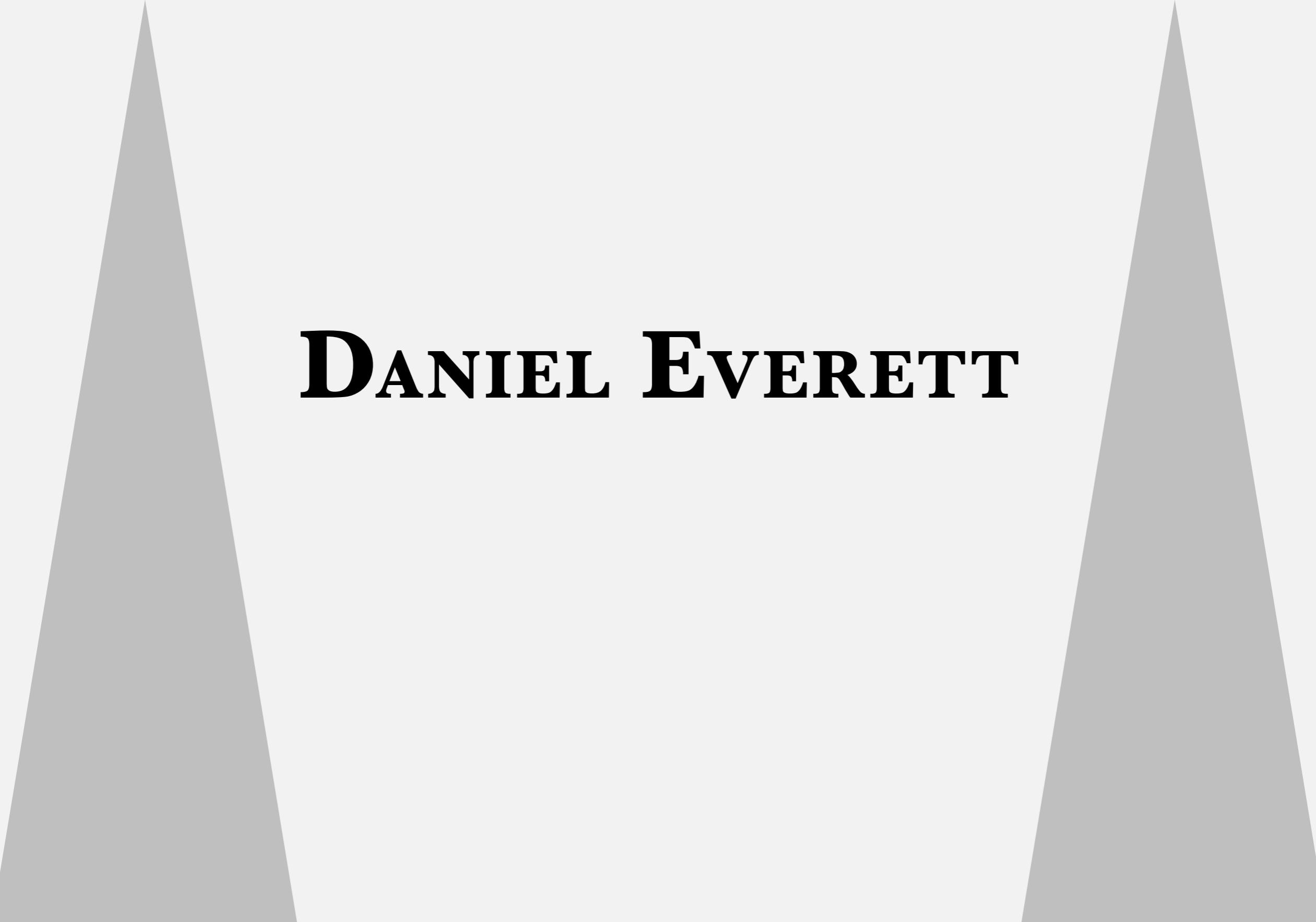
Yoky Matsuoka was born in 1972, in Tokyo, Japan. As a promising young tennis player, Matsuoka came to the United States to attend a high-level tennis academy. She ended up staying, completing her high school studies in the States, and then attending the University of California at Berkeley, where she received a BS in electrical engineering and computer science. She received her PhD in electrical engineering and artificial intelligence from MIT. While at MIT she was the chief engineer at Barrett Technology, where she developed a robotic hand that became an industry standard. She has served as a professor of robotics and mechanical engineering at Carnegie Mellon University and professor of computer science and engineering at the University of Washington at Seattle. At the University of Washington, Matsuoka created a new field, which she called “neuroRobotics,” and established the university’s neuroRobotics laboratory, where robotic models and virtual environments are used to understand the biomechanics and neuromuscular control of human limbs. In 2007, Matsuoka was awarded a MacArthur Foundation Fellowship, or “genius grant.” She was a cofounder of Google’s X division, where she served as Head of Innovation. Matsuoka is currently the vice president of technology at Nest Labs, a green technology firm that develops energy-efficient consumer products such as the Nest Learning Thermostat.

Vilayanur S. Ramachandran was born in 1951, in Madras, India. He trained as a doctor, then switched fields to study visual psychology at Trinity College at the University of Cambridge in England, where he received his PhD. In 1983 he was appointed assistant professor of psychology at the University of San Diego (UCSD). He is currently a Distinguished Professor in the Psychology Department and Neurosciences Program at UCSD, and also serves as the director of the university’s Center for Brain and Cognition. He is best known for his work on bizarre neurological syndromes such as phantom limbs, various body-identity disorders, Capgras delusion (in which the sufferer believes that family members have been replaced by impostors), and for his theories on mirror neurons and synesthesia. Among his numerous awards, he has been elected to an honorary life membership to the Royal Institution of Great Britain, fellowships from Oxford University and Stanford University, and the annual Ramon Y Cajal award from the International Neuropsychiatry Society. In 2011 *Time* magazine listed him as “one of the most influential people in the world.” He is the author of the best-selling *Phantoms in the Brain* (1998), as well as *A Brief Tour of Human Consciousness: From Impostor Poodles to Purple Numbers* (2005), and *The Tell-Tale Brain: A Neuroscientist’s Quest for What Makes Us Human* (2010).

Freddie Roach was born in 1960, in Dedham, Massachusetts. He began training as a boxer at the age of six. By the time he turned professional in 1978, Roach had fought 150 amateur bouts. Training under the legendary Eddie Futch, as a professional Roach compiled a record of 41 wins (17 by Knockout) and 13 losses. After retiring as a fighter in 1986, Roach apprenticed as a trainer under Futch, then started his own career several years later, opening in 1995 his Wild Card Boxing Club in Hollywood, California, where he now trains his stable of fighters. As a trainer Roach has worked with 28 world champion boxers including Manny Pacquiao, Mike Tyson, Oscar De La Hoya, Amir Khan, Julio César Chávez Jr., James Toney, and Virgil Hill. He is also the coach of UFC Welterweight Champion Georges St. Pierre, and one of the top female boxers in the world, Lucia Rijker. In 1990 Roach was diagnosed with Parkinson's disease, but has been able to largely control the effects of it through medication and his rigorous training regimen. Among his numerous awards, he has been named Trainer of the Year by the Boxing Writers Association of America an unprecedented five times, and was recently inducted into the International Boxing Hall of Fame. Roach is the focus of the current HBO series *On Freddie Roach*, directed by Peter Berg.

Santiago Calatrava was born in 1951 in Valencia, Spain. He earned his architecture degree from Polytechnic University of Valencia, and then went on to obtain a PhD in civil engineering from the Swiss Federal Institute of Technology, in Zurich, Switzerland. Because of his civil engineering background, Calatrava has focused primarily on large-scale public projects such as bridges, train stations, museums, cultural centers, and sports complexes. Inspired by organic shapes in nature, Calatrava has sought to infuse these public projects with a mythic, yet futuristic quality, featuring parts of buildings that move and change shape. Among his notable designs are BCE Place Galleria in Toronto, Canada (1992), Oriente Railway Station in Lisbon, Portugal (1998), the extension to the Milwaukee Art Museum (2001), Auditorio de Tenerife in Santa Cruz, the Canary Islands (2003), the Athens Olympic Sports Complex (2004), the Turning Torso Tower in Malmo, Sweden (2005), and the Light Railway Bridge in Jerusalem, Israel (2008). He is currently designing the Transportation Hub at the World Trade Center in New York City, expected to open in 2014. Calatrava is also a renowned sculptor whose work has been shown in galleries all around the world. Among his numerous awards, he has received the Gold Medal from the Institution of Structural Engineers (1992) and the Gold Medal from the American Institute of Architects (2005).

Cesar Rodriguez Jr. was born in 1959, in El Paso, Texas. After graduating from the Citadel, the Military College of South Carolina, with a degree in business administration, Rodriguez entered the Air Force Undergraduate Pilot Training Program. Trained as a command fighter pilot on the F-15, among other jets, he slowly rose through the ranks, becoming a major in 1993, lieutenant colonel in 1997, and full colonel in 2002. He compiled over 3,100 fighter flight hours, 350 of which were in combat operations. He distinguished himself in aerial combat, as he is credited with downing three enemy aircraft—two Iraqi MiG fighters during Operation Desert Storm (1991) and a Yugoslavian Air Force MiG during the Yugoslav War (1999). His three kills in active duty are the most of any American pilot since the Vietnam War. Rodriguez commanded the 332nd Expeditionary Operations Group during Operation Iraqi Freedom (2003). Rodriguez retired from the Air Force in 2006. He is a graduate of the U.S. Air Force Command and Staff College, and the U.S. Naval War College. Among his numerous medals, he has been awarded three Distinguished Flying Crosses, the Legion of Merit, and the Bronze Star. He is currently employed by Raytheon as the director of International Programs and Growth for their Air Warfare Systems Product line.



DANIEL EVERETT

ROBERT GREENE

You know, I can tell in the book you just have to play the political game and not complain about it. Just do what's required and that's just how life is.

DANIEL EVERETT

Yeah, that's right. That really is all you can do. I mean, I go down there and that's why I tell people who do field research, it's a holistic experience. I take these MIT and Stanford people down there. They're really brilliant people, they know how their experiments should run and they know exactly what they want to do to test, but they're not used to working in these circumstances. I tell people when they get ready to do field research in a place like the Amazon, whatever you think you can get done in a specific period of time, double it. Double the period of time because 50% of your time is going to be either sick or making friends or interruptions of all kinds.

ROBERT GREENE

I want to get to that part of the interview, because you allude to it a lot, kind of the whole experience and how difficult it is. It kind of engages your whole emotional character, your personality, and everything. It's stressful. You got a sense of the book from what I wrote?

DANIEL EVERETT

Yeah.

ROBERT GREENE

I sent like 2,000 words.

DANIEL EVERETT

Yeah, I read that.

ROBERT GREENE

I realized later I should have maybe not sent such a long . . .

DANIEL EVERETT

I read that, yeah.

ROBERT GREENE

So I kind of have it broken it into several chapters. I was going to explain a little bit and then kind of . . .

DANIEL EVERETT

That would be great.

ROBERT GREENE

The gist of the idea is that the human brain evolved for a specific purpose and has a process that it goes through, and at the end of this process is a form of intelligence that I believe is not often tapped by people as a potentiality and is very powerful. I think maybe it's something that we're going to lead to in the future, and it involves learning something very well, getting immersed in it, knowing its detail and what makes it alive; as in something organic, whether it's physics or the tribe, a different culture or a work of art. From that position where you are so deeply immersed in it, it comes alive and you make connections and you see things that nobody else imagined before. So when you're on the outside, you have a certain kind of intelligence and you see how maybe things connect a little bit, but when you get what I'm calling more like on the inside of it,

you have a totally different expanded kind of consciousness.

I'm seeing as I research all kinds of people in all different fields . . . I have an inductive method. Inductive method, I always get them confused. Inductive method like yourself. It's all based on material. But I pretty much see that this crosses all domains. You'll get the same kind of discussion of the creative processes. This is really about the creative processes from Einstein to Darwin to Glenn Gould. I'm trying to connect it to something about the brain and how it evolved. I'm also interviewing neuroscientists as well on this subject.

One of the purposes of the book is I think we're losing touch with this a little bit because it involves a bit of drudgery. It involves practice and discipline and being able to spend hours learning something. A lot of people in our culture nowadays don't necessarily possess that patience.

DANIEL EVERETT

The linguist and anthropologist, Ken Pike, who was one of my first professors has developed a way of talking about the outsider's perspective versus the insider's perspective that has had little influence in linguistics but has been tremendously influential in anthropology, which he calls the etic versus the emic.

ROBERT GREENE

The etic versus the emic. I don't know this.

DANIEL EVERETT

The etic, E-T-I-C, and emic, E-M-I-C, those are just the suffixes of other words that are used in linguistics. So when we have the etic perspective of say a tribal group, we just are there. We don't know anything about them. We may be extremely well trained anthropologists and we note, okay, they do this, they do this, and they do this. But we don't have the perspective that they have when they're doing that. The emic perspective is when as a North American of

a particular culture of Southern California, I have an emic perspective of that culture. I have an etic perspective of cultures I haven't really crossed that barrier with. I would say there are two other cultures that I have a sort of emic perspective of and that's Brazil and the Pirahã, but it takes a long time to do that. That's not exactly what you were saying, but it's a very . . .

ROBERT GREENE

That's exactly what I'm saying. It was weird because Andrew just sort of handed me your book. Maybe he's intuitive himself. Some of the book is about intuition but hopefully on a deeper level than how it is usually talked about. He handed me your book a couple years ago when I was last there on a book tour. Maybe he sensed that it was the right thing, but it is exactly what I'm looking at. I was really impacted when I reread it. There's so many ideas in it that are exactly what I'm trying to communicate. Ken Pike, would it

be worth me looking into his book or is it too technical?

DANIEL EVERETT

No. There is probably a Wikipedia article on it.

ROBERT GREENE

Is he still alive?

DANIEL EVERETT

No, he died several years ago, but his work has just been very influential in anthropology. If you type those into Google, you'll find a lot of information on him.

ROBERT GREENE

It's P-I-K . . .

DANIEL EVERETT

P-I-K-E. Kenneth Pike, yeah. One of the reasons he hasn't been as influential as he might have been is he was a very obscure kind of writer. Even people who knew him and knew his theory found it hard to figure out what he was saying.

ROBERT GREENE

Oh, well, maybe I . . .

DANIEL EVERETT

Yeah. But the people who did figure out these two terms, they just took off in anthropology. The reason it didn't take off in linguistics primarily is because he said them about the time Chomsky was coming on the scene. Chomsky's deep structure, surface structure kind of thing, people thought it was the same. It has nothing to do with what Pike was talking about. Pike was an up and coming star, but then Chomsky came on and was just a supernova compared to that, and Pike did have an influence on anthropology but not so much in linguistics.

ROBERT GREENE

Okay.

DANIEL EVERETT

I'm going to go turn off this sound thing. It's sort of irritating.

ROBERT GREENE

Your e-mail. If you need to check it, don't worry.

DANIEL EVERETT

Yeah, okay. It's just my son sending me a link to his [inaudible 15:30]. There was this huge accident there yesterday. It killed a bunch of bikers, people that were just out riding near Interstate 8, and 5 out of 12 of them were just, some car just plowed right into the motorcycles and killed 5 people. That was right by where [inaudible 15:48].

ROBERT GREENE

You didn't know anybody?

DANIEL EVERETT

No. I looked through the names, but I didn't know anybody.

ROBERT GREENE

The structure of the book is very simple. I'm looking at everything occurring in a process as an organic. If you understand that, you have an understanding of how things work. Every individual goes through their life process in an emic sense. One thing that I noticed is in order to deal with the boredom and drudgery and practice that

goes into mastering any kind of field, you have to feel excited. There is an emotional quality, and you have to love what you're doing or you're never going to get past that point to get deeply enough into it. The love element is actually more important than most people understand.

The first part of the book is about what I'm calling Life's Task. It's an expression that Nietzsche used that I use in all of my books. It's a sense of kind of what you were meant to do in life. You feel deeply connected when you're doing it. So I wanted to talk to you briefly about that and get a sense about you, going a little bit into your early years. Then there's this apprenticeship phase that's almost sort of like a craft in the medieval sense where you have an apprenticeship phase which everyone goes through. I want to also talk to you about that a little bit with your earliest training. I know you were in Chiapas with the [17:29].

DANIEL EVERETT

Yeah, [inaudible 17:30].

ROBERT GREENE

Normally there's a second phase, which is what I call the creative phase where you're beginning to have the ability to kind of play with the concepts that you're starting to master. Then finally there's the ultimate mastering phase where you have that feel for it. But with you that second and third phase seems a little bit conflated, and of all the people I'm interviewing, I want to get really deeply into that third phase. So that will be the most of what we're talking about today.

First I want to know if you have any questions about me or the book or anything like that before we get started?

DANIEL EVERETT

Yeah. I really thought that the project sounded fascinating and that's why I agreed to do it. Just remind me how you're envisioning the final organization of the book.

ROBERT GREENE

It's kind of pretty much what I just told you.

DANIEL EVERETT

In terms of who's . . .

ROBERT GREENE

You mean how am I incorporating the interviews?

DANIEL EVERETT

Yeah.

ROBERT GREENE

That, you know, is not necessarily completely determined. All of my books -- this will be my fifth -- have used a lot of history. I did a book on warfare, so I research heavily people like Napoleon and such. I incorporate them by telling stories about their life in a kind of emic sense. That's my new word now. It's from their point of view, almost like it's fiction but it's not. And then I kind of explain what I think it means. So this book is a combination of historical figures and so far eight contemporary figures. There might be a couple more. I am going to have to figure

out how to mix them. But within the overall structure that I just explained to you, where I'm introducing the idea that I introduced to you just earlier with things about your life's task. The apprenticeship, the creative, and then the master phase.

I'm going to be using the historical and contemporary figures as stories to illustrate these ideas. It will probably be three or four or five real incredible stories that stand out. And I will probably just narrate over a series of a couple of pages, almost from your point of view, what happened. Then throughout the book there might be little snippets from you about smaller things that happened. But quite honestly, I go through a process myself. If I have figured out a book before I write it, I have no interest in it anymore. So I have to leave myself the horrible challenge of how I'm going to incorporate all of this material.

DANIEL EVERETT

That's fine. I understand.

ROBERT GREENE

If you saw the other books though, you would sort of know what I'm talking about and how I somehow managed to do it. My books are very popular in the African American community, and a rapper who was 50 Cent, he loves my books and I did a book with him.

DANIEL EVERETT

Oh, that's right. I remember seeing that.

ROBERT GREENE

Well, in that book I had to use his life and then historical figures, so that gave me an idea of how I could do it.

DANIEL EVERETT

Right. Well, that's great. Okay, good.

ROBERT GREENE

That's about it. Mostly I really want to inspire people. I know it's a little cheesy, because there's a self-help element to it but I always play on that genre a little bit to develop this love for something. To my feeling a lot of it has to come down to your relationship between pleasure and pain. If

you find only pleasure in things that are immediate and distractions, you can never develop this patience. But when you sort of master something, whether it's chess, piano or another culture, you get a far greater pleasure from that. I want to show people what that potential pleasure is.

DANIEL EVERETT

Okay. That sounds great.

ROBERT GREENE

The first part was sort of going into your earliest years. I know you had sort of a rough childhood. Can you say that?

DANIEL EVERETT

In some ways, yeah.

ROBERT GREENE

Did that kind of prepare you for some of the hard things you faced later on?

DANIEL EVERETT

Yeah, I think it did. The most important experience of my entire life, certainly the most traumatic of my entire life was my mother's death when I was 11. And among

many things that it did in my life, was remove the fear of death. If my mother can go, I can go, and I've thought that since I was 11 years old. So from the time I've been 11, I've been extremely aware of my own mortality and not afraid of it.

ROBERT GREENE

Unequivocally?

DANIEL EVERETT

I don't want to go painfully, but death itself doesn't bother me at all.

ROBERT GREENE

That's very powerful.

DANIEL EVERETT

I have lost my mother and then a few years later my brother, and then I've lost a sister and I've lost a step-mother and my dad's twin brother. I've lost both my dad and my step-father and all my grandparents.

ROBERT GREENE

What is it?

DANIEL EVERETT

A violent life. My mother -- she was 29 -- died of an aneurism very suddenly just working as a waitress. My brother drowned. My sister died of AIDS. My step-mother committed suicide. My father was just a bar room brawling cowboy, and I saw a lot of rough stuff with him and rough guys. Interestingly enough, as rough and tough and mean as he could be to others, he was not that way with the family. You would think that he would be an abusive father because he drank heavily and he fought all of the time. He never touched me. Well, there was one time he touched me, but I probably had it coming.

I wrote him a couple of times when I was going to college and when I was in the village. I said, "A lot of people wonder how I can do this. But your example all my life of what it meant to be tough was part of it." These are examples that are important to me. I remember once him welding a cattle gate on this corral. It was just glowing red hot, and

he went to jerk away and his cord got caught up in it and rammed his arm right up against it and just burned a hole in his arm. He just said, "God damn." And that was it. He worked the rest of the day, went home, and put some ointment on it.

ROBERT GREENE

How old were you when you saw that?

DANIEL EVERETT

I was 14.

ROBERT GREENE

That impressed you?

DANIEL EVERETT

That was impressive. Then we would go places and there would be some guys acting rowdy or something. I sat in bars with him from the time I was 14. I played my guitar in bars from the time I was 14. He didn't take any gruff talk. If people were getting loud or using bad language around women, he would stand up and tell them to shut up, and they always did. I was always impressed because he's the same height that I am. He was five

foot eight and a half, and he would talk to these guys who were well over six foot and they didn't bother him. They would just sit down. I remember that. There were times as part of what I did in field research that I was put into really dangerous situations. That example and the lack of fear of death really got me through it. It is kind of interesting that those are some of the lessons that I've drawn from it. It took me a long time to realize that was the lesson I drew from my mother's death, for example.

ROBERT GREENE

But when you had the very near death of your wife and your daughter, it sounded like you dealt a little bit with some panic, but it was for others. I mean, you obviously don't want to lose these people.

DANIEL EVERETT

Yeah. I don't fear my own death. I've been through so many deaths in my family, the only fear I have of death now is that any of my children will go before me. I don't want

to see anybody else go. I'd much rather go before them. I don't have any fear of my own death, but I don't know how well I could take continuing to see people I love go.

ROBERT GREENE

It must be very hard.

DANIEL EVERETT

Yeah, it's really hard, especially when there are so many sudden ones. So I know when I'm confronted by people in the jungle, that I could die and they could. I have a totally clear visual image of people I love who look like me dead. So I know that's a possibility. It's in a sense almost liberating. I don't long for death.

ROBERT GREENE

Does it give you the sense of also or respect for the urgency knowing that at any moment you could die, but you want to do what you wanted to do.

DANIEL EVERETT

Yeah. There's a lot I would like to get done for myself. The only things I fear about death

is leaving things undone that I want to get done. But mainly being unable to take care of the people that I love, those are the only things. There's a lot of work I still want to get done, and I'm feeling really good about life. I really enjoy my life very much. So I'm, as the preacher used to say, I'm ready to go to heaven, just not on the next train.

ROBERT GREENE

Hopefully by the end I want to get to things that you're working on now. I'm very interested in what you're going to do next.

Also I imagine at the time you felt a little bit different, from your background there was something else because you obviously ended up going in a different direction than a lot of people from your background.

DANIEL EVERETT

Yeah. From as long as I could remember, I absolutely hated the small town I was growing up in. I wanted to get out of it. I think music played a role in that, because it was the first thing that I felt like I had really

mastered well enough that it could take me somewhere else. I knew that I wasn't satisfied with what was going on around me. I didn't just want to take a job. I used to literally be afraid of the idea that some day I would just have a tract house with a mailbox in front like everybody else I knew. That really scared me, so I wanted out of that.

ROBERT GREENE

What would get you out of that besides music? You mentioned seeing "My Fair Lady," I don't know how long ago.

DANIEL EVERETT

Yeah, that's right. That was part of music because it was one of those trips that my band made to L.A. that I told you about. That was a very interesting year.

ROBERT GREENE

That was your rock band?

DANIEL EVERETT

No, this was the high school band, actually a junior high band. We had a new music teacher and he said, "I'm sick and tired of you

guys thinking every time we come to L.A. we're going to go to Disneyland. I want you to do something else." He was going to take us to see "Don Giovanni" by Mozart, but the school board said absolutely not. They thought that would be a corrupting influence on us. We didn't get to see Mozart. So he took us instead to the Egyptian Theater in Hollywood to see the new movie that had just premiered, "My Fair Lady." So we walked in with the whole school band.

ROBERT GREENE

The Egyptian Theater is still there. We go there all the time.

DANIEL EVERETT

Oh really? This was the very year that "My Fair Lady" came out, and I remember even the principal of the high school saying, "Where are the cartoons?" It just totally transformed me. I joke about thinking that if I became a linguist I could help people like Audrey Hepburn, but really the person

that totally transfixed me in that movie was Rex Harrison.

ROBERT GREENE

Higgins.

DANIEL EVERETT

Higgins, his character, not him so much.

ROBERT GREENE

What do you think it was?

DANIEL EVERETT

It was just I love language. I grew up around Spanish. I loved Spanish and I loved language. We had to take Spanish from the time we were in sixth grade, and we were told what we had to learn in Spanish. We had to walk up to the front of the class and the teacher was Mexican-American and so I said what I had to. She just opened her mouth and said, "Do you speak Spanish in the home?" And I said no. She said, "You sound exactly like a Mexican."

ROBERT GREENE

You had an ear for it. You have the knack.

DANIEL EVERETT

Yeah. And I realized that I loved learning Spanish. I loved hearing it. I loved visiting Mexico. Most of my family was prejudiced against Mexicans. Well, they were prejudiced against anybody who wasn't WASP, but I was just the opposite. I just thought these were fascinating people. All my best friends were Mexicans. I loved walking into their house and these people who spoke perfect English switching to perfect Spanish with their parents. I just thought that was fantastic.

ROBERT GREENE

Was there something also about the culture that fascinated you?

DANIEL EVERETT

Oh, everything about Mexican culture. I loved the food. For me, that still is home cooking, Mexican food. Just the way that they related. I remember walking in front of a Mexican family's house one time and they were having a birthday party. They were just bringing people in off the street to eat this

huge meal they had prepared in the house. "Come on in!" I'm just walking in with these people I don't even know and eating all this great food. I thought, "Gee, we wouldn't do that at my house. We wouldn't invite strangers in to eat."

ROBERT GREENE

Were you one of the few gringos who would mix with them?

DANIEL EVERETT

No. In that town, that part of California at that time . . . well actually, my memories go back. When I was three years old, I can remember we lived out in a very rural area. I lived with my grandparents and my mother lived there too. She was divorced. She would have been about 22 and I was 3.

ROBERT GREENE

So your parents were already divorced?

DANIEL EVERETT

Yeah. They were divorced when I was a year old. So, we had a Mexican maid who came in and cooked for us. I remember her

name, Lupe Delgado. I was three years old. Then, we had little cabins out behind the house for other field workers and they were all Mexican. I would, as long as I can remember, sneak over to these little cabins, and these Mexican field workers would give me tacos and tortillas and stuff. I always got in trouble for doing that, but I was over there all the time. I knew there was something different from as long as I can remember that fascinated me.

ROBERT GREENE

There's a debate about how much of it is genetic and how much of it is acquired. So very early on you were hearing Spanish. But also maybe, perhaps you had kind of a knack for languages as well.

DANIEL EVERETT

My dad was a very smart guy. He didn't have any formal study of Spanish, but he could communicate fairly well in Spanish and he knew all the expressions. He took me to bars from the time I was 14 down in

Mexico. I would be so impressed because we would walk into this Mexican bar, and he'd just start talking loud slang to everybody and they would all laugh. He just was totally at home there in these dark lit bars with all these different looking Mexican people. He just loved it and communicated some of that to me.

ROBERT GREENE

I speak several languages. There's one thing I have a feel for and it's languages, but I know that there's something that separates people who aren't necessarily good with languages. There's an ear and a kind of receptivity and you're kind of involved in the other person so that you can hear their intonation and get into it. There is something that separates people who are good with languages. Do you have a feel for it?

DANIEL EVERETT

I have a feel for it and I enjoy it. This is what stops a lot of people I think. I enjoy trying to imitate them and sound like them.

ROBERT GREENE

Yes, me too.

DANIEL EVERETT

Some people feel like if you try to get the intonation and the stress right and everything, you sound foreign. An intuition that I have is that some people think that's phony, that you're pretending to be something that you're not. But that's what you have to do to learn another language because you're not that speaker. Paying careful attention early on and really learning to love another culture, I think that I would be a very different person if I hadn't grown up on the Mexican border.

ROBERT GREENE

What did happen because of "My Fair Lady" that you decided you would eventually go into linguistics?

DANIEL EVERETT

I never heard of anything like this -- the fact that he could write down these sounds and imitate this stuff. I never heard of anything like that in my life. It was there subliminally.

I loved languages. I couldn't believe that somebody studied these kinds of languages. There was no outlet for it. There were no linguistic classes, but my favorite class was English grammar. I loved diagramming sentences and that sort of thing. I just loved it.

ROBERT GREENE

That's a whole other thing there, where that comes from. Structure.

DANIEL EVERETT

It felt totally intuitive to me. Everybody else couldn't figure out how to do this.

ROBERT GREENE

What are you talking about specifically?

DANIEL EVERETT

Kellogg sentence diagramming. I don't even know if you did it at your age, but we would have to start off with a sentence. It's like the hierachal structure below the sentence where you had to say which phrase modified which phrase all the way up to the top, which is not that different from the kinds of trees that Chomsky drew. It's not the same at all.

There's no theoretical basis for it, but it just made perfect sense to me. Of course I knew what a prepositional phrase was, what a preposition was that modified this other stuff. Adjectives, adverbs, prepositions, that all made perfect sense to me and the way they fit together. I loved it. That was the closest thing I had to linguistics.

ROBERT GREENE

What do you think it was about it that you loved? Was it just the sense of order?

DANIEL EVERETT

Yeah. It was just being able to think about the way I talk. I don't know exactly why, going back. I just know that I loved that class. I loved doing it, and everybody else would complain about it. When I got into college, New Testament Greek at Moody Bible Institute, I probably didn't study more than 15 minutes a day for that class because it just would soak right in. I remember having to do these charts of all the verb conjugations that would fill pages. I never had to memorize.

All the other guys were trying to memorize the charts, which nobody did successfully. I never tried to memorize it once. Except for the irregular verbs, I just learned the way the patterns were.

ROBERT GREENE

So you had no idea where this skill had come from? You never thought about it?

DANIEL EVERETT

It made sense to me. I was very interested in it.

ROBERT GREENE

I mean, think about it. It's unusual, and it is worth pondering where something like that would come from. It's not normal. It's unusual.

DANIEL EVERETT

Probably not, because I saw my friends, people interested in different things. It was interesting to me from as long as I can remember to see how people would branch off into different interests. What somebody else considered fascinating, I just remember

all the kids who were fascinated with taking cars apart and putting them together. I just couldn't give a rip about that. My dad was a mechanic, but I hated that. The people who were really interested in math. That sort of appealed to me, but it wasn't as intuitive to me as language, and language just seemed to make sense in a way that . . . music did in a way, but I think that language meant more. As I went on, one of the ironic things is that one of my best friends, he's now passed away, was Peter Ladefoged, one of the greatest phoneticians in the world. He was at UCLA.

ROBERT GREENE

Phonetician?

DANIEL EVERETT

Phoneticians, yeah.

ROBERT GREENE

And you knew him growing up?

DANIEL EVERETT

No, I came into his writings early on in my linguistic career. We wound up going to the Pirahã together many years later for him

to check out some of my claims. He was the consultant on “My Fair Lady.” When Rex Harrison holds up to Liza Doolittle the page of phonetic writing of what she said, Peter had written that. When he turns on the gramophones in his study, all those voices were Peter coming out of there. Peter had been on the set all the time consulting with Harrison and telling him how to react to things. It was interesting to me and really cool that this movie that had been so influential to me, I could now get the facts of what was going on behind the scenes and how these things came out.

ROBERT GREENE

It could be just something about your brain. The part of the brain that’s related to music is also related to language, and some people theorize that language came from music.

DANIEL EVERETT

Yeah. I don’t know that language came from music or what I think of that view, but I do think there are similarities there. I found it

interesting to look at the number of linguists that I admire who were very good musicians. There are a number of them. I used to in fact go to the Linguistic Society of America meetings and send something around trying to organize a jam session, because these linguists that were so good in their discipline would come out and they turned out to be really good musicians too.

ROBERT GREENE

I would have thought Chomsky’s probably not a musician.

DANIEL EVERETT

Uh, no, he isn’t. Although, you know, David Pesetsky, in his department, who is one of my biggest critics is a very good, first rate musician. It’s also interesting to see what kinds of music people play. Who plays jazz? Who plays blues? Who plays rock and roll? Who plays classical? I have found that . . . [inaudible 41:06].

ROBERT GREENE

You’re more rock?

DANIEL EVERETT

No, I’m mainly blues and rock blues, blues especially. My highlight was when I was 17, I played warm-up for Lightnin’ Hopkins in a bar in San Diego. It was a wonderful experience seeing him. That kind of music to me was just as awe inspiring and beautiful as anything. Although I do, as long as I can remember, love classical as well. Anyway, I think that’s right. I’ve heard stories of really brilliant people, that when they first sat down at a piano it just made sense. That’s the way I felt about linguistics and language.

ROBERT GREENE

A little later on, not like three years old speaking . . .

DANIEL EVERETT

When I was about 11 or 12, not linguistics, but language. It just made sense the way that people did things. So I would say from the time I was 10 or 11. I think that one of the things that separates somebody like me from

a genius is that it made sense to me but I still had to work really hard.

ROBERT GREENE

That's not [inaudible 42:24] misconception about genius.

DANIEL EVERETT

I just know that there are some people. I feel like I'm better on the guitar. What I play, I'm better than 90% of the people. But the difference between 90th percentile and the 95th and the 97th and the 98th percentile is greater than from the 90th.

ROBERT GREENE

But what if you had spent your whole life on music instead of linguistics? Maybe you would have been . . .

DANIEL EVERETT

That's possible. I've thought of that. In any case, it just made sense to me and it was never an effort, although I still hadn't been exposed to linguistics as a science.

ROBERT GREENE

It was more you were looking for the experience? Something different from your small, cramped town.

ROBERT GREENE

One last thing on this section. Over, why is it flashing over? That's ominous. One thing in the theme here is almost kind of philosophical, but that everybody is sort of theoretically, completely unique. Their DNA never will be repeated ever again. The problem with people is they're not aware of it and they're running away from it. So some people who aren't like that have a sense of almost a destiny, like they were destined to be something. Did you ever have that at all? You don't have to make it up if it's not there.

DANIEL EVERETT

No, I have always felt it. I have always felt that I was very different. I would tell people things that indicated that I thought I was a bit different, and they would see it as like getting too big for your britches, illusions of grandeur.

I never thought that this difference meant that I was better than people, but I always felt separate and I always felt that there was something else for me to do. I was never satisfied just staying in the same place.

ROBERT GREENE

Did you have any feeling about what that meant, or can you even remember?

DANIEL EVERETT

I just felt that I had some very unusual things to do and say. Even though I was not always able to articulate that mission to myself, I felt that I had it in life and I still do.

ROBERT GREENE

And do you think it's really important?

DANIEL EVERETT

It's been the greatest motivating force of my life, I think. I mean, it's what makes me excited about the things that I do, and it's what makes me not take an inability as a justification for not going forward. If I need to learn something and I think that it's crucial to what I have to do, then I will learn it.

ROBERT GREENE

Even if it requires years of practice? It's very important?

DANIEL EVERETT

Yes. This may be getting ahead of things, but I remember when I decided I really wanted to learn Chomsky's theory. There was no place where I could go and ask. So I just got all the journals. I just invested my own money.

ROBERT GREENE

They're not easy to read.

DANIEL EVERETT

And I would sit down with these journals and I would read them from 7:00 a.m. to 11:00 p.m. I had the luxury of doing this because I was in a Ph.D. program. I would get really tense and upset and I was in a bad mood because to understand this article I had to go back and read these other two to understand them, and there was this huge circle. I estimate that within four months I read about 3,500 pages of this incredibly technical stuff.

Then, I realized I know this stuff and I know all the literature.

ROBERT GREENE

In order to put up with the drudgery of it you had to have something that underneath it all that sense that it was leading to something.

DANIEL EVERETT

I reached a certain age and I said, "There are people who are well known for this thing that you're interested in and who are making contributions." This is an internal dialog. "Do you want to be somebody who just reads what they write, or do you want to be one of the ones who write what they read?" I decided I wanted to be that. I did not want to be some person who just taught other people's ideas or who just read other people's books. Every book that I have is an argument between me and the author. There are a lot of books that I love to read, but every one pisses me off some place. I remember I left a whole bunch of books in Brazil. They were mainly Christian

books and I had stuff written through the margins of all of them.

ROBERT GREENE

I'm the same way.

DANIEL EVERETT

People would look at them. The person who bought our house, I left all the books, they said, "We didn't read all the books, but we sure went through looking for all your comments because they were hilarious." I would read a page and before I would turn the next page, I would make myself summarize what I learned off that page. I wouldn't let myself turn it until I felt that was pretty good. If I was vague on something, I would notice, "Why did I skip that part so fast? Ah, because I didn't understand what the hell it was about." So I would make myself go back and reread it. I was very rigorous with myself, and I think the reason I was is because I had this sense of mission. I wanted to get beyond the low expectations intellectually that even my father had. There

were a lot of people who felt that to be a success intellectually is some sort of mystical thing. You're either born with it or you're not.

ROBERT GREENE

Crap.

DANIEL EVERETT

Yes. I believed it for a long time, but then I realized I don't have to believe this anymore. Also it was very important to me that people started complimenting me. My ex-father-in-law, who just died last month, after awhile we grew very close together and then very far apart because of the different views of religion. His role in my early life was fundamental because he would say things which I later realized he said to everybody. He'd say, "You're the smartest person I've ever known. That's just amazing." I didn't realize it was hyperbole. He had made me take myself seriously. That was one interesting thing that showed me how important encouragement can be.

ROBERT GREENE

Maybe it wasn't hyperbole. Maybe he was doing it on purpose as a way to encourage you.

DANIEL EVERETT

It could have been. But it did encourage me. I think it probably was, but it did encourage me. I remember showing up at college coming from this very low-class background and seeing people who were dressed much better and who looked much better and they talked with the assurance of people who had never been lacking the things I lacked all my life. I really wanted to destroy them competitively.

ROBERT GREENE

It's fine to admit that.

DANIEL EVERETT

Yeah, I did. I wanted to get the top grade in every single class.

ROBERT GREENE

It wasn't just . . . there was something else behind it. There was a reason.

DANIEL EVERETT

Yeah. There were two reasons. There was a short-term reason of being the best that I could be. I didn't care what it was leading to. There was a long-term reason of wanting to master something. I really wanted to master a body of knowledge. It wasn't that articulate to me at the time.

ROBERT GREENE

What was the goal in mastering? What was behind it? What did you think you would get from mastering something?

DANIEL EVERETT

I wanted to put distance between me and my past, and I wanted to define a very different kind of life for myself based on doing the things that I love to do and not doing the things that somebody else told me to do, and being someone that other people would turn to for help in understanding this as opposed to someone who was always going to the teacher and asking for an explanation.

ROBERT GREENE

Let me put it this way. Since you play music, you played the guitar, did you teach yourself guitar or did somebody teach you?

DANIEL EVERETT

I took a few lessons, but the quantum leap in my guitar playing came when I walked into a nightclub in San Diego when the San Francisco groups were just starting to get famous -- Jefferson Airplane, Big Brother and the Holding Company; and Country Joe and the Fish. Before that, I had thought that the British groups were the best but I still do -- the Beetles. Anyway, I walked into this place, the Hi-Ho Club in San Diego, and there was a band up there called The Puzzle and the lead guitar player was just doing things I never knew you could do. Nobody ever taught me that. Why did I not know that you could do these things on the guitar? It was just amazing.

So I said, "I'm going to be better than that." I was 13 or 14. I said, "The only way that

I'm going to be better than that . . . if I'm not better than that I have no chance of making it big." Then I realized that there's a big difference between seeing the canned performances on television and watching them do their craft on the stage. Even if a third-rate band that nobody ever heard of can do this fantastic stuff, what could the major bands do if they really let loose? So Eric Clapton plays this lead. What would he sound like if he were live and just improvising, which then I later found out. So that encouraged me to go back and just practice 12 hours a day on my guitar. I practiced and practiced and I did nothing else.

ROBERT GREENE

As you practiced, did you find suddenly the guitar became a totally different instrument?

DANIEL EVERETT

I found that the reactions I got from people were utterly different than they had been before. I just saw my fingers going so fast and I would play. I remember I called in this

organ player from another band and I played some stuff. I said, "Look, this is what I'm working on right now." I played it for him and it was just blowing him away. It was because I practiced so much. I literally would practice many days from 3:00 p.m. when I got home from school to 3:00 a.m. I just practiced straight through. The neighbors would beat on the garage and tell me to shut up. When I played in bands, I remember stepping down from the stage at some big Battle of the Bands in El Cajon, California and we weren't that good, but the lead guitar player for the next band that came up there said, "I'm embarrassed to walk on stage now." You don't normally say that to competitors. That was the reaction I wanted.

ROBERT GREENE

But did it become more fun once you got to that?

DANIEL EVERETT

I loved every single minute of the 12 hour day practice sessions. I just loved the guitar.

ROBERT GREENE

But it became increasingly more fun as you got better?

DANIEL EVERETT

Yeah. The exciting thing about mastering an instrument to me is just enjoying the sounds that come out of it. It's like mastering the Pirahā language.

ROBERT GREENE

That's what I'm getting at.

DANIEL EVERETT

Yeah. Because when I get to the Pirahā now with people, I come with the people who are doing documentaries or magazine articles. I'm a lot older than when I started there. All these stories in the book are getting farther and farther in the past. So I come and the Pirahā surround me and I'm understanding what they're saying and I'm talking to them. Gosh, this is great. I paid a long hard price to be able to speak with these people. It's funny to me to take in sometimes professional linguists who can't repeat a single word and

realize it. I told Steve Sheldon, the missionary who was there before me, we went in together one time and I heard him speaking it. I said, "We're the only ones who know how damn hard it is to be able to say these words right and put them together in a sentence."

ROBERT GREENE

Well, I just have this idea, but I could be wrong, that mastering something as a child and it could be just simply mastering English or a musical instrument, chess, sports, kind of sets a paradigm for you that you understand what you can get out of taking the time to master a process.

DANIEL EVERETT

Well, I think that's exactly right. I have almost put it in those words to myself when I think about the guitar. So I no longer desire a musical career.

ROBERT GREENE

Right.

DANIEL EVERETT

I enjoy playing the guitar. But if you told me today that I could be a professional musician in and tour around, it just doesn't appeal to me any more. But it did show me that I could master something and be better at it than most people. That when I was looking at linguistics all those hours a day trying to figure it out and working on the Pirahā language and trying to figure that out, this is what I knew I could do it. I would look at the Pirahā children and I would say these damn three and four year old kids can speak this language. If they can speak it, I can speak it.

ROBERT GREENE

Well, that's a little different.

DANIEL EVERETT

Yeah, it is. But it is still just you set goals for yourself. Yeah, it is different. But I knew that there were some things if I put my mind to them, I could really do well.

ROBERT GREENE

Okay. All right. I'm going to segue into the apprenticeship phase

ROBERT GREENE

I know the sort of the story about your meeting your future wife and the conversion and all that. How soon after that did you, that period when, I'm interested in that time you were sent to Chiapas. How old were you at that point or when was that exactly?

DANIEL EVERETT

Oh, this would have been 1977, the first of '77. My son was born January 1st, 1977. We went just a few weeks later to Chiapas.

ROBERT GREENE

Oh, so that's later than I thought. What was happening in that intervening period, very briefly?

DANIEL EVERETT

The intervening period was Bible school and initial linguistics.

ROBERT GREENE

You knew, that was something your wife had done as well?

DANIEL EVERETT

She was born and raised in Brazil. Well, she wasn't born and raised in Brazil. She was raised in Brazil. She was born in the States, but her parents were missionaries. That's where she still is today.

ROBERT GREENE

But was, how is this . . . getting into the linguistic part of it, was that just simply part of being a missionary?

DANIEL EVERETT

Yeah.

ROBERT GREENE

Is it a coincidence that you ended up going there?

DANIEL EVERETT

That's right. What happened was SIL required linguistics training for people who wanted to be Bible translators, which is what I wanted to be. I remember talking to my

father-in-law and saying, "I'm going to take these linguistics courses. What's the difference between linguistics and translation?" He said, "Linguistics is boring, translation is fun. That's the difference." He said, "But you've got to take the linguistics." I said, "But I don't even know what it's about, can you tell me what it's about?" He said, "You'll just have to take it."

So I walked into my first linguistics class at the University of Oklahoma from Ken Pike. I knew he was . . .

ROBERT GREENE

Oh, you were taking classes from him?

DANIEL EVERETT

Yes, and he was also the President of SIL and the head of the Department of Linguistics at the University of Michigan.

ROBERT GREENE

Oh.

DANIEL EVERETT

Simultaneously. I didn't know that he was such a widely respected linguist. He walked

in and started talking about language and I didn't understand most of what he said. We had follow-up sessions with graduate assistants that made it clearer. I just loved it. I thought it was the most interesting, fascinating thing.

ROBERT GREENE

It's supposed to be boring.

DANIEL EVERETT

Yeah. I just loved every syllable, every bit of it. I told my wife at the time, I said, "I have found something I am really good at." Because it was so funny, every component of linguistics; I mean there's not just syntax, there's phonetics, can you make these sounds. There's phonology, can you analyze the patterns of sounds? There's field work, can you get information out of native speakers? This was all part of the training. They would give us words and things to say that they thought was going to be hard, and I could just say them, just like that.

They would give us problems to solve and grammar. I remember we had all of our exams were like 90 minutes, and I never took any more than 15 minutes to do the exam. I would just walk in, do the exam, and walk out. The teachers would just look and everybody would say. To me it was just, it was like Greek class again, or Spanish, it was . . . this would just, was, I didn't need to be taught about this.

ROBERT GREENE

That was a nice feeling of power.

DANIEL EVERETT

It was just amazing to me, because I had struggled at some things as a student, but this wasn't one of them. In fact, it was interesting, after my first year of classes, I took the final exam. You had three hours to do the final exam. I took 20 minutes, got up, handed the exam in, and went straight to the hospital with what they thought was appendicitis. I was in really bad shape.

The teacher came up to me, Ken Pike's GA, and she said, "Ken was talking to me and he said that you didn't really do as well on this exam as he expected. You have gotten the top score in every other exam you've taken, but then we heard you had gone to the hospital. Were you feeling ill during the exam?" I said, "I just walked straight from there to car and went to the hospital. I was in horrible shape." So he said, "Okay, we're not going to count that exam then." The only reason is because I had done so well. I loved linguistics after that.

ROBERT GREENE

I just need to get a sense of the timeline. Tell me what year you were born?

DANIEL EVERETT

1951.

ROBERT GREENE

'51. You met your wife like '69?

DANIEL EVERETT

'69.

ROBERT GREENE

And then you went into the program, what year would that be?

DANIEL EVERETT

I started, well, after Moody, I graduated from Moody Bible Institute in 1975.

ROBERT GREENE

What, six years in between there, what . . .

DANIEL EVERETT

Well, that was being married at 18, starting a family, working at the post office, and not making huge progress towards anything.

ROBERT GREENE

And you were working at the post office?

DANIEL EVERETT

Yeah. I worked at the post office all day, every day, and tried to go school at night.

ROBERT GREENE

Oh, go to school at night.

DANIEL EVERETT

I didn't make a lot of progress, because you couldn't take that many classes at night. I was going to a junior college. I started off going

straight to bible school from high school. I got into Biola University, and it was incredibly expensive. I was working 60 hours a week at a service station, and my grades were mediocre. I told my wife, I said, "Everything I make, everything you make," she had a job for a while, "goes into paying these college bills for me to get Bs and Cs. It's better to just drop and go back to San Diego. Go to Grossmont College, junior college, where it's free and learn how to be a student."

So, that's what we decided to do. My grades started going up. When I got to Moody, I graduated number one in my class. Working. Then I went back to Grossmont to finish courses that would have been for my BA. I got 4.0.

ROBERT GREENE

And this is in linguistics at Grossmont?

DANIEL EVERETT

Well, just in lots of stuff.

ROBERT GREENE

Oh, a BA.

DANIEL EVERETT

Yeah, just a BA. BA stuff. But I learned how to be a student. That was the first hurdle. Then out of all the things I enjoyed, I enjoyed so many things in college. I loved anthropology. I loved English literature. There were so many things I liked. But nothing was the light on in my brain experience that it was when I took those first linguistics classes.

ROBERT GREENE

At SIL?

DANIEL EVERETT

At SIL in Norman, Oklahoma.

ROBERT GREENE

And this was '75?

DANIEL EVERETT

This was, was it, it might, yeah, I think it was actually '75. That's right, it was '75.

ROBERT GREENE

Okay. And then, were you, was this in mind that you would be doing field research someday? Were you open to doing field work?

DANIEL EVERETT

Yes. I was interested, I didn't know what field research was. I was interested in converting a tribe to Christ. That's what the goal was.

ROBERT GREENE

I see, I see.

DANIEL EVERETT

Whatever I had to do to do that. I read all these stories of missionaries who had been ready to sacrifice everything so that people could avoid hell and go to heaven. There was this period of a few years where I believed all of this stuff. I believed it fervently. That was a big motivating factor. When I got to linguistics, I wanted to be a translator. I wanted to be a missionary. I was already working towards becoming an ordained minister, which I finished and later resigned.

Linguistics just changed the course of things, because it showed me that there was something I was really interested in that had none of this other baggage attached to it. I didn't articulate this to myself at the time, but

I was attracted to it. Years later, the contact with linguists, the contact with science, the contact with this entire culture of academics played a major role in helping me be more objective about these other beliefs that I had and evaluate them in the same way I would evaluate other kinds of things and abandon them because I was, myself, dissatisfied with the answers that they gave me.

ROBERT GREENE

What was it that they sent you to Chiapas? I don't know why . . .

DANIEL EVERETT

This is jungle camp.

ROBERT GREENE

What is jungle camp?

DANIEL EVERETT

All of us knew we were going to go to . . . I knew I was going to go to the Amazon. This is a training session that SIL put together that has four phases to it. You start with three weeks of orientation in Dallas, Texas. This is the way it was then. It doesn't exist

anymore. They would talk to you about all the things that were coming up. They would give you some overview, cross-cultural viewpoints, what Mexico is going to be like, and a lot of logistics. You had gone to the Army-Navy Supply Store with a big list of things. Duffle bags, I bought all this stuff, gun belts, all this stuff that you were told you were going to need. Then you go to Mexico City, and in Mexico City you get an overview of Mexican culture. There are lectures on Mexican culture. There are trips to the Ballet Folklorico. Seeing these things and getting into another culture.

From that point, you go down to Chiapas. Now, the whole experience is four and a half months. The first thing was about, the total from Dallas and Mexico City, was about not even four weeks. The rest of it's in Chiapas. Then you come into Chiapas, and you go to something called main base. At main base, everybody gets a little brick thatched roof

hut with your family. One room, maybe two rooms, for the entire family. You learn to . . .

ROBERT GREENE

Your family was with you?

DANIEL EVERETT

Yeah. Your family has to go. You're going to be missionaries together. So it's for everybody. My son, who was six weeks old, got meningitis and almost died. He came very close to dying.

At the main base, they work on physical conditioning first. You do 25, 50 mile hikes through the jungle. Come back to canoeing. They put you in teams of people. They want to see how you work together when you have mixed skills. You do a canoe trip through the rapids in these dugouts that you had to stand up in and pole. They would always mix men and women, people who were good and people who weren't, and see how you dealt with that.

ROBERT GREENE

Interesting.

DANIEL EVERETT

Yeah, it was very good training actually. They would teach you, they would put you in stressful situations with your family. They would march you out someplace in the middle of the jungle. Maybe a slightly cleared area and they would give you these military hammocks. It was starting to get dark. You were responsible for putting up a campsite before it got too dark for your entire family. That meant chopping trees, chopping branches. There was only one way they'd allow you to hang those hammocks. You had to follow their procedures. You couldn't give your family untreated water. You had to treat the water. They would walk around, evaluating what you were doing. Not only they looked at your attitude, your success in following the rules, how comfortable you made it for your family, and they expected you to be enjoying it. If you didn't, they thought well maybe you're not cut out to be a missionary.

ROBERT GREENE

How many people would end up going to it after that?

DANIEL EVERETT

There would be about 120 people that would go down for this, and not many of them are still missionaries.

ROBERT GREENE

So, how were you at taking this?

DANIEL EVERETT

I quite enjoyed it.

ROBERT GREENE

It was like your first time in another culture, outside of . . .

DANIEL EVERETT

Yeah, yeah, this was the first time I had been in another country. I don't count Tijuana and Mexicali as being in another country. This was way down there. Although I had been to Mexico, southern Mexico, the summer before and I visited a couple of those. So really it was my second time. But it was the first time I had to learn these skills.

After main base, then there was advance base. In which case they would take you, this gets . . . so they would take you to the edge of this lake in the middle of absolutely nowhere. You had to hike. They flew the families with little kids out there the day we were to arrive. We had to hike 50 miles to get there. When we got there . . .

ROBERT GREENE

50 miles, that's a lot.

DANIEL EVERETT

Yeah, yeah, carrying a pack, 50 miles. When we got there, there was just a clearing and my family's just sitting there in the clearing. We had to get a roof up. First thing I did was hang all the hammocks and then I started, you had to build a house for your family and you could not use nails or hammers. You had to use only a machete.

ROBERT GREENE

They had taught you how do that?

DANIEL EVERETT

Yeah, they taught you how to do all this stuff at main base. They taught you the skills. Now it was the time to apply the skills. At advanced base, the first one to get their roof on . . . you couldn't get your, they would give everyone a kerosene lantern, but you couldn't have it until your roof was on your hut.

I remember being so proud of myself for being one of the first to get down there and get that lantern out of everybody. You had swimming. There was also, again, lots of conditioning things. They taught us how to tie knots, how to butcher meat, how to can meat. That's another thing we learned at main base. That comes into the third phase.

ROBERT GREENE

Like military training.

DANIEL EVERETT

Oh, yeah, it was. Then the final exam of advance base is one day they come and get you. You don't know when it's going to be.

You can only have what you happen to have

on you at the time. You can't go back and get anything else. So I always carried matches and water and what they allowed me to have. They just marched us out, took us in a canoe all the way across the lake, marched us way into the jungle, and they would just say, "You stay here." I would just stay there by myself.

ROBERT GREENE

By yourself, for how long?

DANIEL EVERETT

They say, "We'll be back in a few days."

ROBERT GREENE

Did you have a backpack?

DANIEL EVERETT

No, they couldn't carry a backpack.

ROBERT GREENE

You had what?

DANIEL EVERETT

I had a military belt that had, I had canteens, matches, a couple of fish hooks, 50 feet of rope, and I had a rain poncho and a machete. That's all you could have.

ROBERT GREENE

That's kind of dangerous.

DANIEL EVERETT

You could die. I remember they showed . . . I knew how to make a spongy, springy bed based on that 50 feet rope weaving saplings through it. It was really cool. I put, as a cover, I put up my rain poncho. I had, I got a fire going. I cleared around my camp.

ROBERT GREENE

You did that where they left you?

DANIEL EVERETT

Yeah. I had to clear around, and I remember the first day I was too tired to go look for food or anything. I was just thirsty but I just fell asleep. My fire went out. It was pitch black when I heard something really heavy walking around my camp. I got right up and I had my machete in one hand, blowing on the fire. I had a little, that's another thing I took I forgot. I had found, somebody had abandoned this, it was a little copper tube with a plastic tube coming out of it. I put the

copper underneath the coals and would blow really hard and I would get the fire going really fast. I remember, this other guy . . . I got lost one day. The rule was if you . . .

ROBERT GREENE

You were by yourself?

DANIEL EVERETT

Yeah. The rule was if you did run across somebody else, you're not allowed to talk.

ROBERT GREENE

What was the heavy noise that you were hearing, an animal?

DANIEL EVERETT

Animal, yeah, it was an animal. I was coming back. I went to the lake, and I marked my path to get there and back to my exact little site in the jungle. I learned how to do that. On my way back, if you get off to the side of your path a ways, you can't see the marks you put on the trees. You can get lost just like that. I got lost. I'm wandering around through the bush, and I don't know where the hell I'm at. I come across this other campsite and it's this

guy I knew. He'd been raised as a missionary kid. He grew up in this environment. He was lying there. He had his hammock done where he could lie back like this, and he had like 30 little fish smoking in front of him. He was just eating the fish watching me walk by. I was starving and thirsty. He was just laughing his head off. He thought it was hilarious. I found my way back to my place. I caught a couple of little fish. I learned how, I knew how to identify plants I could eat. I got water from vines. I learned how to do this.

At the end of the time, they gave us another assignment that involved a lot more hiking, and we hadn't eaten well in a while. I'm joking the whole time. The only negative thing in my whole evaluation, they gave me this glowing evaluation, they said sometimes your sarcasm can be hard on people who are very, very tired.

ROBERT GREENE

You're just a naturally strong, athletic person?

DANIEL EVERETT

I loved it. Yeah, I have a lot of endurance for that kind of thing. It just didn't bother me. For some reason, again, I just loved the experience. Then the third phase of jungle camp was village living. They would take us out to a Tzeltal Indian village, and you were there for six weeks. They would drop off, I think it was like 30 pounds of raw meat. They just dropped it in front of your hut. You had to can, clean it, cut it, whatever you wanted with it.

We did that. We would go to the fields and work with the Tzeltal Indians during the day. My kids would take off with the Tzeltal kids and be gone from morning to night. My little daughter, Chris, we didn't have doors, we just had sticks you put up as a sort of doorway. I know I would get up at 6:00 in the morning and they would already be apart because she had gone out already. She was three, and I'd look across the village and she'd be sitting there with the Tzeltal Indian women

with a big bunch of tortillas in one hand and a big cup of black coffee in the other, at three. She was drinking this sweet coffee and eating tortillas and having a blast. Some other missionaries would come by and visit, and they would look in and see what we were doing. They would say, "Oh, I've changed my mind. I don't ever want to do this. I could never live like this."

ROBERT GREENE

Why? What do they mean?

DANIEL EVERETT

Just so poor. You're just living in a dirt floor hut. Living like the Indians. I got typhoid fever while we were there, had to get flown out with a blood pressure of 60 over 40. I was really in bad shape. But we loved it, and I did really well.

ROBERT GREENE

What was it you loved? Was it more than just the roughness? Was it also the other culture that you were . . .

DANIEL EVERETT

I loved the culture. I loved learning the language. I loved seeing my kids learn the language. I remember my oldest daughter, Shannon, come in. She was nine then. She said this means this, this means this, this means this. She would say, so this must mean, she would isolate a suffix on a verb and say so that must mean this. I said that's what it means, and we were all excited. We were learning together. I loved making progress in the language and having them compliment me. Learning this stuff, I loved the fact that very few people were doing this. We were acquiring these things as a family. We were doing this family thing that very few people ever have. A lot of guys do these short, survivor experiences. Imagine this television show "Survivor" and you have three little kids as well.

My first wife, Keren, is the toughest human being I have ever seen for that kind of

environment. You can't make it too tough for her.

ROBERT GREENE

Oh, really?

DANIEL EVERETT

Oh, yeah. I remember one day this lake that we were based at for advance base was almost a mile across. These guys that were really good swimmers and former life guards were challenging each other to a race. Keren walked out there, all 102 pounds of her, and said I can get over there and back before any of you. I'll challenge you all to a race. When she got back, they were so far over the horizon you could just barely see them.

ROBERT GREENE

She's a great swimmer?

DANIEL EVERETT

She just doesn't get tired in the water. It was really, she just did the breaststroke all the way across and all the way back. They all had to stop and rest before they started back. She just turned around and came back.

ROBERT GREENE

That's why she was ahead.

DANIEL EVERETT

Yeah, yeah. Well, actually, she started off ahead of them. She's fast at her breaststroke too, but that's partly true because she never got tired. Anyway, that was part of it. I liked being different, excelling as a family, excelling individually, at this that was so different. I felt so privileged. Nobody from my family had ever been able to do anything like this before. I realized that the more I mastered, the more I learned, the more privileges would come to me.

ROBERT GREENE

Did you know this language at all when they sent you down there?

DANIEL EVERETT

No, I didn't know any of it.

ROBERT GREENE

So had you been trained in theoristics?

DANIEL EVERETT

Yeah, part of the linguistics training, a large part of it, was field methods. How to learn a language when you speak no language in common.

ROBERT GREENE

This was also a monolingual?

DANIEL EVERETT

Monolingual. They spoke Spanish, but we were not supposed to use it. We were not allowed to use it and I didn't. Although they would sometimes get frustrated and start telling me things in Spanish and I understood. But I didn't initiate conversations in Spanish. Then SIL would send people around, and they would sit with you and someone from the village and say, "Okay, talk." They would evaluate how well you could talk in a natural conversation with those people.

ROBERT GREENE

They did arm you with some methods for learning. I saw some of it in the book.

DANIEL EVERETT

Yeah, they gave great methods. It's the best field training in linguistics that's available in the world. They're the best at it of anybody. Nobody's as good. I've never seen anything as good at it, in their materials and the way they train and the experiences they provide you with. Then you also had to hand in individual linguistic papers. You had assignments. You had to figure this out about the language and figure that out. You had to turn in these papers.

ROBERT GREENE

Was is it sort of an exciting intellectual challenge?

DANIEL EVERETT

I loved every minute of every day there. The whole experience, I just, I couldn't believe that I was being allowed to do this kind of stuff. Here I am with this other culture. I know somebody's already studied this language, but I never studied it before and people who wanted to see what I could do

with it. Maybe I could still find something out that nobody ever found out about this language, which as far as I know I didn't. Then I knew that one day I was going to go someplace else, and I would be the one responsible for that language.

ROBERT GREENE

Obviously, the language wasn't as difficult as Pirahã but it was probably pretty hard.

DANIEL EVERETT

Yeah. I mean, actually I think all languages are equally difficult. I mean I think that what makes a language seem simple is how close it is to your native language. The reason languages seem simpler, I think, this is not a scientific opinion but I think it's right, is how close they are to your native language. The closer it is to your native language, the simpler it seems. I mean, English is an incredibly complicated, difficult language for a variety of reasons. So is Portuguese. So is Mandarin. All languages are. Pirahã is a language isolate. It's not related to any other

known language. There's no literature you can consult about it, except the literature you create and learn from your own mistakes. That's what makes it hard.

There was a lot written on Tzeltal, which is a Mayan language. So if you really wanted to go on, even if nobody had studied Tzeltal before, they had studied Tzotzil and a lot of other Mayan languages. You could say this does this in that language, and that, so it must be doing this in this language. It's like studying Spanish for the first time, but there's already a lot of books on Portuguese and Italian and French that would be tremendously helpful.

We got a letter while we were in main base of jungle camp actually from Steve Sheldon. He said, "I've just been elected director of SIL's work in Brazil. I know, I've heard from people you like a challenge and that you would like to work with a challenging language. So here's the most difficult language I know of

where I've worked." He said, "I've been there since 1967. This is . . .

ROBERT GREENE

This is after you finished the camp?

DANIEL EVERETT

We just started the camp, actually.

ROBERT GREENE

Oh, just starting the camp.

DANIEL EVERETT

Yeah, the main base. So he said, "I've been there since 1967, and I've done some things. I really don't think I understand the language at all."

ROBERT GREENE

You were already making a name for yourself. People knew about your . . .

DANIEL EVERETT

I had done, all straight As in SIL. I did start, I was already having a reputation for being one of the best of the new crop. They knew I was interested in this and in challenges. Every course I took I did it better than the course before. We talked about it. We said that just

sounds great. We don't know anything. We didn't take a long time to make this decision. Let's hear a little bit more about it. He said, "You like a challenge. Here's a challenge." He hit just the right buttons on me. I said, "We'll do it."

ROBERT GREENE

And your wife had already been in Brazil?

DANIEL EVERETT

She grew up there. She knew a little bit about this tribe. She had heard about them. What she wanted to do was go to a tribe, if possible, that didn't speak Portuguese that had never been evangelized, at least successfully.

ROBERT GREENE

And did they, like, something that really interested me were, in a language situation like that, kind of figuring out what words meant, where you could go through kind of a deciphering process, were they able to help you in that, or is that something you had to kind of escalate and develop?

DANIEL EVERETT

It's a skill you have to develop. I mean, you can ask them questions. But their answers are very often helpful, but they tell you things you weren't focused on. Sometimes the Pirahã would know better than I did what I should be asking, but they didn't answer what I was asking. They answered what they thought I should be asking. Like how to use it in a story or something like that. They might say something like, [speaking Pirahã] which is to write, to make marks. I said, you said [speaking Pirahã]? And they would say, yeah, [speaking Pirahã], and they would say it with a different suffix. I'd say, so what's . . . okay, so [speaking Pirahã]. You didn't have any idea why they said it differently. You know that there's some meaning difference here, but what is it. When I could ask the question, what's the difference, they would say, "Oh, there's no difference, just two ways." That's false. There are differences. They just didn't . . . if you ask an English speaker what does

the “to” mean in I want to work, nobody can tell you. People don’t know what that means. Some linguist have ideas about it, but it’s even controversial among linguists.

ROBERT GREENE

It’s the infinitive or just . . .

DANIEL EVERETT

Well, it’s, you can have he can work. Why don’t you say, he can to work? Why do you say he can to work versus I want to work. With some verbs you have to have the to and other verbs you don’t. So, it’s not just the infinitive. There are lots of interesting analyses of it. But the point is, even if linguists knew exactly what it was doing, the average person doesn’t have a clue why they talk the way they talk.

ROBERT GREENE

I get what you’re saying.

DANIEL EVERETT

They can’t answer the question for you. You can’t ask them, why do you say it this way? Why do you say economy sometimes and

economics sometimes and economics another time? Why do you say root one time and then route another time?

ROBERT GREENE

I don’t know.

DANIEL EVERETT

I don’t know, I just do. Actually, you probably don’t just do. There are probably reasons for when you’re going to say one versus the other. But you can’t articulate it. The linguist has to figure it out. It’s the same if I’m asking somebody, why do Americans do this?

ROBERT GREENE

Do they give you any strategies for how to figure these kinds of things out? Or do you have to sort of do it on your own?

DANIEL EVERETT

Yeah. Yeah, they give us a lot of strategies, but I’m the one who’s written more on it now than most people have. So I have a, I have a chapter in a book on field methods that was successful called the “Monolingual Method.” I have a coauthor in England and I

are coming out with a book from Cambridge University Press on field methods that has a large section on . . .

ROBERT GREENE

This is not the book that you were talking about?

DANIEL EVERETT

No, this is another, technical book, and this has a section on monolingual field work. Most linguists avoid those situations, because even with a lot of training it’s really difficult. When I would work with other tribes in Brazil, like the Baniwa who speak fluent Portuguese, I would say, they would give me a story. I’d say, “Okay, what does this word mean?” They’d tell me and he would say, “We put this part at the end of verb.” At the end of this word, we put this here because it’s an old man talking a long time ago, but if it was like this it would be an old woman talking a long time ago. This is because it’s a woman. This is because it’s . . . and they would go through and just explain everything in Portuguese. If you can’t

figure out a language like that, that's really easy, it's like having it come to you for free compared to the Pirahã where they couldn't explain a single word's meaning. They could tell you some things. They could describe it, but you had to figure it out from context and make it more precise.

For example, the word for dog. I didn't realize at the time that dog is not indigenous. I should have known this, right? But dog is not indigenous, therefore there are no indigenous words for dog among American Indians, because their languages existed before dogs came along. So the Pirahã told me, I asked what's the word for dog? I see a dog and say what do you say? They say [speaking Pirahã]. So, okay, fine. I write [speaking Pirahã]. Then I asked somebody else because I always want to check it out, and they say [speaking Pirahã]. So I wrote [speaking Pirahã]. People would use them interchangeably. They would say they're both right, they're okay. So I had no idea what the reason was. Then years later

they caught two weasels that look like dogs called jungle dogs. There are two species, two different colors, one's [speaking Pirahã] and the other one's [speaking Pirahã].

ROBERT GREENE

There were two different kinds.

DANIEL EVERETT

Two different kinds, but they were indigenous words. For the dog, an imported European dog animal, they didn't care which one you used for it because it was just named after both those creatures.

ROBERT GREENE

Oh, I see what you're saying.

DANIEL EVERETT

Either one of those creature's names works for this, because it just refers you back to them. Other things would be like, a lot of names refer to natural objects. Other things like, whenever I would figure something out, I would be so excited. Just one little part of a word.

ROBERT GREENE

I know, it's like Sherlock Holmes.

DANIEL EVERETT

Yeah, and that's the way it was all day, every day. That's the way it still is sometimes when I go there.

ROBERT GREENE

But it must have been frustrating in the beginning. We'll get to that. So they did arm you with some strategies.

DANIEL EVERETT

Excellent strategies, excellent methods.

ROBERT GREENE

One thing I am very impressed about is how you attune you are to your observational skills, details, picking out these clues. Is that something you just had to develop on your own or do they . . . and different culture, would they sort of give you training you in how to immerse yourself in a different culture?

DANIEL EVERETT

They can't, this is a thing about field linguistics. There's a certain amount of methodology that can be imparted, but there's a large amount of art and intuitive ability that cannot be imparted.

ROBERT GREENE

Right.

DANIEL EVERETT

I'm not always observant. When I walk with my current wife, Linda, she reminds of the Pirahã because she's really interested in nature. She sees every single bird and every different species of tree. I tell her there's sometimes when I think you'd be quite at home among the Pirahã. I don't tend to notice that stuff, which the Pirahã find astounding. But I do notice parts of words. I do notice all the linguistic stuff and it stands out to me. I have a very good oral and visual memory for language in the analysis of it.

I do a demonstration now that's called a monolingual demonstration. I've done it for

linguists, I've done it for non-linguists. They bring in a language I've never worked with before, and the thing that makes it work well is when you can remember 15 sentences ago you heard the same little bit. So you look over here, ah, now I know what that means. People's reaction, they really enjoy it when you can draw a red circle around it and a red circle where you saw before and draw a line together and show them the connection. If you do it right, they'll be seeing the connections too. But it's because you know what to ask and you know which direction to take it. So, when I got to the Pirahã, I didn't speak a word of the language. But within an hour I was making sentences and putting things together. For the other missionary who was with me who didn't speak the language, to him it was just magic. He said I've been coming here for 20 years and I can't say a word.

ROBERT GREENE

Is that really after one hour you can do more than he could in 20 years?

DANIEL EVERETT

He didn't live there for 20 years. He just visited off and on. He had tried many times. He couldn't say anything in the language partly because he wasn't a linguistic missionary. He hadn't been trained to do that. Yeah, with that method and my interest and abilities, in an hour and a half I was putting a lot of stuff together and coming up with ideas about the language. The Pirahã they didn't know about our, as far as they know I'm a different species, so maybe I've already learned the language. The fact that I could say a few sentences back correctly, they would just start talking to me full speed in the language. He must have learned it by now. It was challenging.

ROBERT GREENE

But it's also you're observing their culture, like how their huts are ordered, built, and

their structured. Kinship relationships. Are these things they train you in?

DANIEL EVERETT

No, they did not train me in the anthropology. Consequently, for the first few months I totally ignored those cues. They had told us we should pay attention to this stuff, but they hadn't driven it home like the linguistics. Like most linguists, I thought that linguistics and culture, language and culture were totally separate. I'm not interested in the culture, I'm interested in the language and how the language works. Obviously, I've concluded that was a bad choice. But you can't help, if you're really interested in language, you're interested in what they're talking about. They're talking about, in the case of the Pirahã, things that are going on around you all the time. You do start to see these things.

But I constantly made the assumption that deep down people are people, and so whatever, eventually I can get across any

message and communicate any value to them. After all we're humans. Which I came to realize later is right if you're talking raising one of them in your culture or you being raised in their culture, having the aim in perspective. But there was a huge chasm across which you could not go, and there were . . . so I don't believe in translation. I think you can do rough translation, but I don't believe that's it's possible to translate everything from one language to another.

ROBERT GREENE

No, not in the end. I've translated things before from French to English, and there are words that can never be translated.

DANIEL EVERETT

Exactly. But with the Pirahã, they were encouraging. Largely, not everybody was encouraging. The kids always made fun of me, and the women wouldn't talk to me at first. But the men were encouraging, some of the men. They were nice. I realize they wanted to stay on my good side because I had

nice things to hand out. But they were also just genuinely encouraging, and I loved it.

ROBERT GREENE

I can imagine most people thrown into that situation, because it's just all of these sounds that you can't make any sense of, the level of frustration almost starts impeding your ability to learn it. Then you reach a point where you almost just give up. You got past that somehow.

DANIEL EVERETT

Yeah, I got past it because it never occurred to me to give up. I knew I could do this. I had the methods that they had given me. I knew I was learning stuff every day. I also knew that it wasn't coming as easy as I might've hoped. It was a lot more work than I thought. I loved the idea that two people before had tried and failed. I love that. I love the fact that working on these other languages would be pretty easy. This was hard stuff. If I could learn, if I could do this, I was . . .

ROBERT GREENE

I don't want to say it's the hardest, this is probably the hardest language on the planet now that we know of.

DANIEL EVERETT

It's the hardest situation because you're isolated in the jungle. Nobody's around, it's really hard to get there. These people don't speak Portuguese, and you don't speak their language. There's no language related to them. Every single thing you learn you have to do it on your own. Nobody can teach you. They don't teach like that. They believe, like the story I talked about in the book, that you either . . . they sort of believe language is innate in the sense that specific languages are innate. When they would see me doing things that they didn't do, they would say, "See, you're not one of us. So you can't learn our language." But then I started learning it and learning it more and more and they would, they found that fascinating. I visited another village, and the little kids' smiles would just

be open. You'd talk to them and they just wouldn't answer. They would just . . . their mouths would be open because they weren't used to . . .

ROBERT GREENE

They'd never seen anybody.

DANIEL EVERETT

Nope, these words shouldn't come out of that mouth. To some of them, I was like an amazing parrot. I was just this other creature saying their language.

ROBERT GREENE

You said that you would see them talking to you. Then they would talk to somebody else as if you weren't even there.

DANIEL EVERETT

Yeah, exactly. It's as though your family dog started talking to you. I mean, that's how shocking to them it would be.

ROBERT GREENE

How long did it take you to get to that point? Certainly not when you first got there.

DANIEL EVERETT

Well, no, but it took, after about six months, I could say a lot of things. By no means fluent, but I could do a lot stuff in the language and understand maybe 60% of what was going on around me.

ROBERT GREENE

Well, we're making good time. I don't remember what the last thing we were talking about was, but . . .

DANIEL EVERETT

Monolingual method or whatever.

ROBERT GREENE

But you were saying it took you, after six months you could say words that others couldn't.

DANIEL EVERETT

Right.

ROBERT GREENE

But I want to now get to the thing that fascinates me the most here. Well, everything fascinates me. But your discovery, your major discovery, not the only one, about the role of

culture and where that came from and the roots of it and your immersion in their culture that allows you to see this. I kind of broke down . . . this is sort of what I do. I always break things down. What I see is like three strategies that you used in doing this. But one of the main ones was participating in their culture. This is a big theme in the book. It's an idea I've seen in other people's writing, about what's called participatory knowledge. It's a different form of knowledge. We talked about it with the [inaudible 0:02:05]. Is this something that you started doing the moment you got there? What I mean is engaging in the same activities as a way of consciously learning their language. Going into the jungle with them, hunting, other various activities.

How did this evolve?

DANIEL EVERETT

This was part of my SIL training. SIL said that, which is what makes their training so good. You cannot learn the vocabulary, so think of it not even about learning the

culture but just learning the basic vocabulary, unless you're engaged in all the activities they're engaged in, because every activity has its own vocabulary. And so if you don't go hunting with them, if you don't go fishing with them, if you don't go working in the fields with them, if you don't stand around while they're cutting animals to pieces, while they're eating, while they're sick, if you're not there with them through all these different components of life, you won't learn the way they talk about those components of life. And since the Bible is about all the components of life, you can't communicate the Bible until you understand the people. Which is not a bad idea.

Whatever you think of the Bible as a book, you can't communicate any set of difficult concepts to a people that involve a lot more than the intellect. So I did do all that with them just as I had with the Tzeltals and my training in Mexico. I would go to the field with them and swing an axe all day. I would

go hunting with them, which was sort of pointless because I'm so bad and so noisy in the jungle. But I would go with them and I would ask questions all along the way. They got to the point where they said, "Did you bring your notebook and paper?" There were no portable recorders then. And I said, "I forgot it today. We'll tell you some other time; you'll just forget it." They knew if I wrote it down, I could say it back just like they could. So putting all of this stuff together, learning a language . . . I've come to the conclusion that you can't write a grammar of a language if you don't have this full experience.

ROBERT GREENE

But the missionaries and that approach is just a way to learn vocabulary. It's not about . . .

DANIEL EVERETT

They also wanted you to figure out the grammar. So there was no deep cultural linkage between . . . however, in doing this, I began to learn things that left me unsettled. As you're learning the language, just as when

you're learning your chosen field, in my case linguistics, even when you're learning the concepts, who are you to say that these words aren't there, these concepts aren't there in the language, or that this theory can't handle what you're finding?

ROBERT GREENE

Give me an example what you mean by that.

DANIEL EVERETT

I wasn't finding numbers. Well, the example that stands out to me most I couldn't find the difference between left hand and right hand. This is very early. I was trying to get left hand and right hand. I did not know that these are not universal. I didn't have a Ph.D. in linguistics. I just had two summers of introduction. Besides back, not that many people knew of languages without left and right. At least, they hadn't written them up in any way. So I couldn't find that. So is the problem because I'm a bad linguist and I can't find it, or is the problem because they don't have it? What do I make of it if they

don't have it? What does that mean? I had no answers to that, so I couldn't find it. So I kept trying and trying and trying.

ROBERT GREENE

Literally trying to teach them right and left?

DANIEL EVERETT

Learn from them. I wasn't trying to teach them, because I assumed everybody knew this. Trying to get them to teach me what their words for left hand and right hand were. So when you try this for a couple of days with a lot of speakers, you still can't conclude that they don't have it. You can only conclude that you didn't find it. So you say . . .

ROBERT GREENE

You're assuming that it's there.

DANIEL EVERETT

You're assuming that it's there. Why? Because the theory, whether it's a folk theory or a scientific theory, your understanding is that all people have it. The same thing goes to grammatical theory. If I don't find quantifier words like all, each, and every, and the

theory tells me all languages have them, then the fact that I didn't find them and I've got all these brilliant people telling me that all languages have them, I just figure I didn't find them yet. So I'm starting to accumulate things I haven't found.

ROBERT GREENE

So what did you do with the right and the left? Was that one that you went further with or you filed it?

DANIEL EVERETT

I was walking in the jungle and I said, "Now I'll find out. This is what I should have done to begin with." They're going to tell somebody which way to turn, and I'm going to be ready. They'll say turn left. So they told the guy, "Where was this place that you were talking about?" They said, "Turn up river, turn down river. Go to the . . ." I said, "Okay, so they're not using left and right. What the hell is the matter here?"

ROBERT GREENE

How did you know that that wasn't left and right? Well, you knew the word upriver and downriver.

DANIEL EVERETT

I knew those words. Those are easy. I've got those because they have them. Here's another question that even some linguistics don't get.

ROBERT GREENE

Upriver and downriver could be straight ahead or behind.

DANIEL EVERETT

Exactly. It's always varying.

ROBERT GREENE

How do you know which is right and left still?

DANIEL EVERETT

If they say turn upriver and you're walking away from the river but you know the river flows perpendicular to the way . . . you turn right. But if it's inappropriate to say turn upriver, let's say you're already walking upriver, then they won't say turn upriver.

They'll say either turn downriver, turn to

the river, or turn away from the river. The point is all Pirahã have their geography in their heads. So the closest thing we have to it in English is if you're walking you say turn north, turn south, turn east, turn west. Although, those are even more abstract, because they're not linked to parts of the geography. They're linked to the world as a whole. Then when we were teaching them to write, you'd say, "Okay, move it to the right." They would always say when you tell him to move his hand, turn it upriver, turn it down river, depending how he was oriented towards the river. So then I eventually came to realize that they do not have left and right. They use these absolute kinds of terms. So if everybody knows the geography and you tell him to turn upriver, there's no ambiguity. But if we're facing different directions and our life depends on turning left at the same time, your left is different from, so one of us might die.

ROBERT GREENE

It's a cultural and survival thing.

DANIEL EVERETT

Yeah. So that's how I found that out. Then you go to all, each, and every. You have philosophers like Donald Davidson writing, "Until languages have the some versus all distinction, we haven't fully become human in our linguistic abilities." He didn't know about the Pirahã. And yet if people believe that strongly and there are linguists all over who think these are universal and they just think it's absurd that you would say they're not. But you realize they're not. And how do you get to the point where you can say that they're not there? It's only after you've investigated for a long time, but also you know how they talk in the culture. You know how they express these things. So it never occurred to me that it was saying that the Pirahã were stupid because they lack these things. It's just that you realize that they don't talk about the world in a way that uses these things.

ROBERT GREENE

It's typical of most people to have a kind of innate sense of cultural superiority even though they're not even aware of it. It's natural almost to bring it with you. You didn't have that even from the very beginning?

DANIEL EVERETT

No, I had it at some time. There were times . . . you get really tired and you've been laughed at all day and you withdraw into these little self-defense mechanisms. I remember being disappointed because to me culture was wearing bright feathers and painting your body and having ritual dances and myths and beautiful artwork, handicrafts. I told my wife one time, "This is like a bunch Scouts on a camping trip. A bunch of hippies. They must have lost their culture." And that's what a lot of people conclude when they see them for the first time -- this is a group that's falling apart and they've lost their culture. But nothing could be farther from the truth. Their culture is so strong . . .

ROBERT GREENE

How did the process lead you to come to that conclusion or that idea?

DANIEL EVERETT

Watching them in various environments. You have to spend a lot of time. So you see them lying around, farting, and eating potatoes out of the fire. It's not really impressive. You walk with them into the jungle . . . just one example. When the Pirahã are standing in the village, they tend to stand with their hands crossed and their legs crossed in a certain way. You say, "Why the hell do they do that?" You watch them take off through the jungle and their hands are like this. I mentioned this to my current wife, Linda, and she's a scuba diver. She said, "That's the way you dive. It keeps your hands from banging on things." Well, that's exactly why they do it.

ROBERT GREENE

It's harder to keep your balance. They're probably so used to it.

DANIEL EVERETT

They're just very well balanced. The two most common places to get bitten by snakes are the feet and the hands. The hands, because you go to steady yourself. If you learn to keep your balance and hold your hands like this, you not only avoid hitting thorns but getting bitten by snakes.

ROBERT GREENE

So this is impressive when you go into the jungle and you see them operating. They're not stupid.

DANIEL EVERETT

These guys know what they're doing. You can ask them a question about any plant, any animal, anything you see and they'll tell you all about it. Everybody knows all about everything they encounter. There's nobody who says, "I don't know what that plant is." They'll tell you what eats that plant, why it's . . . everything.

ROBERT GREENE

It took you a while to realize this.

DANIEL EVERETT

That's right.

ROBERT GREENE

Because the idea that they don't have right or left or these other things, it's not from just a lack of culture but it's because of their culture.

Daniel: It's because of their culture. That's right. Their culture is perfectly designed to enable them to succeed in their environment. One human being could not sit down and design this culture or any other culture. This is the result of hundreds of years of evolution of that culture. So that far from being a degenerate system, it is the perfect system for them there. And only when you come to realize this can you talk about the things they have or don't have without feeling like you're putting them down. You're simply telling the world how this group of human beings has chosen to survive and succeed in this part of the world. But you have to develop that unique perspective. You have to have lived

there long enough to know, "Why do they say it like this?"

Now for scientists, it's not enough to say, "I know this is what it means because I feel the way they feel." That's not a scientific statement. But for you as a scientist, you get those intuitions because of your years of being there and now you have to look for the scientific explanation for your intuition. But you put those intuitions in yourself by being in that circumstance and by learning and participating in that culture.

ROBERT GREENE

One thing though that I was interested in is you would go through these experiences, like with your family nearly dying or your wife and your child, or suspecting that they tried to kill you perhaps. And you would seem to go through this process over and over again where you ask yourself, why did it happen, from their point of view. It's kind of unusual. Is that something you've been doing your

whole life or was it just a survival mechanism or was it more enlightened?

DANIEL EVERETT

I've always tried to understand why people think the way they do and in particular, I guess egocentrically, why they think about me the way they do. I've always had, partly because of an inferiority complex . . . "Why did she not invite me to her dance?"

ROBERT GREENE

This is all people who are studying, that idea very much. People who come from marginalized cultures, or if you feel marginalized within your culture, are much more sensitive to those kinds of signs, because you want to understand what makes somebody superior or the power structures.

DANIEL EVERETT

Yeah, and I think that had a lot to do with me. I had, in addition to my mother dying really young, I struggled with acne really bad. I had all these problems. I had a lot of friends so I wasn't a complete outcast. A

lot of people considered me a lot of fun and cool to be around. But at the same time, I felt deeply marginalized and inferior to other people, and I tried to understand what that was. I tried to make sure that whatever traits I had that were negative I was getting dealing with and I was getting rid of those. I remember somebody saying something to me about, “You hold your mouth open a lot.” So I consciously worked on keeping my mouth shut. That’s a very minor thing. But with the Pirahã, if they didn’t like me, if they responded poorly to me, they wouldn’t have responded poorly to every human being that was there I don’t think. So what did I do wrong and how can I avoid doing that?

ROBERT GREENE

That’s not natural. Most people would have thought, “Why are they trying to kill me? What’s wrong with them?” So that’s very interesting.

DANIEL EVERETT

Maybe it is. There’s another thing that made me think that way. And that is I am not leaving here and I don’t want to be killed, so I’ve got to solve this problem. Leaving there was not an option.

ROBERT GREENE

It’s a survivalist thing as well.

DANIEL EVERETT

That’s right. And so it was natural curiosity. It was also deep respect for them, because I really liked them as a people and it hurt my feelings. Not only threatened my life, but it hurt my feelings that they would talk about me that way. “Gosh, I like you why can’t you like me? What was wrong with me?” I felt the same way around Brazilians sometimes. I used to say, “Some Brazilians don’t like me because I’m an American. Well, I can’t do anything about that. But some don’t like me because of things I can do things about and I want to fix what I can fix.” So it’s useful to be liked by people.

ROBERT GREENE

It is. But you sort of brought this already with you to the jungle.

DANIEL EVERETT

Yeah, I did. And that has to do with my background and problems I had in adolescence. The fact that my mother died and the fact that I struggled through adolescence with feelings of inferiority, I’m certainly not the only adolescent that felt that. But suicide . . . well, every adolescent thinks about suicide I suspect. The guitar was the first thing that started to pull me out of this, because when I was on stage, girls and guys would just flip out. When I was off stage, I felt like a totally awkward dork and I couldn’t do things. I could say anything I wanted up on stage. Nothing even came to me to say when I was off stage. So learning that there were some ways you could deal with this by mastering certain things was important. So with the Pirahã I wanted to understand them. And I guess my desire to understand

them grew as I wanted them to like me. Not just from the scientific perspective that I wanted to understand them, but I wanted to act appropriately and speak appropriately. I wanted to be cool, be one of the gang. And that played a large role in it.

ROBERT GREENE

You got there?

Daniel: To a large degree. Right now, I'm just as white as I can be. My body shape is very different from theirs. I'm ancient by their standards.

ROBERT GREENE

What's their . . . there was somebody you mentioned lived into their 60s.

DANIEL EVERETT

A lot of them do. You will see a number of people who have, but the average Pirahã is less than 50. Probably more like 45 when they die. And they show age differently. We show gray hair . . . Pirahã would probably be around 70 before they started showing gray hair. We can show it in our 20s. So they

think we're much older than we are. We have wrinkles that they don't have always. They just age differently. So we have signs that indicate much greater age. That means that with all of these physical characteristics I'm never going to be one of them, but they do like me and they know they can trust and they know that I help them. They know I speak the language, and they know that I treat them with respect. They know they can explain things to me and I will understand that, and they can't do that with anybody else. So not completely one of the boys but . . .

ROBERT GREENE

As close as we can come.

DANIEL EVERETT

. . . as close as we can come. The only person that could do better would be somebody who had all the linguistic abilities I have and they were brown and small. They would do better. Or a Japanese. The Pirahã think Japanese look just like them.

ROBERT GREENE

Really? There have been Japanese people who have come there?

DANIEL EVERETT

A pilot once. A missionary pilot came in once who was Japanese.

ROBERT GREENE

They were fascinated. They are related.

DANIEL EVERETT

The Pirahã said, "They look just like us. What is he called?" "Japanese." Because they had asked me, "Who makes your tape recorder?" And I said, "Japanese." "Who makes this?" "Japanese." "So they look like us and they make everything and they fly planes and we know you don't know how to fly a plane, so they're superior." They like that.

ROBERT GREENE

And their language sounds Chinese almost

DANIEL EVERETT

Chinese, because it's tonal. Both Chinese and Pirahã are tone languages, and Japanese has a teeny bit of that. Perceptive people realize

they sound something like Oriental languages because they're tonal.

ROBERT GREENE

So you were accumulating these anomalies that couldn't make sense of right and light, number . . .

DANIEL EVERETT

No numbers, no kinship system, no creation myths. They didn't have any of this stuff.

ROBERT GREENE

No kinship system?

DANIEL EVERETT

The simplest kinship system, no. I had read about kinship systems, the Hawaiian system, the Iroquois system, these complicated systems. So I said, "Okay. Now I've read all this stuff. I'm ready for the challenge." And I only get three words. Four words, five words, depending on what level of detail you're looking at, but about five words of some sort; their whole kinship system. I'm thinking, "This can't be right." But it is right. So the kinship system, the creation myths, the color

terms, all of this stuff accumulating and then white people couldn't learn the language and they wouldn't learn Portuguese. People couldn't figure out the culture. Nobody had success in converting them. What accounts for all of this weird stuff about the language and the culture and all of this? Is it just a coincidence that they're weird in all these ways?" When I say weird, I mean obviously different from us. We're weird in the same ways to them. Well, in different ways. I said, "Either these are all coincidences, or there's some kind of notion that links all this stuff."

ROBERT GREENE

You think nobody had noticed these anomalies before because they never had gone far enough?

DANIEL EVERETT

Nobody but Steve Shellbrook and my wife Keren, my first wife. I said to Steve, "Did you ever see these things?" He said, "Well I had some ideas that they might not have these, but I would go to these workshops on

linguistics with SIL people and they would say, 'All languages have that. Go back and look harder.'" The difference between Steve and me was that I was prepared to say, "No, you're wrong. Not all languages have this." He felt, "I'm not a linguist. Who am I to argue with them?"

ROBERT GREENE

Why did you have that certainty? Why would you insist not respecting these eminent authorities?

DANIEL EVERETT

Because I had been publishing in all the top journals. I was building a reputation for myself. I knew Chomsky by that time, I knew these people. I had a sense of where I fit and what my abilities were relative to other people's. I said, "Let's really see if we can unify this. And what seems to unify it . . ." and there was one remark that got me thinking about this. I wrote first a paper on the Pirahã 's tense system and how different it is. A really good friend of mine who's head

of the linguistics department at the University of Edinburgh in Scotland, Ed Finney, was at the University of California Santa Cruz, Jeff Polan, who wrote and said, “That’s very interesting, but if you stop and think about it what’s the big deal? There’s a culture out in the Amazon for whom time is not that important.” I said, “Yeah. But why would that be a coincidence?”

There are other cultures that live in similar environments for whom time is very important. So it’s true that you can’t say that because they live in this environment they’re going to have similar values on everything. I disagree with that version of anthropology. If we look at their values, and not just their values, but which values are more important. We could say, for example, that to an American and to a French person being thin is a value. We could say that to Americans and to the French walking around is a value and eating cheese and wine is a value. So what is the relative ranking of those? And you

see that when you look at Americans and you look at the French. Obviously to Americans it’s more important to eat the cheese and drink the wine than to get the exercise. And for the French . . . so these aren’t things that people talk about consciously. The anthropologist has to observe them, has to come up with these theories and has to test them in some way. I was at the Max Planck and I said, “I have got to come to grips with this. This is the singular most important intellectual problem of my life.”

ROBERT GREENE

These differences?

DANIEL EVERETT

These differences. And understanding the Pirahã and being able to tell the world how remarkable they are and how different they are. All the articles I’ve written so far have largely said how they fit into the theories as we understand them and have been designed to show how unremarkable they are once we get a deep understanding. And that’s the

standard theoretical linguist’s perspective or anthropologist’s. These things which seemed mysterious are no longer mysterious because we understand them in the context of our theory.

ROBERT GREENE

How do you know when you’ve reached that point?

DANIEL EVERETT

Charles Peirce calls it abduction. If you have a surprising fact . . . so A, is a surprising fact. They have no number words. So you have a hypothesis. The easiest way it goes is, (A) they have no quantifier words. (B), if they do have quantifier words and you’re just wrong, there’s no surprise. So (C), it’s probably (B). (C) is probably you just didn’t get it right. That’s the simplest hypothesis.

So the other hypothesis is that you’re right, they don’t have them, and we have got to reconsider fundamental ideas. Do you have to think you’re absolutely right before you say that? No. Do you have to have confidence

that you've done due diligence and you're pretty sure this is what it means and you believe that this unifying idea fits what you know about them intuitively? Okay. And now are you prepared for the shit storm that's going to follow? And I wasn't. I thought I was, because I envisioned my opposition coming in the form of articles that were well reasoned and pointed out the flaws in my logic. I was not prepared for being called a liar and a racist and all this stuff. But that's what happens, and I would still do it today. It wouldn't affect me at all to know that.

So I wrote it and I said, "If I'm right, most of linguistics as we understand it has got to be reconceived." I'm not going to send this to a linguistics journal because the chances of a linguistics journal publishing an article saying linguistics as currently conceived is wrong are pretty remote. They would want so many addendums to this that it would be a book or two before I'm finished. I do want to write a book on it, but I want to get the ideas

out there. So who's most likely to publish it? Anthropological journals. So I went to the top journal of anthropology and said I'm just going to give it a shot and send it to them. I let a few people read it, and they were like, "This is LSD for linguists." I sent it off to Current Anthropology, and they accepted it almost without revision. And that's by far a bigger journal than the linguistic journals. So then the debate started. I gave a talk at the University of Cambridge.

ROBERT GREENE

What year are we talking about?

DANIEL EVERETT

2005 I think. 2004/2005. It was the Linguistics Association of Great Britain. It was a big honor. I was asked to give two or three days of lecture on the Pirahã language. They always choose a well-known field researcher to give a talk about some weird language. That's a great tradition. Sitting out there were some MIT folks, because they sort of knew what I was going to say because

I circulated some of my ideas. They came prepared and asked me hard questions and I wasn't able to answer all their questions well. So I was sputtering a bit. The reactions to that are different. Their reaction was I didn't know what I was talking about. My reaction was, "Yeah, I do know what I'm talking about. I have to clean up these things." I was totally confident about what I was saying. I knew that if one of my arguments was a bit weaker, well I have to find another one.

ROBERT GREENE

What were some of the things that they were hitting you on as far as trying to trip you up in a way?

DANIEL EVERETT

First, they misunderstood thinking that I was trying to say that this could not occur anywhere else but Pirahã. And they would say, "Well, there's another language that has these characteristics." I said, "So what? That's fine."

ROBERT GREENE

How would that disprove what you're saying?

DANIEL EVERETT

They would say simply that it's a feature of grammar and it's not related to culture. Their view is that if it's got a cultural explanation and you find another language that doesn't have the same culture but has a similar characteristic, then it's got to be independent of culture. But what they didn't understand . . .

ROBERT GREENE

That doesn't even make sense. I'm sorry. From an anthropologic . . . that wouldn't make sense. Two cultures as far apart as the Mayan and modern American could have similar values on something. It doesn't mean that they're . . . it's universal.

DANIEL EVERETT

Exactly. There's that and there's the fact that I am trying to explain not just one or two things but a range of things based on the culture.

ROBERT GREENE

So they were trying to isolate little things there?

DANIEL EVERETT

I said, "Pirahã doesn't have recursion therefore it doesn't have possessors like John's mother's brother's house." Because that's recursive. They said, "Well, German doesn't have that either, and it doesn't have the immediacy of experience. Or are you saying that it does?" Snicker, snicker. I said, "But German does have it after the noun. German doesn't put things so much . . ." It turns out that's even wrong. German has it in both places depending on the dialect. It was just a silly thing to say.

The weakest argument I gave was about the order in which you could find words. That was a bad argument and they pointed that out. It was a bad argument. That was just something I threw out there. There were a lot of arguments. That was just one of many arguments. Then they wrote this very large

article. He went back to his home institution and talked to a couple of students and they wrote this article. Well, that was great for me. I have a strong intuition that I'm right. Just like when the Pirahã tried to kill me, I've got to figure out what made them want to kill me and not repeat that. If they disagree with me, I've got to figure out why they don't agree with me and make sure I can answer all of that. It turns out that some people are so committed to particular views that, in principle, it's impossible, because if you're right, everything they believe is wrong. So they're not going to believe it. It's like trying to convince a Christian that there is no God.

ROBERT GREENE

But if it exists for the Pirahã, does that mean you can't say that there would be another culture that would have the same principle?

DANIEL EVERETT

I think a lot of Amazonian . . .

ROBERT GREENE

Human reaction to an environment that they have, why wouldn't there be . . .

DANIEL EVERETT

I think there are.

ROBERT GREENE

That doesn't debunk your argument.

DANIEL EVERETT

No. One anthropologist, a guy who's worked with the Pirahã, he doesn't speak the language but he did spend 18 months working there and I've looked at his dissertation. He learned a lot of interesting things with the little baby Pirahã that he did speak. And what he said was that he believes that I'm right, that there's immediacy of experience principle, but that it's widespread throughout the Amazon. Well, I agree with that too.

But here's what my critics say about that. They say, "Other Amazonian languages do have recursion and they do have number words, so this must not have anything to do with it if they also have an immediacy

of experience principle." The answer there is just as we saw with the French and American example on weight and cheese, two groups can have this immediacy of experience principle but other things can be more important in the values. One of the hard lessons, if I'm right, is that each individual language and culture is a unique combination, and you cannot say that every principle developed for one language will apply to the next language over. It may at some really deep level of abstraction you can see evidence for it, but you've got to understand not just the culture, not just the language, but how they work and affect each other for each individual culture and language pair. That makes the task much more complicated, and it makes the possibility of a unifying theory much more remote. If you believe that we already have such a theory, then that can't be right.

So being prepared to take those people on . . . there have been times when I felt it was me

against the world. I was telling a good friend, he teaches at MIT but he's the one going with me to the village in January, I said, "After seeing all the kind of criticism that Obama gets on a regular basis, I don't feel so bad." Well, he misunderstood that. He thought I was trying to say I was as important as Obama. He said, "Gosh, that's egocentric." I said, "No, no. If he can deal with all that he gets, my stuff looks pretty minor in comparison." Bill Clinton, some of the stuff he put up with when he was in the White House or even George Bush, whether you think it was deserved or not. There's adversity in life, and you've got to have confidence about it. I've always been, in some respects, more influenced by philosophers, even though I'm not a philosopher than I was by linguists or anthropologists.

ROBERT GREENE

Like who?

DANIEL EVERETT

The personal performance of these philosophers like John Searle who teaches at University of California Berkeley, and Willard Quine, who's no longer around, who taught at Harvard. Rich Thomason is a great friend of mine who was at the University of Pittsburgh and now at the University of Michigan. These guys are so confident in their abilities that they are unassailable. You're not ever going to destroy their argument. There was this time when Quine was giving a talk many years ago, I forgot where, and he was at the blackboard and somebody raised their hand. One thing I love about philosophy conferences is that everybody in the audience is out to destroy the other person's arguments. This guy raised his hand and said, "If I understood you right you said the following?" He said, "That's correct. And then this follows, but then here's a contradiction which means your theory falls apart." And everybody in the audience

gasped because he just said . . . and Quine says thank you and goes back to talking like it was water off a duck's back. Quine is not going to bother himself with this right now, but he didn't forget it. In the next publication, he's going to demolish it or he's going to change his view.

So what I learned was you stick to your guns, you think about it. You're arguing with smart people. They're going to have good arguments and you're going to have good arguments. The question is who can come back fastest and who has the best argument in the long term? When these really strong criticisms first came out, initially I just couldn't believe that they were trying to humiliate me in front of everybody. But if you read the history of science, that's what it's about. I said, "Okay, so let me think about this." And you have to be really confident. A lot of people would just never have responded. I could have just avoided responding. I did a good job. I don't need to stay in these debates

to be liked here. Most people here don't have any idea what I do. When I was in a linguistics department, I had to be engaged in debates, because all the colleagues knew I was a linguist and they read all this stuff and they expected my answer. If I gave up, then I had been defeated. Here, I do respond and I respond because I believe that I'm right and because I want the Pirahã, these wonderful things about these people to have the influence they should have on our thought. But there's some really nasty stuff going on.

ROBERT GREENE

That's a lot of what I wrote about in my first book. I wrote a book about power and Machiavelli and Machiavellian politics. Actually, in this book, there is a small component because I believe in order to master something and succeed at it and get at the truth you have to deal with the Chomskys and all these other people. It's a skill that you have to develop. I do want to talk about any of your own life skills or strategies you've

developed, whether it's just ignoring them or feeling confident in yourself. Because a lot of people are crushed by it.

DANIEL EVERETT

It's really interesting. My first Ph.D. student, full professor at MIT in Brain and Cognitive Sciences, and he sometimes wonders why I get so emotional about this stuff. I've learned to deal with the emotion better, because at first I was running to all my friends, "Oh my God. Look what they're saying about me. Why do they do this?" But I've noticed that some of the people who ask me to be more balanced and not be so affected, when they get a little bit of criticism they come unglued. You have to be able to deal with this. I don't ignore it. I never ignore it.

ROBERT GREENE

But one thing I've noticed that you do is you're a very competitive person. So you use it as a challenge. They're trying to poke holes. I'm not going to let them. I'll figure out a way

to show them. But it only comes because you know that you've touched something real.

DANIEL EVERETT

I'm not doing this because . . . Chomsky said of me in a recent interview, in this article here he says, "Dan wants to be famous but he doesn't understand that famous people have to have ideas and he doesn't have any."

ROBERT GREENE

Wow.

DANIEL EVERETT

That's the kind of stuff . . .

ROBERT GREENE

That's a pure ad hominem attack.

DANIEL EVERETT

Absolutely. He's also said I'm a complete charlatan. He told a Brazilian reporter, "I will not discuss the work of Dan Everett. He is a complete charlatan." So I've challenged him to debate. I've challenged all these people. He has agreed to speak on this documentary about me.

ROBERT GREENE

But not face-to-face?

DANIEL EVERETT

None of these people will take me on face-to-face. I've heard it said that it's because I'm rhetorically more gifted and this is not about rhetoric. This is about truth and science.

Okay, that's fine. Maybe a debate isn't the best way to turn these things up. Whenever I write, I try to anticipate what they're going to say and they've taught me what they're likely to say. I told the people doing the documentary, they told me who is going to talk on it. I said, "I could probably tell you word for word what everybody's going to say including me. So if you'd like me to, I could just save you the effort of having to interview anybody because he's going to say that I'm getting too much credit. This is old hat. This guy's going to say I'm a liar. This guy's going to say it's incoherent. This guy's going to say I'm utterly brilliant and these other people are idiots."

So you can use that predictability as you write and as you prepare to anticipate what they're likely to say and to have the answer. A good lesson I learned from Ken Pike, which was somebody asked him, "Oh that's a great argument. Are you going to put that in the paper?" He said, "No. I'm going to save that for the question session. Because somebody's going to ask me about that and it's better to have some of your best material and be nonchalant about it. Oh, you mean this? Of course I know this." You purposely sometimes save some of your best and don't let it out because they're going to come back with that, and then you can show people you've thought about it.

ROBERT GREENE

That's a good military strategy.

DANIEL EVERETT

It's like holding things in reserve.

ROBERT GREENE

It's keeping your powder dry.

DANIEL EVERETT

Keep your powder dry. Yeah. It is an amazing, almost gladiator combat in some ways.

ROBERT GREENE

In a way, it only strengthens you. Instead of complaining about it, it's actually a way to sharpen yourself and sharpen your theories.

DANIEL EVERETT

It has. I told them this once to really piss them off. I said, "You've done two things for me. You've helped me think more clearly about the issues and you've sold more books."

ROBERT GREENE

That's true.

DANIEL EVERETT

I said, "Keep it up." They would write to people who did reviews of my book and tell them it's a shame that they reviewed this piece . . . and nobody should review this book. They got me kicked off one NPR program. So they're doing everything they can to affect that way. They believe probably

they're just trying to keep a charlatan in his place. But for me it does have the effect . . .

ROBERT GREENE

Don't they know the history of science? Don't they know that they did that with Einstein and Galileo . . .

DANIEL EVERETT

Did it with Chomsky too.

ROBERT GREENE

. . . Darwin and Chomsky?

DANIEL EVERETT

They tried it with everyone. I have this quote at the beginning of the book from Alfred Wallace . . .

ROBERT GREENE

The Wallace book's great. I also love the other one . . .

DANIEL EVERETT

Oh, Geertz, yeah. I love Clifford Geertz.

ROBERT GREENE

I'll be using that perhaps. Did you ever feel like you got to a point where you sort of mastered Pirahã? Or did it always remain

somewhat elusive to you? Your wife claims that you can never really quite make it or that she hasn't or you haven't.

DANIEL EVERETT

That's a very interesting issue, because there's only one person in the world that I would say, besides a native Pirahã of course, little kids still know the language better than I do, but there's only one non- Pirahã in the world who begins to know the language as well as I do, and maybe in some respects knows it better, and that's Keren. When I first wrote this article, I let her read it and her first reaction was, "Only someone who's lived there that long and thought that hard and that long about these ideas could come up with this paper. It's absolutely right." But then she started to think about it and the implications of it. If I'm right and we speak the language well enough to communicate the Gospel, but there's a cultural barrier that is never going to allow it to go through . . .

ROBERT GREENE

She can't accept that.

DANIEL EVERETT

. . . that's what she can't accept. So her explanation is they haven't accepted the Gospel because it hasn't been clearly communicated. It is true that you can always improve your language ability, but what she says in the New Yorker article and things like this aren't . . . I just don't believe them. The language is not somehow mysteriously communicated in prosody. I've described the prosody. She would argue with me, and this is reviving a lot of old stuff, but . . . and I would say, she's never written or published anything except with me, except her Master's thesis on the language. So I said, "Have you ever read really anything I've ever written about Pirahã?" No. It's very difficult for us to talk about it. And part of the reason, because she's very intelligent, but the reason is that we have such different understandings. That's not unnatural. But if you believe that God

has prepared every culture to understand His Son and the message of salvation, then if that message is not communicated effectively, it's your fault. But if you believe that culture and language pairings differ in unique ways, it's possible that working within specific cultures you can never communicate a message from another culture. You might be able to communicate a lot of the messages, but to the Pirahã and their range of values, the idea that somebody that nobody ever saw has a right to tell them what to do and how to live makes no sense and it never will.

ROBERT GREENE

She's still after the quest of being able to translate it?

DANIEL EVERETT

She still works down there.

ROBERT GREENE

So you feel like you've reached a level, let's not say you're fluent, but you've kind of attained a level similar to the guitar that took many, many years?

DANIEL EVERETT

Yes.

ROBERT GREENE

Do you ever think in the language? Do you ever dream in the language?

DANIEL EVERETT

I dream about talking the language. I don't know that I dream in the language. I don't know that I dream in Portuguese either, but I speak Portuguese. I feel as comfortable in Portuguese as I do in English. It may be that having not spoken it for several months, I'd need to . . . but within a week or two I'd feel as comfortable as I do in English. I remember going to MIT as a visitor after I'd done all my doctoral work in Brazil, and I was uncomfortable in English, talking about linguistics. I don't know what languages I dream in. I'm not a native speaker of Pirahã and somebody else could learn the language better than me, but it's going to take them a long time. I've learned a lot of stuff. And it's funny because when I came out of the tribe

with the New Yorker reporter, he wanted to talk to Keren and Tecumseh Fitch, another researcher was with us. He said, "What is Keren going to say about your ability in the language?" I said, "She's going to say that we don't speak it yet." So he sat down with her and asked her and she said, "He doesn't speak it." He said, "But explain how he's been talking to the Pirahã for the last two weeks that we've been in the village and everything that we ask him to communicate he did communicate because we could tell by their actions that they understood." "Well, I didn't say he couldn't speak it at all."

ROBERT GREENE

What did you think of that article? Were you happy with the New Yorker?

DANIEL EVERETT

Some things I was, yeah. What surprised me is that they basically made the article about me, which I don't know they were going to make it about me. I didn't see it until it came out. There are some parts of it that I like.

Anything that I read about me, I think that it's important for me that they're accurate. But everybody has something they want to tell, and so they take the bits of my life that illustrate what they're doing. I don't believe in truth with a capital T, and everybody takes their perceptions from what they're understanding. I do my best to explain what I feel. It may be that somebody writes it down and I say, "Actually that's a better explanation of me than my own explanation of me." But the New Yorker article, overall I would say I liked it. I thought he did a good job.

ROBERT GREENE

Getting back to this idea of mastering it. So you have a different feel for Pirahã obviously than when you first got there?

DANIEL EVERETT

Yeah, absolutely.

ROBERT GREENE

A large idea in the book is that once you reach that point, your whole perception is changed. You have a different way of looking

at it. And also ideas come that are actually more real than before. You actually were groping in the dark. Does it feel like that?

DANIEL EVERETT

Yes, absolutely. That's where this idea came from, because I began to realize that I know how they're going to talk in certain situations. And I know how they're going to behave in certain situations. And I know what they won't do and what they will do. That knowledge came at a price. Even what part of it is ineffable, that I can't explain really well, I feel it and that motivates me to say things to try to explain that feeling.

ROBERT GREENE

Can you give me an example? I know we're talking about the ineffable but is there anything that comes to mind?

DANIEL EVERETT

Let's try to get something besides the IEP because that's one of the biggest. But when Tecumseh Fitch designed his experiments with the animated monkeys that are

described in the New Yorker article, he said, "What do you think about this?" And I said, "It could work, but I think it might not be because of the animation. But we'll just have to see." The Pirahã don't fully get the difference between a picture and a drawing. Two dimensional representations are just not life, and so they're all artificial. So he brings the monkey up there, and when I see it I know exactly what they're going to do. They're going to start asking about this monkey. And that's exactly what they started doing. They started asking about the monkey. Why is that? It's because that is the concrete and the immediate. They know about monkeys. To say this is not really a monkey but it looks like a monkey for the purposes of this experiment so we can talk in more general terms, that doesn't interest them, and it's going to be really difficult for them, a few of them could, but it's not going to work across very many subjects.

ROBERT GREENE

So you have a sense of how they experience things?

DANIEL EVERETT

Yeah, I do. I know what they find happy. You know what's going to touch them emotionally, and that's a really hard thing to do. At some points when you see another culture, you don't even know that they have emotions because they don't laugh when you laugh, they don't cry when you cry, they don't show friendliness when you do. But now I do understand the Pirahã. I sort of can anticipate. And part of doing that is being able to joke in the language and say things that make people laugh. If you can make people laugh, you've shown some understanding of who they are.

ROBERT GREENE

What makes them laugh isn't necessarily what makes us laugh? Is it different?

DANIEL EVERETT

It's not formulized jokes. Formulas.

ROBERT GREENE

What kind of things make them laugh?

DANIEL EVERETT

You see an animal somebody's just killed and bringing it back in and you make some joke as though the animal were saying how they don't enjoy being shot at and coming in to be cooked. And everybody thinks that's funny because they love the perspective of the animal. They love putting words into animals' mouths. Even though they don't believe animals can talk. That's how they talk about what's going to happen next. So if it's about to rain, they won't say necessarily, "It's about to rain." They will say, "The clouds say we're going to drop water." And it's the same thing with animals. If you see an animal jump from this tree to that tree, you explain that by saying, "The animal said I will jump to that tree." They love to anthropomorphize. That's how they attribute thoughts. There's no word for thinking. They use the word to say. He says this.

ROBERT GREENE

But they are actually believing to an extent that the animal is going through a process like that? Or the cloud . . .

Daniel: No. It's just a way of talking.

ROBERT GREENE

How do you know that?

DANIEL EVERETT

That's the hard thing. So how do they know? If you interview them about animals and you say, "Do animals talk like people? Are they like people?" "No, they don't talk. They're like dogs; dogs don't talk." When you confront them with that, it's just absurd. Why would you think these animals talk? But it's a way of talking about how the animals are going to behave. It's a way of attributing some sort of reason to their behavior. What the Pirahã think about what goes on in the heads of animals I don't fully know. I know on the one hand they talk about as it as though they're going through the processes that we're going through. But when confronted with

that and talked to in more detail about it, they deny it. So I know those two facts. My intuition, therefore, after living with them and watching them talk about this in many ways is that they don't believe that clouds talk. I know that. But they will say, "The cloud says it's going to rain. It's going to drop water." They don't believe that these other animals talk either.

ROBERT GREENE

So their word for "think" is "to say"?

DANIEL EVERETT

That's right. That's common in a lot of languages. In fact, in Wari, which is another grammar I wrote up there, they have a future tense but it's disappearing. Rather than say it is going to rain, they prefer to say the sky says I will rain. It's a much cumbersome structure, but they prefer that to the other one which is a simple little structure, and so they're losing the future tense. And English doesn't actually have a future tense. We have a past tense and a present tense is the way we mark our verbs.

But for marking the future, we use this other word modal or will or shall that actually come from very different kinds of meanings. So we have this weird way of talking about the future, which we understand it to be the future. But if you were just learning English, it wouldn't make much sense as a future. You have to learn that means the future even though it's not literally the future.

ROBERT GREENE

That's true. Are there words that you learned earlier on that came to have a different meaning later on after you understood the language better? Where you understand that nuance and had a completely different meaning?

DANIEL EVERETT

Yeah. I'm trying to think of an example.

ROBERT GREENE

Years later you go, "Oh, that actually means this. I didn't know that."

DANIEL EVERETT

There are two levels of which that's true. One is proper names. You just think of them at first as proper names, but then you come to realize later that they're phrases or words for things you haven't encountered yet. So there's no name that just is a name. There is no word that means the equivalent of "Joe" in Pirahã. Every name is a description of sort some, but it's frozen in the past. It's not an active, ongoing . . .

ROBERT GREENE

They change their names to mean the present.

DANIEL EVERETT

That's right. They change their names a lot. But sure, things that I thought meant . . . let's see. Just one trivial example. The words for "here" and "there". If we're both talking and I say, "What do you call that?" You could say, "I call this . . ." So for me it's "that" and for you it's "this". That's pretty trivial. But to keep it apart in learning the language

is pretty hard. So I had "this" and "that" confused for a long time, and the ambiguities don't even show up that obviously when you're talking about it. That's one example.

The other thing is the numbers. I thought those meant one too many for many, many years only to go back and realize they don't mean one too many. It seems so obvious at some point. You're writing about your experiences all the time. One of the funny things that's emerged from the criticisms about me is that people think that if I wrote it in the past I'm committed to the everlasting truth of that statement, because they don't do field work. Field work is nothing less or more than your attempt to do the best you can at every stage of knowledge you're at. So you keep a record, even a published record of those things, and that shows the evolution of your ideas.

It's true that if you give a lot of complicated arguments about why this means this, then

when you're saying it doesn't you have to answer all your own arguments. That's true. You say, "I was wrong about this. These arguments actually were showing me other things. They weren't showing me this."

I listen to tapes. There were times when I was recording with them and I would ask them a question and they would say something and I would get frustrated. Why are they telling me this irrelevant crap? But then you go back a couple of years later and you listen to it and they would say, "But that doesn't mean that here." And I didn't know that's what they were talking about. They were actually giving me better information. They were giving me answers better than my questions, and I didn't know how to appreciate it at the time. And that's happened a lot. So now I pay very careful attention. When their answer seems utterly irrelevant, there was something wrong in the question or there's something I'm missing.

ROBERT GREENE

They're trying to tell you.

DANIEL EVERETT

Yeah, they're trying to tell me.

ROBERT GREENE

That took you a while to pick that up?

DANIEL EVERETT

A long time to pick that up, because I went there thinking I'm the scientist. So no matter how egalitarian I thought I was culturally, I'm the Ph.D. here. And it turns out that that takes a lot of unlearning. The attributes of wisdom that our culture gives us are irrelevant in another setting.

ROBERT GREENE

It's amazing. It's always my dream that you went to another planet or something and faced something completely alien. It's always been a fantasy of mine.

DANIEL EVERETT

I wouldn't feel any more intimidated by going to another planet as the first linguist to get there than I would with the Pirahã.

In fact, I don't know if you know this book, "Children of God" by Maria Doria Russell, which is they discover a new planet and there's a people on that planet. So they get ready to do an expedition to that planet and they include a Jesuit linguist among them. It was just brilliant. The things she was saying. I wrote her and said, "Did you ever do any field research?" And she said, "No. I took a class about Chomsky once." And I told her how right on it was, and she said, "Oh, that's the best news I've heard."

ROBERT GREENE

Have you read [inaudible 1:02:19]?

DANIEL EVERETT

I don't think I've read any.

ROBERT GREENE

She studied anthropology, so maybe she doesn't do the linguistic part. But she has a lot of science fiction and she'll create a language for these people.

DANIEL EVERETT

It's fascinating to see people's intuitions about that, but nothing could be more remote than going into the Amazon and finding the Pirahã and spending night after night there alone. If I go back now with all these . . . it's difficult for people to understand the dynamic, because when you go with a team of people, scientists and documentary filmmakers and that sort of thing, nobody can grasp, even though they're just as close to the Pirahã as I am, they cannot grasp what it would be like to be told to get off the boat and stay there and we'll come back in a year, which was basically my first experience with them with my family. So you're just there. Just you and them and nobody else.

ROBERT GREENE

I would find that so exciting. I mean not now. I'm too old but . . .

DANIEL EVERETT

At the time, for me it was very exciting. I didn't ask my kids that much about it, but

they seemed to do well since they're all connected to it. My girls would just take off in the morning with the Pirahã girls in a canoe and go upriver. And I didn't think about anacondas or jaguars or that kind of stuff.

ROBERT GREENE

Is that true that story in there about the anaconda? Is it really that large?

DANIEL EVERETT

It's astounding to me. This is many years hence, but I remember at the time thinking it was a log, an enormous log. And then I saw it was a snake. And then I realized that the head of the snake was bigger than my head. Now, can I prove that it was bigger than my head? No. But if you look at that anaconda right there, which is a dinky little thing compared to this one, it's not even . . . look at the size of that anaconda's head.

ROBERT GREENE

Would you say it'd be four times . . .

DANIEL EVERETT

At least four times the size of that thing. Its body was this thick and it raised . . . when it raised out of the water, it was way over us. It was just towing above us.

ROBERT GREENE

What's keeping it . . . it just has muscles that allow . . .

DANIEL EVERETT

I had no idea they could do this.

ROBERT GREENE

And then it backs up like . . .

DANIEL EVERETT

It fell over backwards just like a tree falling.

ROBERT GREENE

I thought it kind of reversed itself.

Daniel: No, no. It just fell over. Just like a tree falling into the water. And then I realized it could have easily come into the . . .

ROBERT GREENE

And how does it kill people? It just squeezes them?

DANIEL EVERETT

It just wraps around them and every time you exhale you can't inhale anymore. And then finally it will crush all your bones.

ROBERT GREENE

And then does it then eat human . . .

DANIEL EVERETT

It swallows you whole.

ROBERT GREENE

It's killed people?

DANIEL EVERETT

Oh yeah. They can swallow you whole.

ROBERT GREENE

Really?

DANIEL EVERETT

Yeah. That one could swallow you whole.
That one there could swallow a person whole.

ROBERT GREENE

This happens?

DANIEL EVERETT

Yeah. They can swallow deer, antlers and all.

ROBERT GREENE

Lucky it didn't overturn your boat and just eaten you all.

DANIEL EVERETT

It could have. It easily could have. Why it didn't . . . I hit it with the prop of the motor and maybe that . . . I have no idea. I wasn't afraid at first, because I didn't think it could come out of the water. When I saw it stand up like that, that's when I got afraid.

ROBERT GREENE

Weren't you afraid of it going underneath and overturning . . .

DANIEL EVERETT

All those kinds of things have happened. Yes. I was too ignorant to be afraid of all those possibilities at first, and then by the time it fell off that way, we were going about 15 miles an hour upriver.

ROBERT GREENE

Are they fast?

DANIEL EVERETT

They're fast. He came right to us. But I don't think he could have turned around and kept going after us, because when he fell that way and we were still going, he was probably several hundred feet behind us by then. But if he would have come into the canoe, he could have. I hit him and he was at the back of the boat. Then he came up just off here, towering above us.

ROBERT GREENE

Nobody was screaming?

DANIEL EVERETT

Nobody even noticed it except my older daughter, because this is all going on . . . the motor makes a lot of noise. But when I saw what it was, I wasn't telling everybody, "Look at this." My oldest daughter was reading a comic book, and she saw it when it was up and said, "Oh, my."

ROBERT GREENE

Your wife didn't see it?

DANIEL EVERETT

They just saw it as it was falling. I said, "That thing was about 40 feet." And they said, "Oh, don't exaggerate." I said, "I know because I've had 20 foot skins before. It was far bigger than those 20 foot skins." And the Pirahā tell me how big they can get. This thing was hundreds of kilos of meat. There's no upper limit on the size of anacondas. As long as they can eat . . .

ROBERT GREENE

There's nothing else killing them. There's no predator higher on the food chain, right?

DANIEL EVERETT

That's right. There's only one other animal in the water that's an equal predator and that's the giant cayman. Gets over a ton.

ROBERT GREENE

Cayman and anacondas will square off?

DANIEL EVERETT

No. They're both at the tops of their food chains. They would give each other quite a run for their money.

ROBERT GREENE

The other terrifying story was the piranhas in the water. Swimming in the water after you saw that.

DANIEL EVERETT

We didn't get in the water after we saw them. We were in the water, and then I asked what they were and he told. I was ready to get out right then. But he didn't act worried about it, and I wasn't going to be a girl, in the sexist way of putting it. I've seen a lot of those things with them, but this is a great lesson from the Pirahā. They will get excited if they're hunting and they're tearing through the jungle, but they don't get real panicky about life. If you see a Pirahā fleeing, you better flee because there's some serious danger on the way. If I saw a Pirahā run by in fright, I would not even ask. I would be right behind him.

ROBERT GREENE

Have you seen that happen? Has that happened?

DANIEL EVERETT

In the jungle I've seen them running.

ROBERT GREENE

What would it have been from?

DANIEL EVERETT

Jaguar. That's what they'll run from in the jungle is a jaguar. I've seen cats in the jungle right in front of me when I didn't have a weapon. It was a mountain lion. But I didn't see a jaguar, which could eat a mountain lion for breakfast. A mountain lion weighs about 90 to 120 pounds. A jaguar weighs over 400 pounds. Only the tiger and lion are bigger. I've seen dead jaguars that the Pirahā killed, and I put the paw and it covered my hand entirely. And the head was much bigger than my head. And that's not the fur, that's just the skeletal structure. They're amazing animals. They can carry a full grown person up into a tree with their mouth. They're amazing. They're so powerful. I have a 130 pound dog, and a jaguar could kill him with one blow. Just tear his head off with one

swipe. They're incredible animals. There are about five species of cats in the Amazon, different species ranging from the ocelot, really small . . .

ROBERT GREENE

Is the puma the same thing?

DANIEL EVERETT

No, a puma is a mountain lion. Cougar, puma, mountain lion. They're about 90 to 120 pounds max.

DANIEL EVERETT

I'm going to have to read your books more, because that is what the world is like, and it's just amazing what I've been seeing. I know that there are people who would be happy if I was dead, if I were dead.

ROBERT GREENE

Oh, sure.

DANIEL EVERETT

This is an astounding fact to me. I told one of these guys once. I said, "I ran a jack hammer for a living. I worked in service stations." I

said, "We've got it pretty good, you know. We're sitting around having our little debate that the average guy in the street doesn't give a rat's ass about." I said, "And we're being paid a lot better than they are." I said, "Let's not take this too seriously, right?"

They hate that reasoning. They hate that because they see themselves as the priests of the truth. It's as much religion as any evangelicalism I was ever involved in.

ROBERT GREENE

Well, Thomas Queen talked about that, just read the history of science. People have an idea about science which doesn't bear any relationship to the reality.

DANIEL EVERETT

No.

ROBERT GREENE

And you can go through so many stories. I just read a really dry book about all of this, a man in the 19th century who was, I guess, he was a doctor and a chemist who was the first person to claim that cleaning your hands

had a relationship to disease as far as surgery was concerned.

They started trying to listen to him, and he had some pull. And then, the establishment came down and said, "That's ridiculous. This guy's a charlatan." The whole thing. They threw him out, and then he managed to get to another hospital. He ended up like 50 years old, homeless in the streets of London, died, and recognized 30 years later that he was ahead of his time.

You can read these stories over and over again to the point where it's all about human nature.

ROBERT GREENE

I'm sure you know what you're doing. I'm sure that's right. This isn't, perhaps, the last place you'll end up.

DANIEL EVERETT

I don't want it to be. As somebody here said, "How do you manage to move around so much?" And I said, "I just love it. This is

a great job." There's probably a better job somewhere, and maybe in a couple years as long as I've got good health, I'm not closing myself off. I'm pretty much a gypsy. I just want to write my ideas and experience new things and that's it.

ROBERT GREENE

Hopefully, this book, if I ever get it out and it's sold . . .

DANIEL EVERETT

Good.

ROBERT GREENE

. . . will irritate very much your MIT enemies, because I'm putting you in a class with these other people like Lisa Randall and I don't know if you know who Rama Chandran is.

DANIEL EVERETT

Yes.

ROBERT GREENE

Rama Chandran, he was my first interview.

DANIEL EVERETT

All right.

ROBERT GREENE

So hopefully that will really irritate them.

DANIEL EVERETT

He's actually written me.

ROBERT GREENE

Rama Chandran? I mentioned that I was interviewing you, and he knew of your book.

DANIEL EVERETT

Oh, yeah.

ROBERT GREENE

He's very absent-minded. So, he can't remember what he did yesterday. The quote that you give here, I showed him this quote because he loved it because it's method is looking at anomalies.

DANIEL EVERETT

Oh, right. That's what motivates what I'm doing. I'm not saying that the Pirahã, there's nobody else like the Pirahã in a sense. That's not what my argument's about. I believe it, but I believe it about a lot of other groups.

ROBERT GREENE

Right.

DANIEL EVERETT

It's that no language is exactly like any other language, and that theories that try to make them seem like they're all alike just have to leave out so much stuff.

ROBERT GREENE

There could be a level . . . I want to get to that, but there could be a level of abstraction.

DANIEL EVERETT

Well, sure. There absolutely is, and I talk about this. This is what my whole new book is about.

ROBERT GREENE

Oh, okay.

DANIEL EVERETT

Cognitive Fire is about how languages could look alike if there's no innate mechanism for language. So, let's say that Pinker is completely wrong, which I believe, how could you still explain all the things he tries to explain with the language instinct by just saying that language is a cultural tool?

If it's a tool, what is it there to solve? What is that task like? The task shapes the tool. The task plus general human biology, not as language instinct, but just general human biology shapes the tool so that bows and arrows all look alike. And tools that serve the same function tend to look alike.

ROBERT GREENE

With nuance and difference, depending. The bows and arrows are the same structure, but they're all . . .

DANIEL EVERETT

Yeah, with lots of nuances. But the other thing is that a lot of people don't look at when they're thinking about universal grammar and the similarities of the languages of the world is there is a strong possibility that language arose only once in some hunter-gatherer tribe in Africa and has spread out throughout the world. All the current languages, all the modern languages are descendent of that one language, which alone would explain most of the similarities.

ROBERT GREENE

Oh, uh-huh.

DANIEL EVERETT

So, of course, they're similar. They all come from the same language. There are several ways in which languages, you would expect them to be similar, that don't at all imply a language instinct or a language . . .

ROBERT GREENE

I'm not versed in this, but I'm always confused about the idea of universal grammar in that it doesn't really go for an evolutionary explanation.

DANIEL EVERETT

Right.

ROBERT GREENE

So, is it religious? Is it almost a belief in our specialness, our uniqueness?

DANIEL EVERETT

People like to say Pinker now totally disagrees with Chomsky. That's false. They agree on everything except that Pinker believes there is a good, natural selection explanation for

universal grammar and Chomsky doesn't.

Okay, so fine. So Chomsky, he's got . . . Jerry Fodor, famous philosopher, and Massimo Piattelli, who's also been a long time follower of Chomsky's, have this new book out, *What Darwin Got Wrong*.

ROBERT GREENE

I think Profile published it.

DANIEL EVERETT

Did they?

ROBERT GREENE

Yeah, well, I hate the book, but that doesn't mean it shouldn't be published. It's not a surprise that they did that because if Chomsky's right, Darwin's wrong.

ROBERT GREENE

Right.

DANIEL EVERETT

And so, his followers are going to try to show that Darwin was wrong.

ROBERT GREENE

So, where would language have come from?

DANIEL EVERETT

Well, it could have been the fact that one thing Chomsky likes to say, maybe it's a problem of physics. You pack so many neurons into a skull so small, maybe, that's just a side effect. It just popped into being.

They talk about spandrels all the time. The corner is not part of the design necessarily. You've got to get the walls together and so it produces the corner. You could paint little designs over there, but you wouldn't want to say that the building was built to get that, or that was part of the original plan of the building. So they try to say language is like that. It's a spandrel.

Let's say there are two explanations for something. One explanation says this just follows from what we already know, and the other one says this only follows from this new mystical kind of knowledge that we don't know where it came from.

What's the simplest explanation? Why go with the one that doesn't involve the mystical? So I think that Occam's Razor is a severe problem for universal grammar plus the fact that it doesn't mean anything. I have quotes from Chomsky. I have a lot of e-mails from Chomsky telling me it doesn't predict anything. That's like asking, what does biology predict? He said universal grammar is a field of study like biology. And so, what Chomsky says is universal grammar is whatever it is about human biology that makes language possible. That's just silly. That's just saying human language is possible because we're humans.

ROBERT GREENE

Right.

DANIEL EVERETT

That's a tautology. It's completely circular. If all you mean by the universal grammar of human language is that humans produce a language that's different from other species

because we're not other species, you haven't told me much.

ROBERT GREENE

Say that last thing again.

DANIEL EVERETT

Humans produce a language that is unlike the system of other species because humans are not like other species.

ROBERT GREENE

So then, they don't believe that we evolved from other species.

DANIEL EVERETT

They do, but wherever language came from it's not like that. So, something . . .

ROBERT GREENE

This is so irritating because there's been so many interesting studies written on the connection between human language and animal language.

DANIEL EVERETT

Yeah. Chomsky says the idea that other species have the capacity for language but don't use it is equivalent to the idea that there

is an island full of birds waiting for humans to teach them to fly. Or he said a chimpanzee trying to use human language is like a man jumping out of a window flapping his arms trying to be a bird. It's just silly.

But it isn't, because I spent time at the Max Planck in Leipzig where it's one of the greatest centers for primate and comparative evolutionary studies of language. And you find that, sure, humans talk better than dogs. There's no question about that, but do dogs do nothing that is at all like what a human does?

ROBERT GREENE

The woman I'm interviewing at MIT, Irene Pepperberg. Have you heard of her?

DANIEL EVERETT

No.

ROBERT GREENE

She teaches parrots.

DANIEL EVERETT

Oh, right. Right, yes, yes.

ROBERT GREENE

She taught them. Her latest thing, which I shouldn't maybe tell you, but she's going to see if parrots can actually do recursion.

DANIEL EVERETT

Oh, yeah. That's great. Well, see, when people ask me . . . so, we know that certain animals can do . . . actually, if she can show that parrots have recursion, that's a severe problem for Chomsky.

ROBERT GREENE

Oh, I know.

DANIEL EVERETT

But what I'm saying is that the Pirahã don't have it because they choose not to. I've got a new paper that I'm circulating now, which is one reason the book's taking so long. But this is a long paper. It's called, "You Drink, You Drive, You Go to Jail. Where's recursion?" And the reason for that is you drink, you drive, you go to jail. Those are like Pirahã sentences. They're non-recursive. But we interpret the whole thing recursively. We

interpret it as if you drink and you drive, then you will go to jail, which is a recursive structure. But there's no recursion in the grammar. That recursion is imposed by the brain, and I'm saying that's what the Pirahã do. So, there's an example from English where we do exactly the same thing.

Now, just imagine a language that's all they need. So, I would love it if she could show that parrots have recursion. That would be fantastic.

ROBERT GREENE

She taught Alex, which is her . . .

DANIEL EVERETT

I remember that now, yeah, Alex.

ROBERT GREENE

She taught Alex the concept zero, which previously people thought was impossible for an animal ever to understand. And she taught the parrot levels of abstraction where he could group things together and nobody thought it was possible. The thing is that parrots come

from a very complicated environment. They live very long lives, 80 years sometimes.

DANIEL EVERETT

Right.

ROBERT GREENE

And they have very complicated patterns of communication among each other. And so, she just felt that they were the animal most primed for learning some of these things.

DANIEL EVERETT

Well, that's fascinating. My friend, Mike Tomasello, at the Max Planck, who studies both canine and primate cognition, he said in a book, he said, "One thing about other animals they will not draw one of their conspecifics attention to something separate from both of them that doesn't."

So, my dog came up to me. They're raised basically like humans. They grow up in your house, sometimes. So, my big 130 pound Rhodesian ridgeback came to me because there's a place on the couch that he likes to sit. We had a guest who was sitting in that place,

and he's looking over there. So, he came to me and he started pawing me and looking at it. I said, just for experiment purpose, "Could you get up?" And he just went over there and got in his place. I sent Mike that. He said, "You know, it's really interesting because none of us have really studied animals very much that have been raised like humans." And he said, "So, we may be wrong and it may be exactly in these cases."

And that's a cultural thing. He's got a different culture from a dog in the wild. I used to laugh at the idea that dogs could understand. I said, "All the dog hears is like the Peanuts cartoon, blah, blah, blah." They make some connections clearly.

But I started thinking about it because John Sorrell wrote many years ago that dogs clearly have intentional structures. They have beliefs and desires. And so, I think that the idea that language is unique to humans is just old-fashioned.

ROBERT GREENE

And it makes no sense. If through the process we evolved from them, that somehow we would have emerged out of nothing. I know only birds reach the point where they can fly. There's a level where Chomsky says there's a level of emergence.

DANIEL EVERETT

Yeah, yeah, that's right.

ROBERT GREENE

I guess believing in this book is that it has to come from something, from a process that began before us.

DANIEL EVERETT

So, like Adele Goldberg of Princeton says, "Nobody denies that there's something different about human biology that is responsible for the different level of language we've attained. The debate is whether there is a specific language specific endowment or not."

I've said this to many people. Maybe the fact is that we're smarter, and so we do

better at certain things. That doesn't require a language organ. That's just requires that humans have bigger brains, better short-term memory.

Here's the real problem that Chomsky never, this question he never asks. None of the people that he works with ever asks. Why do we want to talk to each other in the first place? That's really what differentiates from all other primates. We want to talk. We want to communicate. We want to cooperate. We recognize other minds.

ROBERT GREENE

One theory I read recently was the theory, because I'm looking at what's called Machiavellian intelligence among primates, that intelligence involves a social tool. Primates have extremely complicated social environments. So, primates groom each other. They spend hours grooming each other, and that's where they develop their relationships. We don't groom each other. Maybe, we once did. So, there were moments

sitting around the fire when it was like the equivalent of grooming. It was the beginnings of creating some kind of language.

DANIEL EVERETT

Well, I talk about this in the book, a couple of scenarios where language might have come from. The book's not about the evolution of language. The two basic things of the book are the evidence that it's not an instinct, that there's no universal grammar.

ROBERT GREENE

Yeah.

DANIEL EVERETT

And the evidence that it's simpler and just as effective to say it is a cultural tool that solves the communication problem. Then I say a little bit about why this communication problem evolved in us and not other species.

ROBERT GREENE

Do you have a theory?

DANIEL EVERETT

Well, I think grooming would certainly not be incompatible with it. It has to do with the mastery of fire, I think.

ROBERT GREENE

Fire? The same thing about people sitting around a fire.

DANIEL EVERETT

Right, right, exactly.

ROBERT GREENE

That's what this theory is as well.

DANIEL EVERETT

Yeah. So, I think that's a really good idea, because language is a social tool. And so, I agree with that.

ROBERT GREENE

Okay. Well, I was going now to launch into the second half here.

DANIEL EVERETT

The interesting thing about academics is we can get away with saying things like that. Where I grew up, if you were really rude to a woman like that and she ran out crying,

somebody would take you around the side of the building and kick the shit out of you

ROBERT GREENE

Well, the thing I gauge, this is why I asked you about it. I gave a talk at Stanford.

DANIEL EVERETT

Oh, right.

ROBERT GREENE

The Behavioral . . . I forget what the thing was called.

DANIEL EVERETT

Yeah.

ROBERT GREENE

Advanced Studies.

DANIEL EVERETT

Center for Advanced Study in Behavioral Science.

ROBERT GREENE

About my concept of what it means, identity and individuality. That was the theme. So I gave, I talk about, kind of what I told you about discovering what makes you unique.

DANIEL EVERETT

Mm-hmm.

ROBERT GREENE

As a process that traditionally only an artist, like a Renaissance artist could go through. And then a writer.

DANIEL EVERETT

Uh-huh.

ROBERT GREENE

But that it is becoming something that individuals everywhere feel the right to go through. And that it is a very ennobling human process. That is what you should be aiming at. So, I gave a talk. And this Italian woman comes up to me, and she had been smiling throughout my talk, which I thought meant she liked it. She goes, "You are so American. The Americans only talk about being an individual and individualism. It is such an American thing. My grandfather drove a truck, and he was a very happy man just driving this truck. Can't somebody be

happy just doing a job like that? Why are you people so . . ."

DANIEL EVERETT

[laughs]

ROBERT GREENE

You can't argue against something like that.

DANIEL EVERETT

Yeah.

ROBERT GREENE

It takes it to another level.

DANIEL EVERETT

Right.

ROBERT GREENE

It becomes about your values.

DANIEL EVERETT

Yeah. Yeah. I know what you are saying. I know academic culture well enough to know that if somebody is smiling, they don't like what you are saying. It is these ways of coping with stuff. I irritate people sometimes a great deal, because if I don't like what they are saying, I just tell them, "I don't like what you are saying." But I don't say it in

a backstabbing way. I am not going to say behind somebody's back something different.

ROBERT GREENE

Yeah.

DANIEL EVERETT

But it is true that some of the people who have said things about me and done things to me, where I come from, I would have driven over to your house and jerked you out the front door and stomped your head in your front yard.

ROBERT GREENE

Well, I will do the metaphorical equivalent of it. [inaudible 0:02:46]

DANIEL EVERETT

Yeah. That's true. But it is not as much fun as a metaphor. I mean, that's the nice thing about some of these guys like my dad. They resolved their problems very quickly this way.

ROBERT GREENE

One of the people I am interviewing, because I love sports, and I was going to get sports in there. I don't know if you follow boxing?

DANIEL EVERETT

Yeah. Yeah.

ROBERT GREENE

If you follow Manny Pacqui  o?

DANIEL EVERETT

Yeah. Yeah.

ROBERT GREENE

I am interviewing his trainer and Manny Pacqui  o.

DANIEL EVERETT

Oh, really? Fantastic. He is just amazing. He is so . . .

ROBERT GREENE

He is the greatest boxer I've ever seen.

DANIEL EVERETT

What he just did was just the most amazing feat. To think somebody who towers above him, and just beat him to a bloody pulp. And we're not just talking about anybody he beat to a bloody pulp. We are talking about . . .

ROBERT GREENE

This little, small Filipino man.

DANIEL EVERETT

Yeah.

ROBERT GREENE

His trainer is an amazing story. His trainer, from Boston, Freddie Roach is his name.

He grew up in the streets of Boston fighting in bars. He became a professional boxer in the early eighties or late seventies, and he was moderately successful. Not very. He developed Parkinson's disease because he got hit so many times.

DANIEL EVERETT

Yeah. Like Muhammad.

ROBERT GREENE

Like Muhammad Ali. But he is the absolute most brilliant boxing strategist of our era. He has figured something out.

DANIEL EVERETT

That's amazing.

ROBERT GREENE

There, that is where you would like to have Noam Chomsky.

DANIEL EVERETT

Yeah, exactly. Oh, yeah, I tell you. I just love that kind of stuff. Boxing, my family has just always loved boxing. I remember watching the Gillette Saturday Night Fights all the time. And when Cassius Clay first came out. I mean, I watched the Patterson, Liston fights.

ROBERT GREENE

I can remember those.

DANIEL EVERETT

Yeah. I'm telling you. With Manny Pacquiao, my wife has had to listen to me talk about him for the last two days.

ROBERT GREENE

Oh. I didn't get to see the fight, because I was traveling. I didn't have Pay-Per-View.

DANIEL EVERETT

Yeah. I didn't get to see it. I should have probably watched it. But it is just amazing.

ROBERT GREENE

He is so fast.

DANIEL EVERETT

Yeah. He refused to bulk up for that fight so that he could keep his speed.

ROBERT GREENE

I met, for the book, I met Floyd Mayweather Jr., because he and [inaudible 0:05:00] are good friends.

DANIEL EVERETT

Oh, really?

ROBERT GREENE

And he was doing the little thing there. Just the speed. Muhammad Ali was incredibly fast, but I have a feeling these people are faster.

DANIEL EVERETT

Well, I am sure they are faster than a heavyweight like Muhammad Ali. But I remember once back in the sixties, they had him connected to something testing his reactions, and it was just unbelievably fast.

ROBERT GREENE

Yeah.

DANIEL EVERETT

Ali's reactions. The things that he could do. Because of my generation, because of my personal life history, nobody will ever approach him in my mind.

ROBERT GREENE

He is beyond even boxing.

DANIEL EVERETT

The George Foreman fight was the greatest sporting event in history. And the first Frazier fight. No, the Rumble in the Jungle.

ROBERT GREENE

In Africa.

DANIEL EVERETT

Yeah, Zaire.

ROBERT GREENE

Yeah.

DANIEL EVERETT

When everybody thought he was going to be destroyed. I mean, I love Muhammad Ali, and I thought he should not fight him.

ROBERT GREENE

Is this the rope-a-dope one?

DANIEL EVERETT

Yeah. That was so amazing. But, the first fight with Joe Frazier was a great fight, because I didn't think anybody could beat him. And Ali was, I thought, marvelous in defeat.

ROBERT GREENE

Uh-huh.

DANIEL EVERETT

He said, "He whooped me." He said, "I hit him with everything I had and he kept coming."

ROBERT GREENE

Yeah.

DANIEL EVERETT

And he said, "I don't think I could have beat him with a baseball bat tonight."

ROBERT GREENE

Yeah.

DANIEL EVERETT

He said, "Maybe it is good for me. I have never lost like this, ever."

ROBERT GREENE

Uh-huh.

DANIEL EVERETT

He said some really cool things after that fight. Even though before the fight, he just was all hype.

ROBERT GREENE

Uh-huh. There are some people who claim nowadays that he wasn't the greatest fighter. But I have never seen anybody that could equal what he could do.

DANIEL EVERETT

I don't think it makes much sense to compare people historically.

ROBERT GREENE

Different eras.

DANIEL EVERETT

I think you could make a case for Joe Louis being the greatest that ever fought. Or maybe Jack Johnson for what he did.

ROBERT GREENE

Jack Johnson.

DANIEL EVERETT

Yeah. He came along. Just imagine. In some ways, what he accomplished was a great . . .

ROBERT GREENE

Jack Johnson?

DANIEL EVERETT

Yeah.

ROBERT GREENE

Supposedly he is the greatest that ever lived. That's what I've heard.

DANIEL EVERETT

Yeah. Well, he beat the hell out of some really famous white dudes when it wasn't popular to do that.

ROBERT GREENE

And they would go, like, 20 rounds back then.

DANIEL EVERETT

Yeah. They wouldn't go until you didn't get up.

ROBERT GREENE

No.

DANIEL EVERETT

I think there was a Sullivan fight that went 75 rounds with bare knuckles. With Jack Johnson, there was a black blues song about the sinking of the Titanic because he was refused admission. He wasn't allowed to board the Titanic.

ROBERT GREENE

Uh-huh.

DANIEL EVERETT

About how it was God's punishment for not taking Jack Johnson.

ROBERT GREENE

Oh. That's a blues song?

DANIEL EVERETT

Yeah. That was a blues song, and I can't remember who did it now. But I heard it once. He was amazing. Joe Louis was amazing. Rocky Marciano, you have to say of all the white guys, he is the only one that I would mention in the same breath.

ROBERT GREENE

Uh-huh.

DANIEL EVERETT

To me, the greatest are Jack Johnson, Joe Louis, Muhammad Ali.

ROBERT GREENE

I wouldn't argue with that. I wouldn't put Mike Tyson up there anyway.

DANIEL EVERETT

No. No, because he lacked the class. He did not know how to come back from defeat.

ROBERT GREENE

Yeah.

DANIEL EVERETT

You could say neither did Jack Johnson or Joe Louis in a sense. But Ali, he came back from defeat.

ROBERT GREENE

Yeah.

DANIEL EVERETT

He finally went out. He stayed a little too long. That's why he walks funny now.

ROBERT GREENE

Right. The great thing about boxing is there is no bullshit. There is no lying. There it is. It is all there in front of you. You can see it.

DANIEL EVERETT

I know. You can say whatever you want. I remember Buster Douglas after he beat Tyson. They said, "So how did you do it?" He said, "I whooped his ass." That's all he did. That's right. No debating. Nothing.

ROBERT GREENE

That's about it.

DANIEL EVERETT

No. That's what happened.

ROBERT GREENE

You don't have that . . .

DANIEL EVERETT

I heard Manny Pacquiao was inspired to go into boxing because of that fight.

ROBERT GREENE

I didn't know that.

DANIEL EVERETT

The Buster Douglas/Michael Tyson fight.

ROBERT GREENE

Oh, I didn't know that.

DANIEL EVERETT

Yeah.

ROBERT GREENE

I wonder why. That's interesting.

DANIEL EVERETT

He was about nine years old. His whole family was standing around watching the fight and talking about boxing. He realized that got a lot of attention.

ROBERT GREENE

Oh, I see.

DANIEL EVERETT

Yeah. I don't know if that's true or not.

ROBERT GREENE

I'll ask him.

DANIEL EVERETT

Yeah. That would be fantastic to hear about that.

ROBERT GREENE

It is an amazing story. To see somebody from the Philippines, which just has a little bit of a boxing tradition, but nothing like this.

DANIEL EVERETT

Yeah. Somebody so small, too. To just come. He is five-six, and he can just . . . most men walking down the street, he could knock the shit out of.

ROBERT GREENE

His trainer is a big . . .

DANIEL EVERETT

Yeah.

ROBERT GREENE

He was not, he was an average fighter until Freddie Roach got his hands on him. I mean, they both, they're kind of a perfect match.

DANIEL EVERETT

Yeah. Yeah.

ROBERT GREENE

It was interesting, because they have been following it on HBO and that's what I've been watching. Of course they try to dramatize it.

They are making it out as if Manny Pacqui o might be heading towards his first real defeat because he is partying too much and he is now a politician in the Philippines.

DANIEL EVERETT

Right.

ROBERT GREENE

He is all distracted. And of course he came in there and he, I think it was all just for show.

DANIEL EVERETT

Yeah.

ROBERT GREENE

To build up the drama.

DANIEL EVERETT

The only one who has got a chance is Floyd Mayweather. But, I don't think he has got much.

ROBERT GREENE

I think he's great enough.

DANIEL EVERETT

Yeah.

ROBERT GREENE

He does not want to fight him.

DANIEL EVERETT

Yeah. Yeah.

ROBERT GREENE

I think he knows it will kind of be a stain on his legacy.

DANIEL EVERETT

Yeah.

ROBERT GREENE

I don't even remember how . . .

DANIEL EVERETT

If you compare, they have fought a lot of the same opponents.

ROBERT GREENE

Mayweather would come out pretty well in that.

DANIEL EVERETT

Except the people that Pacquião beat worse.

ROBERT GREENE

There was somebody, though, that doesn't fit that. I can't remember who that is.

DANIEL EVERETT

Oh, right. Yeah, there is always the upset. And so much has to do with particular styles of fighting.

ROBERT GREENE

I think he knows that Pacquião could probably beat him.

DANIEL EVERETT

Yeah.

ROBERT GREENE

He is afraid. They came up with this thing about he has to do a drug test. You read about it.

DANIEL EVERETT

Yeah.

ROBERT GREENE

I think he is afraid.

DANIEL EVERETT

Yeah.

ROBERT GREENE

I don't think it will ever happen.

DANIEL EVERETT

Yeah. It would be a great fight. But you are probably right. It is probably more for Pacquião to show. Mayweather has nothing to gain.

ROBERT GREENE

I don't think so. I mean, if he won . . .

DANIEL EVERETT

Except money.

ROBERT GREENE

Yeah.

DANIEL EVERETT

Well, yeah. If he won, that would be . . .

ROBERT GREENE

That would be the greatest fight of my era.

DANIEL EVERETT

Yeah. It would be. It would be the best fight. I would have never thought that that weight of fighting would have attracted that level of attention.

ROBERT GREENE

Well, the heavyweights are nothing.

DANIEL EVERETT

Yeah, they are. They are crap.

ROBERT GREENE

I have seen a few heavyweight fights. They are just really boring.

DANIEL EVERETT

Yeah.

ROBERT GREENE

You can't believe how fat they are.

DANIEL EVERETT

I know. They are just overweight, out of shape.

ROBERT GREENE

Muhammad Ali was ripped.

DANIEL EVERETT

Yeah.

ROBERT GREENE

A solid chunk.

DANIEL EVERETT

Yeah.

ROBERT GREENE

These people are like fat.

DANIEL EVERETT

You look at Joe Frazier. When he fought Muhammad Ali, you are talking about two of the best conditioned athletes that ever fought. They were in fantastic shape because so much money and everything. The hype, the first time two undefeated heavyweight champions . . .

ROBERT GREENE

Right.

DANIEL EVERETT

. . . who had not retired met.

ROBERT GREENE

Yeah. Oh, those were the days.

DANIEL EVERETT

Yeah.

ROBERT GREENE

Anyway. Well, getting back to a different kind of boxing. I wanted to go into a little bit. Tell me if you have time . . .

DANIEL EVERETT

Yeah. Yeah.

ROBERT GREENE

Do you have time constraints?

DANIEL EVERETT

No. I want to get back to the house to help Linda, earlier rather than later. But I'm not in a rush, no.

ROBERT GREENE

Okay. Now we are just dealing more with the theoretical side here. The whole idea of deduction versus induction.

DANIEL EVERETT

Uh-huh.

ROBERT GREENE

How the deductive process is very seductive and alluring. But it can very much channel you into a way of thinking in which you miss a lot.

DANIEL EVERETT

Uh-huh.

ROBERT GREENE

But you are more of an inductive style of thinking. Would you say that?

DANIEL EVERETT
I would say that deductivism as a way of approaching the kind of things that I want to talk about . . .

ROBERT GREENE
Uh-huh.

DANIEL EVERETT
. . . lost its allure as I began to recognize how different languages can be. I initially bought all of Chomsky's arguments against empiricism. Now, I think that rationalism and the deductivism that Chomsky puts with it to form his own brand, his own way of doing science has proven to be counterproductive. I don't know that I necessarily am just an inductivist. I guess you weren't saying that anyway. But I think everybody uses all three -- induction, abduction, and deduction depending. But I don't start thinking that we have a theory of language, and now let me figure out how it manifests itself in this language.

ROBERT GREENE
But you had been trained in that way?
DANIEL EVERETT
Yes. That is the way I originally did all of my work.

ROBERT GREENE
So you fell out of the religion?
DANIEL EVERETT
Yeah.

ROBERT GREENE
Is it just a process? It wasn't like a moment in time in which you decided that this wasn't working.

DANIEL EVERETT
I think that there is a time. A really good friend of mine, Robert Van Valin, who is now a professor of linguistics at the University of Dusseldorf, developed his own theory called Role and Reference Grammar.

That theory is based on the idea that grammar doesn't have to be as complicated. His basic thing is, what would a theory look like if it were created by a non-English

speaker? Say a member of an indigenous tribe. What would a linguistic theory look like if they made it? There is no other theory quite like it. To him, syntax is very simple. What really guides language is meaning and what you are trying to do with it. The syntax part just helps you do that. It is very simple. Whereas with Chomsky, it is the center of everything.

Well, I don't buy into any particular theory anymore, not even that one, although I really still have very fond feelings for it. But what was a eureka moment for me was sailing, going down the Amazon one time with a group of students I was taking from the University of Pittsburgh, sitting on top of this boat at night, it was just idyllic circumstances reading Van Valin's new introduction to Role and Reference Grammar.

I thought to myself, whether he is right or wrong, what he has done for me is shown me that a lot of the stuff that I thought was

counterintuitive but bit my tongue over, I don't need to bite my tongue over anymore. There really is a simpler way of looking at it. Even if all of the answers aren't there right now, it is so simple and it works so well in so many things that I am willing to bet it is going to handle the stuff it doesn't handle now. I started teaching from that time on his theory instead of Chomsky's.

ROBERT GREENE

Oh. When was this?

DANIEL EVERETT

This was 1998. I was getting tired with some of the smugness of people who do Chomskian theory. Like they do scientific linguistics and others don't. At the same time, I was realizing that there were so many things about Pirahã that I could not talk about because there was no vocabulary to talk about them in Chomsky's theory. So it was a combination of those things that got me to say, "I need to find my own voice in this."

ROBERT GREENE

Did you ever think of trying to explain the Pirahã anomalies through the Chomskian? To be the one that would interpret it from the Chomskian point of view? Or you did even try that?

DANIEL EVERETT

Yeah, I did try it many times.

ROBERT GREENE

It just wouldn't fit? You couldn't?

DANIEL EVERETT

Well, in 1984, I was at MIT for the year and I talked to Chomsky. I had just written the "Grammar of Pirahã." It had just come out. I said, "Aside from one or two little contexts, I can't think of much evidence for embedding, a form of recursion in Pirahã." He said, "Well, I wonder if anybody has ever thought of the implications if a language didn't have that." I said, "Yeah. I don't know." Then, somebody told me, "You really got Chomsky thinking about that. He never considered that possibility before."

So it turns out that other people have thought about these things. Like most ideas, you come along and you think you are the first one, even though you have tried to do background research. Then, putting the idea out there, you have now put it to thousands of readers who can tell you whether they have read something. That is fine with me. I am not trying to be the first one to find some of these facts, but to try to get people to look at language as part of human culture and realize that it is not so far-fetched to go back to the work of people who preceded Chomsky. One of whom, Edward Sapir, died at 54 before he really had enough students to solidify his legacy, and who believed strongly in the inter-relationship between language and culture.

In the intervening years, it is fascinating to me that no one can point to more than just a couple of different discoveries that were made through Chomskian theory. Chomsky's major discovery is the Chomsky

Hierarchy of Grammar, which is basically a mathematical result. It is not even a linguistic result. I think it is a very important result. It has led to very important things in computer science, psychology. Then one of his students discovered some really interesting things that I think anybody in any theory would have to admit are phenomena that came to light because of that theory. I don't know of anything else.

ROBERT GREENE

Uh-huh.

DANIEL EVERETT

You look at Pinker. What has he ever discovered? I don't know. I don't know of a single original contribution. I don't know of a single original contribution of Chomsky's, other than the Chomsky Hierarchy of Grammar. When I say original contribution, I mean a discovery about language that everyone recognizes is something we didn't know about language before.

ROBERT GREENE

Well, what about the concept of universal grammar?

DANIEL EVERETT

That is not a discovery. That is a proposal, and it is a very divisive proposal. A lot of linguists think it doesn't mean anything. Sure, he has made a lot of proposals. Most of them, he is the first to change.

He made deep structure. That was a huge idea for a while. But he has changed his mind about that. That doesn't exist anymore. Most of the things that he has proposed that were taken by people outside of linguistics, his major conceptual breakthroughs, he doesn't even believe in anymore.

So then, you see how ephemeral this is, because it is not an empirical discovery. It is just an idea that has some good play time.

ROBERT GREENE

Right.

DANIEL EVERETT

If you are really thinking, what is the empirical discovery? I think Chomsky's main contribution has been to get people to consider the mind and the relationship of language and the mind and to be rigorous in their argumentation. Although I don't he is any longer a rigorous researcher. I think he was at the beginning of his career. I think, anymore, he just says things and watches people run to show him right.

ROBERT GREENE

It has turned into a religion.

DANIEL EVERETT

Yeah. And that is what I see it as. I don't see it as a serious intellectual endeavor.

ROBERT GREENE

A couple of things. I read a book on complexity, I don't know if you've read that. By Waldrop.

DANIEL EVERETT

I read a book on complexity theory, and I can't remember the author now.

ROBERT GREENE

Yeah.

DANIEL EVERETT

Yeah.

ROBERT GREENE

The idea behind it, there was a quote from a man named Chris Langton who created artificial life.

DANIEL EVERETT

Uh-huh.

ROBERT GREENE

It was that basically that, in the future, science is going to have to become almost more like poetry, because things are so complex. And the deeper you get into it, the more you see difference and chaos and complexity. That normal categories of thought don't work.

DANIEL EVERETT

Uh-huh.

ROBERT GREENE

You have to find other ways to describe and explain things to get at the truth. Another

way of looking at it was . . . I don't know if you know the philosopher Bergson?

DANIEL EVERETT

Yeah. Henri Bergson. Yeah.

ROBERT GREENE

His idea was that normal human thinking is very static and that we put things into blocks in order to understand them.

DANIEL EVERETT

Right.

ROBERT GREENE

But life isn't like that at all. And to the degree that we become more intuitive and move inside, we gain a different kind of knowledge.

DANIEL EVERETT

Uh-huh.

ROBERT GREENE

So I understand you are trying to make the case, but I want you to disagree if you want to. I am not saying that inductive is the only method. You can, as you say, combine all three. But that people are kind of losing touch with that. They are moving even further

away from it. You can't get at the truth unless you let the material speak for itself at some point.

DANIEL EVERETT

Yeah. I agree with that. I think that part of the reason that people aren't going that way is because of the international academic culture.

ROBERT GREENE

Yeah.

DANIEL EVERETT

If you have just finished a Ph.D. and now you want to get a job of the ever dwindling number of tenure track jobs . . .

ROBERT GREENE

Right.

DANIEL EVERETT

. . . in the humanities and social sciences, you are less likely to get it if you say your teachers are wrong than if you contribute to their egos . . .

ROBERT GREENE

Right.

DANIEL EVERETT

... by showing how they are even more brilliant than we realized.

ROBERT GREENE

Right.

DANIEL EVERETT

There is a strong pressure to do that.

ROBERT GREENE

Right.

DANIEL EVERETT

I don't believe in unbiased, free inquiry. I don't think it operates. When you see people around Chomsky, I mean, I could see myself being that way around John Lennon.

ROBERT GREENE

Yeah.

DANIEL EVERETT

But I can't imagine any scientific figure having that kind of hold on me. I think it is very unhealthy. I think it is more than intellectual. In fact, I think the intellectual plays a much less important role than the culture of how to get a job in this country

and how to get tenure. And then by the time you have gotten tenure, you have sort of committed your life. A lot of people wrap themselves so much up in the particular theory that they are doing.

ROBERT GREENE

Yes.

DANIEL EVERETT

That is their identity. They can't allow the possibility that they are wrong. They have transmitted this to their students. They have spoken with great authority.

ROBERT GREENE

Right.

DANIEL EVERETT

Now, to tell them that their authority was misguided, misplaced is hard for people. I was giving a talk in Brazil, years before this controversy, when I was just starting to think of alternatives. In fact, the name of the title was, in Portuguese, "Alternatives to an Innate Universal Grammar." I was giving this at the University of Rio. I went

to dinner with a couple of people. One woman was just furious with me. I said, "You haven't even heard my talk yet." She said, "That title undercuts what I have spent my career trying to teach students. I have tried to teach them what a scientific advance it is to have a universal grammar. You are now talking about alternatives? You are undoing my life's work." She said it that way. When I gave that talk, it just turned off so many people in Brazil. It was funny. I went from getting invitations every year to lecture at the Brazilian Linguistics Society to being persona non grata. They wouldn't allow me to speak at a carnival in Brazil. I mean, nothing.

ROBERT GREENE

Wow.

DANIEL EVERETT

In fact, they have tried to bar me. These people here have tried to bar me from going back to the village. They wrote to the Brazilian Indian Agency to tell them that my ideas were racist.

ROBERT GREENE

Yes. I've seen that.

DANIEL EVERETT

Yeah.

ROBERT GREENE

It is hard to believe.

DANIEL EVERETT

Yeah.

ROBERT GREENE

Reading your books, you are the opposite.

DANIEL EVERETT

Yeah.

ROBERT GREENE

In fact, the Chomsky point of view is actually the one that seems sort of racist in the end.

Wouldn't it?

DANIEL EVERETT

Yeah. Yeah. It is.

ROBERT GREENE

What was I going to say? Your idea about the academic environment sounds really true. This is maybe adding to it in a way, but it also maybe perhaps the fact that to accept

that you don't know, you don't really right now have a theory, that you have to let the evidence speak for itself. It is very troubling for people. It is emotionally very troubling. It is a sense of postponing your sense of certainty. I don't know if you have ever heard of negative capability?

DANIEL EVERETT

No.

ROBERT GREENE

The poet John Keats had this idea called negative capability, where only genius exists if you are allowed to entertain the possibility of two contradictory thoughts at the same time without getting upset or frustrated.

DANIEL EVERETT

Uh-huh.

ROBERT GREENE

It is very troubling for humans.

DANIEL EVERETT

Yeah.

ROBERT GREENE

It is much easier to grab on to a theory and go with it than to entertain this possibility, and it also requires much more work. What you had to go through requires much more work in a way.

DANIEL EVERETT

Yeah.

ROBERT GREENE

You have to create the theory or a new idea yourself.

DANIEL EVERETT

Yeah, and you have to do it with everyone being skeptical.

ROBERT GREENE

Right.

DANIEL EVERETT

Years ago I published a paper with Peter Ladefoged, this friend of mine I mentioned, called "The Problem of Phonetic Rarities." This sounds trivial, but it is related to this issue perfectly. I didn't realize it at the time so much what the implications were. I

found some sounds that don't occur in other languages of the world. The theory of sound structure can list those as an exception.

ROBERT GREENE

Uh-huh.

DANIEL EVERETT

If it does, it admits that it can't account for everything.

ROBERT GREENE

Uh-huh.

DANIEL EVERETT

Or it can try to include them in which case it loses all of its explanatory power, because it has to create so many novel devices to handle these three or four things. The conclusion was rare sounds show us that there isn't a universal theory of phonology. Now we have got rare structures. But people are trying to say, Chomsky tries to say, "Well, it is just an exception." He either says I am a charlatan, or let's admit that Dan is right, so who cares? It is an exception.

Well, my response to that is if there is an exception to this, there, in principle, could be two exceptions. If there could be two exceptions, there could be three. In fact, all the languages of the world could be an exception to this. Now, how is it the central part of language? At what point does an exception become a black swan? A complete counter-example?

ROBERT GREENE

Right.

DANIEL EVERETT

This is not something they allow themselves to contemplate. It just makes so much sense. I have heard David Pesetsky at MIT say, "Having a theory of language without universal grammar is like having a theory of the body that doesn't recognize bones." Nobody. You will never find anybody who disagrees that human bodies have bones. But you have a lot of good linguists who deny universal grammar. Their response is, "It's terminological. They just don't understand

what we are saying." Are all those linguists who hold major appointments all over the world just really stupid?

ROBERT GREENE

Well, why not say that your idea of IEP and your idea that it is more recursion, it is more cognition than from a language instinct, that that is a finer form of a skeleton?

DANIEL EVERETT

Yeah. Well, that is what I am saying. Exactly.

ROBERT GREENE

Which brings me to my next point. You are not saying that there is just chaos.

DANIEL EVERETT

Right.

ROBERT GREENE

If anything, you've come up with an alternative theory.

DANIEL EVERETT

And that is exactly the way I see it, which of course is intolerable to them.

ROBERT GREENE

Yeah.

DANIEL EVERETT

But the theory is that it is a combination of human biology. I mean, we have to say words in order, because we don't have the biology to say them simultaneously. We process things a certain way. We have limited short-term memories. We have particular kinds of communication goals based on our culture. We have minds with certain properties. We can draw upon all of that to do all kinds of things.

ROBERT GREENE

Right.

DANIEL EVERETT

I am trying to think of what fact about language couldn't be handled that way after a lifetime spent looking at the structures of language. I can't think of any. Now, of course, if you say that language follows from a universal grammar, that will account for everything, but because it is a tautology. So anything you find in language can be explained by that, and it won't be comparable

to any other cognitive ability of humans because there will be separate modules. As Tom Wolfe said in his talk here, "Anybody who says the brain has modules doesn't know anything about the brain." You might as well say the emperor has no clothes, because there is not a shred of evidence for modules in any possible definition of the word.

ROBERT GREENE

I mean, Ramachandran would say that there are modules and they do help you explain things. It is like the inductive and deductive. They do serve a purpose, and there are functions in the brain that are separated.

DANIEL EVERETT

Uh-huh.

ROBERT GREENE

But the brain operates as a whole.

DANIEL EVERETT

Yeah.

ROBERT GREENE

You can have both.

DANIEL EVERETT

But the thing is, if you look at, yeah, that's true. There is a visual system and there is an olfactory system. There are these old systems that were given by evolution so that we can see it among reptiles and all life.

ROBERT GREENE

Yes.

DANIEL EVERETT

So then we go up the tree of evolution and we see what is common, what we share with primates and stuff. Then you say, "Okay. Now is there something specific in humans for language?" You look and you see that, no, there is not in the brain. Broca's area and Wernicke's area, that were supposed to be these specialized areas, they have multiple function, and we can't even agree where they are at all the time.

ROBERT GREENE

Yeah.

DANIEL EVERETT
Are there stages of development for language?
Only in the sense that there are stages of general development for humans. Whenever we go from one kind of utterance to another, that is not all we are doing. We are doing lots of stuff at the time that could be related to that. There is nothing specific, not even the vocal apparatus. About the only thing we can say that specifically, completely adapted to language is the length of our vocal apparatus relative to chimps.

ROBERT GREENE
There are some other animals that have that too.

DANIEL EVERETT
Yeah.

ROBERT GREENE
Discovered recently.

DANIEL EVERETT
You could say that in the primates' speech, but you have to keep speech different from language.

ROBERT GREENE
Right.
DANIEL EVERETT
Language you can think. Speech has to be out loud.

ROBERT GREENE
Right.
DANIEL EVERETT
Yeah. We evolved a little bit so that now we can't talk and eat at the same time.

ROBERT GREENE
Right.
DANIEL EVERETT
Finding things in the brain that are specific to language.

ROBERT GREENE
No. No.
DANIEL EVERETT
Yeah. There is nothing. There is nothing. Some linguists like what I said about this. Chomsky said that we are studying the brain when we say these things. And I said, "Okay. That is just the silliest thing I ever heard." If

you are studying the brain, cut it open and look for a tree diagram. You are not going to find a tree diagram. Clearly you are not studying the brain. You are studying how you conceptualize mental operations to have to be.

ROBERT GREENE
Right.
DANIEL EVERETT
That is what you are doing. Maybe you are closer to being right than somebody else. But you are not studying the brain. If you were studying the brain, all these little linguistic structures, you would find the mental dictionary and you would find all these labels and all these tree diagrams and everything in the brain. That's not there. That's not the way it works.

ROBERT GREENE
Now, you have come up with a theory. Do you believe that you have come up with a theory about language?

DANIEL EVERETT

Yeah. Yeah.

ROBERT GREENE

That I believe perhaps is more an accurate description. I think that is about all you can say. You can't say it is necessarily true at this point.

DANIEL EVERETT

No, you can't. You can't say it is necessarily true at any point.

ROBERT GREENE

How about saying it is perhaps more accurate? Perhaps closer to the reality?

DANIEL EVERETT

I would say that it is a simpler theory that handles the same facts better. I believe that historically those kinds of theories are closer to being right.

ROBERT GREENE

You wouldn't have come up with this unless you had done these years of field research.

DANIEL EVERETT

No. I would have never. It would have never occurred to me to have, because there are two things. You can have an idea, but what is your professional authority to assert these things?

ROBERT GREENE

Yeah.

DANIEL EVERETT

You have to pay your dues. Not just because you have published in good journals, although that doesn't hurt. You have to pay your dues in really understanding what it is you are saying and being able to think through the implications of it.

ROBERT GREENE

Yeah.

DANIEL EVERETT

I knew this would cause controversy, but I thought about it. And I thought to myself, when I was writing these arguments, I had a clear picture of somebody flying to the Pirahã to check this out. Okay. So that made me

think more carefully about everything I was saying. So what would somebody be looking for to prove me wrong out there? Now, that was before I realized that some people would do it dishonestly. I know if somebody has been with the Pirahã for a few days and staged people where it looks like they are counting and stuff. I had witnesses tell me that it was staged.

ROBERT GREENE

That is pretty devilish.

DANIEL EVERETT

Oh, it is. I had somebody who did all this stuff. That is after MIT psychologists had been there and done all these experiments. I try to put myself in the position of the person who is trying to prove me wrong. I thought about this a lot. In order to do that, you have to know your field very well.

ROBERT GREENE

Not just know your field, because there are people that just spent 30 years studying linguistics in a lab.

DANIEL EVERETT
Right.

ROBERT GREENE
It is the field experience.

DANIEL EVERETT
Yeah.

ROBERT GREENE
You would have never had this idea unless you had spent . . .

DANIEL EVERETT
No.

ROBERT GREENE
Right?

DANIEL EVERETT
No. Unless I had spent that time. Somebody wrote me right after the article came out and he said, "If you are right, why haven't people discovered more languages like this?" And I said, "Maybe they have, and they are lost in the literature somewhere." But I said, "How many people have spent that much time there? How many people have asked

these questions?" I said, "You find what you look for."

ROBERT GREENE
Yeah.

DANIEL EVERETT
If you believe culture has no effect on language, you are never going to ask the questions.

ROBERT GREENE
How long has linguistics been around as a subject? There are plenty of extinct languages. We have no idea what people were speaking.

DANIEL EVERETT
Yeah. The number of languages spoken in the world today is an accidental subset of the total number of possible human languages. Languages come into being and languages die. But what people forget when languages come into being and they look like other languages, some people have tried to make the case that that shows universal grammar.

Like Creole languages, they look like other languages.

ROBERT GREENE
Oh, I see.

DANIEL EVERETT
Yeah.

ROBERT GREENE
New languages.

DANIEL EVERETT
A new language that popped into being that looks like other languages. Voila. Universal grammar. Nobody is raised without knowing another language or hearing another language. They are exposed to other languages.

ROBERT GREENE
Right.

DANIEL EVERETT
Even the native speakers of a Creole language were exposed to other languages.

ROBERT GREENE
To French or . . .

DANIEL EVERETT

To French, yeah. There is no way. The only way to get shed of any influence of existing languages is to raise two people isolated from the rest of human society. What is going to happen? They will develop something, but it won't be very effective. Why? Because they are trying to reinvent the wheel.

If it were innate, you might expect them to develop a language that was just like everybody else's. But if language is the result of cultural evolution, then people aren't going to go into a barn and spend ten years and come out with a brand new Caterpillar tractor.

ROBERT GREENE

Right.

DANIEL EVERETT

And language is much more complicated than a Caterpillar tractor.

ROBERT GREENE

Are there any other languages that have the potential, that are similar without recursion, that have the IEP?

DANIEL EVERETT

I wouldn't be surprised if we found some in Australia. I wouldn't be surprised if we found some, still, in the Amazon.

ROBERT GREENE

Could this be something you might look into?

DANIEL EVERETT

I have in, actually, Thailand.

ROBERT GREENE

Wouldn't that be a very compelling argument in your favor?

DANIEL EVERETT

There are two anthropologists at the University of Vienna who are trying . . . they just had me over to Vienna to give a talk. They would very much like for me to go with them to their field location in Thailand. I don't know how feasible that would ever be for me given my time constraints here and

another program in the Amazon. But they believe that a group of hunter gatherers that they work with in Thailand fit the immediacy of experience principle.

ROBERT GREENE

You could oversee their research. I just think it would be really . . .

DANIEL EVERETT

Well, I am very happy to work with them, and they are great people. In fact, I have not ruled out the possibility of going there. But they would also like to come visit the Pirahã, which I would very much like them to do to do some comparative studies.

This kind of stuff is not done that much because . . .

ROBERT GREENE

It is just starting.

DANIEL EVERETT

. . . it is across the world from one another. People, collaborative teams working together. The other thing that my theory, that I suggest and I think is more compatible with my

theory, is that languages should be studied by teams of people whenever possible. I mean, it is not always, it is rarely possible. Rather than individuals. The fact that I could be wrong about some things is trivial. I mean, everybody is wrong about a lot of the stuff they say.

ROBERT GREENE

Right. Well, I guess, what I am getting at in the end is, in my last book, I had a story of Jane Goodall.

DANIEL EVERETT

Mm-hmm.

ROBERT GREENE

I find it slightly analogous to this, in that for 80 years prior to her work, they had been studying chimpanzees, but in laboratories or in controlled environments because chimps are notoriously violent, difficult to see in nature. So they had theories about chimpanzees that were pretty much set in stone. She went, I mean, I don't know if you know the story.

DANIEL EVERETT

Yeah.

ROBERT GREENE

But she went and she was working with Dr. Leakey and then she went to Tanzania.

DANIEL EVERETT

Yeah.

ROBERT GREENE

She spent a whole year trying to become like a chimp and infiltrate their community. She learned certain behavior patterns that would allow them to think that she was another chimp. Slowly, slowly they let her get closer and closer until she could essentially interact and be there and observe them. She was the first person to notice that she could give them names which they thought was never scientific. It's too [inaudible 0:41:03].

DANIEL EVERETT

Right. Right.

ROBERT GREENE

But through the names, you can see individuals. She so much got a part of what

was going on that she made these discoveries that blew out of the water . . .

DANIEL EVERETT

Yeah.

ROBERT GREENE

. . . many of the ideas. Subsequently, people have been challenging some of her discoveries. And that's fine.

DANIEL EVERETT

Yeah.

ROBERT GREENE

But a lot of them have stood the test of time. My point is, it was through that process, from the outside you had a viewpoint of chimpanzees scientifically that was proven actually wrong. Actually totally wrong about their . . .

DANIEL EVERETT

I think that is a great analogy. I have read and been fascinated by her story and read a lot about her. But I never made, I mean, sometimes I make the analogy in sort of an unconscious way because she is another field

worker spending a lot of time there. But I think that is a good analogy with what is going on in linguistics. As more and more people get to the field, what I am trying to do is to ask them to ask different questions about what they are finding. Because again, if you go out from MIT to do field research and you are given the categories into which language must fit and you are told that that is going to be the acceptable dissertation, then you are going to go out there and you are going to find things that fit in those categories. It won't surprise me that what you discover looks like what you were expected to find.

ROBERT GREENE

You have said that at some points you could almost think the way a Pirahā person could think.

DANIEL EVERETT

Yeah.

ROBERT GREENE

Which allowed you to make certain speculations that are quite amazing.

DANIEL EVERETT

Yeah.

ROBERT GREENE

Now imagine one could do that, and I am just formulating, with your dog.

DANIEL EVERETT

Yeah.

ROBERT GREENE

If you spent 30 years and you got a sense, perhaps you would be able then to reapply that to a science and then have different questions about . . .

DANIEL EVERETT

Well, I try to do that with my dog actually, because he does things. I mean, I can tell what he wants and he can tell me. You can say, well, that has nothing to do with language. But it does have something to do with the beginning of understanding an intuition. I can't say that I know what the world looks like from a dog's perspective. But should I hold the dog to a higher standard than I hold humans in the sense that if I can

predict what he is going to do and it seems that attributing mental intentions is part of how I explain it and that is how I would explain what a human does. Well, I don't think there is anything wrong in principle with me attributing mental intentions to the dog and trying to understand it.

When I am working with a tribal society, I have people write proposals. They go off to the field. They spend a couple of months. They collect the data and they come back and write it up. They never ask any questions about the culture. They don't even learn much about the culture.

Here is a fascinating thing about the Amazon that used to hold true. It doesn't hold true anymore with some of the newer people coming down. But it used to be if you asked an anthropologist with 20 years experience, "Do you speak the tribal language?" The answer was yes. And if you asked a linguist working on the tribal language for 20 years,

the answer was more or less. And it is not because they knew more about what it meant to say they spoke the language. They just didn't speak it, because so many linguists have grown up to believe that you don't need to speak a language to understand it.

ROBERT GREENE

Right.

DANIEL EVERETT

The way it works. Because you are not trying to speak it. You are trying to analyze its structure.

ROBERT GREENE

But when you were missing, not understanding certain things about their culture, I imagine, multiply that by thousands of misinterpretations . . .

DANIEL EVERETT

Yeah.

ROBERT GREENE

. . . that are going on around the planet right now.

DANIEL EVERETT

Right. People ask me for more evidence and that is what they should do.

ROBERT GREENE

Yeah.

DANIEL EVERETT

That is perfectly fine. But we never ask for more evidence when the grammar says what we expected it to say.

ROBERT GREENE

Right.

DANIEL EVERETT

That is evidence that we pre-tried the case.

ROBERT GREENE

Right.

DANIEL EVERETT

We know what the people are expected to find, and the well-behaved field researcher will just go out there and find what we told them that language is like and make us feel better and we can rule the world from our offices in Boston.

ROBERT GREENE

That's right.

DANIEL EVERETT

In Cambridge.

ROBERT GREENE

Are you familiar with the idea of mirror neurons?

DANIEL EVERETT

Yeah. Yeah.

ROBERT GREENE

And empathy?

DANIEL EVERETT

Yeah.

ROBERT GREENE

I was very taken by the idea of you are trying to see their concept of spirits from their point of view.

DANIEL EVERETT

Yeah.

ROBERT GREENE

Which, of course, is pure speculation. But why not? Why not have that idea through there, it is very intriguing.

DANIEL EVERETT

Well, I talked about . . .

ROBERT GREENE

To me, to have a particular speculation myself about the origin, perhaps, of theatre. Because you had talked about a performance that you saw where they were enacting the spirits.

DANIEL EVERETT

Yeah.

ROBERT GREENE

But, for them, it wasn't theatre. It was just the spirits were actually there.

DANIEL EVERETT

Yeah. Right.

ROBERT GREENE

I thought maybe that is somewhere where theatre came from.

DANIEL EVERETT

That's fascinating.

ROBERT GREENE

If you can go to a play now, it is almost like the spirit of somebody who wrote that

coming to life on stage. But these kinds of speculations that I think have come from that mirror neuron idea, you don't see them too much anymore. So, I wanted to ask you about that process where you thought like that.

DANIEL EVERETT

That's a very good point. Because people would point out to me, "Oh, you said this in the past, which is inconsistent with what you are saying now." So, like spirits, I say they have no religion. But how is it that they have spirits? And I say, gee, I never thought that somebody was going to read into that, because I didn't know any other word to use but spirit. They live together, but they don't marry. They have sex with Brazilians but they don't marry. So what is the word for just having sex with someone in order to procreate? There isn't a word for it. Sometimes you just have to go with terms.

If the purpose of a particular paper is not to give a formal description of spirits, but to talk about something else, you don't think

that much about the fact that, okay, this is an entity that has other properties from people. So I will just call it a spirit, because maybe that is what I thought of when I was a Christian missionary. But when you look at it more carefully, you realize that these spirits don't have moral authority. They are just other entities. They have all of the problems that we have. They help explain some things about life so that there is that little bit in common with religion. But if they see it as non-fiction and they see it as just another entity and they will swear to you that they have seen it face to face, by what right do you say that that means the same thing to them as a ghost means in our society or something like that? They wouldn't describe it that way. What makes your description of it more valid than theirs? Somebody said, "So you are saying that the fact that they see creatures that aren't there is as valid as our scientific perspective?" I said, "I am not talking about validity."

ROBERT GREENE

Well, how do you know they are not there?

DANIEL EVERETT

Yeah. Yeah, I know. Well, the most amazing experience in that respect of my entire life, I talk about in the book, where I woke up and they are all pointing to the other side of the beach.

ROBERT GREENE

Right.

DANIEL EVERETT

And I see this. And I see nothing. They are not telling me what was there a minute before. They are still pointing at it and they are telling me what they are seeing. Can I say they didn't see anything?

ROBERT GREENE

Right.

DANIEL EVERETT

With what right? That's my two eyes against all of theirs? My body against their body?

ROBERT GREENE

They will take you into the jungle and they will see things that you won't see.

DANIEL EVERETT

All the time. So this pisses off scientist friends of mine, because I am attributing validity to things which clearly have no objective reality. Maybe they were seeing something in nature that I wasn't seeing. That is not what they were telling me. But the point is I don't know what they were seeing. They were seeing something where I saw nothing.

ROBERT GREENE

Right.

DANIEL EVERETT

That is a metaphor for a lot of the world's problems. The richness . . .

ROBERT GREENE

What is the metaphor?

DANIEL EVERETT

The fact that two people, so if you look at it in modern civilizations, two countries coming together. There may not be any right or

wrong to the matter. As Anwar Sadat said about the Israeli conflict, "It is a question of right versus right." There are two valid points of view here. That makes it hard. If it was an obvious loser and winner, it would be a lot easier to resolve.

ROBERT GREENE

Right.

DANIEL EVERETT

You get somebody coming together, talking about currency, and one says it is fine and the other says it is not. It is quite possible that they are both right. Neither one has made any effort to learn the culture of the other.

ROBERT GREENE

Right.

DANIEL EVERETT

Almost never.

ROBERT GREENE

Right.

DANIEL EVERETT

Americans, it is just so amazing, some of these wars, because we have made no effort

to understand the other culture and to understand why they act the way they act. It was obvious to me as it was to many that when you saw Saddam Hussein's officials, there were no weapons of mass destruction. Could I prove that? No. But based on a lot of experience talking to people across cultures they seemed to be genuinely not having weapons of mass destruction. But getting back to the Pirahã, they see something and to me it is a show. To them it is not a show. Upon what basis would I assert that my perspective is the right one? When you start to question that, I mean, I don't believe in complete cultural relativity.

I think that we have mental limitations. I don't believe that each culture is capable of being utterly unlike other cultures. We are going to share a common core because we are humans and we have brains and things that work somewhat similarly. But I do believe that there is more to relativism than has been

previously recognized. Cultures can differ a lot more than we thought.

When you say they have no numbers. People say, "You mean the mothers don't know how many children they have?" It never occurred to me that that would occur to anybody, because I see the Pirahã and they would never leave without their children there, without all of their children because they know who they are.

ROBERT GREENE

A cat that has six kittens and goes and makes sure that every one, and I have seen it happen.

DANIEL EVERETT

Yeah.

ROBERT GREENE

Picking them up by the scruff of the neck. They know precisely. They don't need to count.

DANIEL EVERETT

Yeah. Right.

ROBERT GREENE

That's an odd idea.

DANIEL EVERETT

Yeah. Then, Chomsky says how silly it is. He says, "We know language by the time we are three. How much culture do we know then? None." This is another quote from this article.

ROBERT GREENE

That's not true.

DANIEL EVERETT

That is totally false. You look at the way Pirahã children learn to ride in a canoe. They learn values from the time they are babies. They are absorbing these values and they don't have to be directly taught. As they absorb these values, they are also absorbing language. They know what is being talked about. They know what the world is like around them. They are learning it all simultaneously. It is just so incredibly ignorant and appalling that someone of Chomsky's stature would make such a blatantly ignorant

claim and get away with it. If I said that, to me, it is the same thing as saying children don't know any language by the time they are three. People would laugh at that. But because he is Chomsky, people let him get away with saying that. And it is just . . .

ROBERT GREENE

I feel that time will show people up. Like 40 or 50 years from now, he won't carry nearly the weight that he has now.

DANIEL EVERETT

No.

ROBERT GREENE

You see examples throughout history of that happening.

DANIEL EVERETT

My favorite analogy for Chomsky is Freud. I just think Chomsky is so much like Freud. They both had fascinating ideas about the mind and about the functioning of the human and about the human condition. They both spurred, they were the catalysts for a great deal of research. I think they both are wrong.

ROBERT GREENE

You might want to qualify that, because Freud might be making a comeback. Like Ramachandarn is studying defense mechanisms because he is seeing people who, for instance, will deny that their right arm is paralyzed.

DANIEL EVERETT

Uh-huh.

ROBERT GREENE

This is no neurological disorder.

DANIEL EVERETT

Right.

ROBERT GREENE

That something went wrong in the brain.

DANIEL EVERETT

Right.

ROBERT GREENE

He is studying where their defense mechanisms come, and he is showing that they actually unconsciously are aware that their arm is paralyzed. They just won't admit it.

DANIEL EVERETT

Uh-huh.

ROBERT GREENE

He is kind of bringing Freud back to life on some levels.

DANIEL EVERETT

Yeah, on some levels.

ROBERT GREENE

I'm saying Freud might be better, stand the test of time better than Chomsky.

DANIEL EVERETT

Yeah. Chomsky. I think that people in the future, I really do believe that archaeologists of the intellectual in the future will wonder how Chomsky ever, once his personality is gone . . .

ROBERT GREENE

Right.

DANIEL EVERETT

. . . I think people will wonder how he ever attained this level of power. I think it was just exciting for people to think, because of our culture also, the great man theory of

culture that is part of our culture, that this lone young man showed up and corrected the world.

ROBERT GREENE

Well, it is also that reaction against the whole B.F. Skinner type of thinking.

DANIEL EVERETT

Yeah. I just gave the keynote lecture, the B.F. Skinner annual lecture to the Association for Behavioral Psychology in Texas last year. Skinner's ideas are alive and doing very well. I think that Chomsky pointed out a lot of weaknesses with those ideas.

ROBERT GREENE

Yeah.

DANIEL EVERETT

But he didn't totally discredit the idea that a lot of our language is learned by stimulus response.

ROBERT GREENE

Oh, that's interesting.

DANIEL EVERETT

So much of what the average person says in the average interaction is just a script. Roger Schank's work on artificial intelligence talks about scripts. It is not everything, but there are just some words that are triggered by certain environments. They don't require a lot of thought, and they don't get a lot of thought.

ROBERT GREENE

If you have learned a language, like I have learned four or five languages, you kind of get a feel for that.

DANIEL EVERETT

Exactly.

ROBERT GREENE

That that is how you do learn a language.

DANIEL EVERETT

Yeah.

ROBERT GREENE

Is kind of a stimulus response type of thing.

DANIEL EVERETT

Yeah.

ROBERT GREENE

You can't learn it abstractly.

DANIEL EVERETT

Yeah.

ROBERT GREENE

Or if can try from a book or on your own . . .

DANIEL EVERETT

Right.

ROBERT GREENE

. . . you can't speak it at all.

DANIEL EVERETT

Yeah. Well, my thing here, I am trying to get, I said, "This is a business school that says one of its strengths is globalization."

But I said, "We don't have enough language requirements. We don't have any to back that up." They said, "Well, you can go anywhere in the world and speak English these days."

But anybody who speaks other languages knows that the nature of the relationship that you can cultivate with people in other countries is completely different when you speak their language than when you don't.

ROBERT GREENE

Also, you don't understand their culture unless you speak their language.

DANIEL EVERETT

Right.

ROBERT GREENE

You know France has a certain way from the outside. But you don't really understand it until you see.

DANIEL EVERETT

Yeah.

ROBERT GREENE

The French language, if you go really deeply into it, you see, unlike any other Romance language, it is really abstract. They have words for abstract concepts, and they can make abstractions that we can't. And that has a real big influence on their way of thinking. But you never get that if you just study them from the outside.

DANIEL EVERETT

It works in tandem again, because the more you know about the language the more you

can learn about the culture but vice versa.

You are going to learn about the culture by sitting around having a glass of wine or an espresso talking to somebody.

ROBERT GREENE

Right.

DANIEL EVERETT

You can't do that in English.

ROBERT GREENE

No.

DANIEL EVERETT

They can talk to you, but you are not going to find out. When I was doing my Ph.D. in Brazil, Brazilians said, "Well, why would you do your Ph.D. here?" Even Brazilians were suspicious of me. "Why would you do your Ph.D. here when there are so many better programs in the States?" And I said, "First of all, for what I am doing, I am not sure there are better programs in the States. But, more importantly, everything I learn here is new. Every experience here is a learning experience."

ROBERT GREENE

Right.

DANIEL EVERETT

"When I see you take a break, what do you do during the break? What is going on around me? What is the culture? I am learning every second of everyday here."

ROBERT GREENE

You should really emphasize the foreign language here at a business school. I, unfortunately, have a lot to do with business because my books are very . . . [inaudible 0:58:09].

DANIEL EVERETT

Yeah. Yeah.

ROBERT GREENE

Businesses, now with globalization have a real lack of empathy and understanding of other cultures.

DANIEL EVERETT

Yeah. I have made a proposal here which is being greeted about like how Superman

would react to Kryptonite that we have a language proficiency requirement here.

ROBERT GREENE

They should be teaching Chinese here. I mean that is what they probably should be speaking.

DANIEL EVERETT

Well, we have Chinese here. We have Chinese. We have several language courses, but they are not required.

ROBERT GREENE

Oh, I see.

DANIEL EVERETT

People take them if they want to. We have a certain amount of demand. But, to me, it doesn't make any sense to graduate someone from a global business university that doesn't speak another language.

ROBERT GREENE

Well, if you ever need me to make that argument . . .

DANIEL EVERETT

Yeah. The provost is South African, and he spent most of his academic career in the Netherlands before he came here.

ROBERT GREENE

Oh.

DANIEL EVERETT

He speaks several languages. But, in the States, you get the problem of marketing. Students will not go to a university that requires them to learn a language. It is amazing to me. You think, "Don't they think that we know what they should learn?" And the answer is no, they don't.

ROBERT GREENE

Well, maybe you can have doing the language requirement gives you a different kind of degree or something.

DANIEL EVERETT

When students pay as much tuition to go to a place like this as they do, they want to get out as fast as they can. So, they can't get out fast enough.

ROBERT GREENE

You are not requiring that they speak fluent Chinese, but you are saying that it is a requirement that you spend one year or two years learning a language.

DANIEL EVERETT

Yeah. I completely agree with that.

ROBERT GREENE

And make the argument that you will be a much more successful businessperson.

DANIEL EVERETT

Yeah.

ROBERT GREENE

Here we can get ten people including Warren Buffett to say that.

DANIEL EVERETT

Yeah. Well, I think it is true. We have to work very slowly, because if you simply introduce a new language requirement, you would lose a lot of enrollment.

ROBERT GREENE

Nearing the end.

DANIEL EVERETT
Okay.

ROBERT GREENE
I can see the end, the finish line.

DANIEL EVERETT
Right. Okay.

ROBERT GREENE
I know you are getting tired. I had this idea about experience. I don't know if I can quite explain it. But it seems that in being open to their culture, in the beginning, because of your background on the border, your openness to the Mexican culture, your musical talents and sensitivity, that being open to them and their way of thinking in life actually changed you.

DANIEL EVERETT
Well, there is no question about it. There is no question about it.

ROBERT GREENE
That there was this receptivity on your part to their ideas, which is . . . I don't know

where to go with it. I had an idea and I can't remember. But it fascinates me.

DANIEL EVERETT
We only learn about the world, in fact, I am trying to get this idea across here and in higher education that I call submissive learning.

ROBERT GREENE
Yeah.

DANIEL EVERETT
Which is we can't learn about the world if we go over there and maintain our comfort zone and just observe.

ROBERT GREENE
Submissive learning.

DANIEL EVERETT
Yeah.

ROBERT GREENE
What is submissive learning?

DANIEL EVERETT
Putting yourself under their control.

ROBERT GREENE
Excellent.

DANIEL EVERETT
Entering into their way of life where you depend on them.

ROBERT GREENE
I see.

DANIEL EVERETT
Where you don't maintain autonomy. Where you are not just observing, but you are participating, and if you are not part of the group, you can't make it.

ROBERT GREENE
Uh-huh.

DANIEL EVERETT
With the Pirahã, what is submissive learning? Submissive learning is depending on them partially for food. It is depending on them to get through the day. I needed them. Somebody to talk to. There were times when I was so lonely.

ROBERT GREENE
Yeah.

DANIEL EVERETT

I made myself go sit with Pirahā, because that is the only people I had to talk with, even though I barely spoke the language.

ROBERT GREENE

You would go without somebody to talk to.

DANIEL EVERETT

Making them my social network rather than just going in and observing and taking notes. If I hadn't done that, I would never have learned to feel like they feel. I would have never sat in their huts and gotten used to them and understood how their way works sometimes better than mine.

ROBERT GREENE

But it also led to your disenchantment with Christianity.

DANIEL EVERETT

Yeah. Very much so.

ROBERT GREENE

It also led to . . .

DANIEL EVERETT

Christianity is another deductive system. Just like Chomsky.

ROBERT GREENE

But I guess the point that I had, my epiphany, if it was one, my idea was that it actually even changed your own scientific method in a way.

DANIEL EVERETT

Yes. Because I got tired of thinking that I had come in with the truth about God and the truth about language and that the role of these people was to fill in the blanks. I not only got tired of it, but I was convinced it was wrong, because they were teaching me so many things that didn't fit into either one of these systems. First of all, they didn't need Christianity because they were happier. I started thinking, "What is the evidence for Christianity? How could I build an inductive case for Christianity?"

Okay. What does it claim for itself? It claims that it makes people happy. Okay. It saves them from hell, but I can't see that. It takes

them to heaven, but I can't see that. But there are many verses in the New Testament that says, "It transforms lives. It makes them different people." Okay. So what is the evidence for that? What would be the behavioral correlate of these Christian fruits of the spirit? Okay? Well, I see them more in the Pirahā than I see among Christians. I see Christians as some of the most insecure, fearful of death, nasty, backstabbing people. Not always.

ROBERT GREENE

Right.

DANIEL EVERETT

But there is certainly a large proportion there. But I don't see that with the Pirahā. They don't fear death. They are happy. Do they backstab? Well, in some senses, sure, they take care of themselves. So, that was one thing. I just saw no inductive evidence. I couldn't build an inductive case for Christianity. I couldn't build an inductive case for Chomsky. The only way I could

make Chomsky's theory work was to just say that it worked by fiat and relabel the things I was discovering as fitting his labels. Just not talking about the ways they didn't fit. That is satisfying for a lot of people. These two deductive systems broke down for the same reason, and that was my encounter with the Pirahā. How they viewed life, how they talked, and how they approached the world around them, it transformed me as a scientist, as a human being. Nowadays, when I am with the Pirahā . . . I can live in almost any kind of condition now, because I have been with the Pirahā. I can enjoy a really nice home. I can live in a really bad situation.

ROBERT GREENE

You stress about things less?

DANIEL EVERETT

Every time I go see them, I get a new therapy, anti-stress therapy. People who see me in the Pirahā say, "I have never, ever seen you more relaxed." I think that is true. I do think that

they have lingering effects. I have always been an uptight, edgy person.

ROBERT GREENE

Yeah.

DANIEL EVERETT

So I can't eliminate tension.

ROBERT GREENE

Right.

DANIEL EVERETT

But I do believe they have helped me a lot. And it is one of the things that has made me successful as an administrator is being able to take these things and know that there are all kinds of things that happen to you in life. If you are not getting arrows shot at you and being attacked by an anaconda, things are pretty, they are not that scary.

ROBERT GREENE

That is sort of the theme of my 50 Cent book that I wrote, because his life in Southside Queens where he grew up is kind of like the Pirahā in that way, because he never knew his father. His mother was murdered when

he was eight. He was raised in the streets. He was hustling drugs when he was nine. Nobody in his group, very few of them, lived past the age of 25. Or if they did it was in prison. Because of that, he developed a very Zen way of looking at life. He is not afraid of death. Nothing phases him. Very relaxed, very calm, and very powerful.

DANIEL EVERETT

That is the way the Pirahā are.

ROBERT GREENE

Yeah. I mean, I am sure they are more [inaudible 1:06:36] than he is.

DANIEL EVERETT

Yeah. Yeah.

ROBERT GREENE

He brings the street aggressiveness.

DANIEL EVERETT

I don't know. The Pirahā also have . . . when I describe the Pirahā, some things in the book, people say, "Well, that contradicts what you said." So, I put that in the book. I say

they are not a violent people, and then I talk about the rape of this one girl. I said, "Look."

ROBERT GREENE

I don't remember the story of the rape of a girl.

DANIEL EVERETT

Well, she was abused. I don't know how much of a rape it was. Just, my wife at the time said it was. I don't know what happened. I know that they abused this girl, a bunch of guys. I know they are capable . . . they didn't go help this woman dying on the beach.

ROBERT GREENE

You have a story of them killing somebody that they were aroused to kill against a rival tribe.

DANIEL EVERETT

Yes. That's right. Okay. So there are exceptions. When I say that this culture is far more peaceful than ours, I am not saying that they don't have any variations from peacefulness.

ROBERT GREENE

Yeah.

DANIEL EVERETT

To me, that is what it means to be human. If anybody thought that I was saying they were perfect, that's just a stupid idea.

ROBERT GREENE

Right.

DANIEL EVERETT

There are no perfect people. But, I tell you, that guy in that canoe there he has got a great sense of humor. He is joking to me the whole time I am in the water about, "The anaconda are finding you now, buddy."

ROBERT GREENE

Oh, really?

DANIEL EVERETT

And he is saying that kind of stuff, laughing. Half the photos, it is funny, he comes across with a serious expression there. But in most of the photos he is laughing. In fact, if you turn it over on the other side, you see a lot of smiling there. We were joking back and forth

the whole time. He is just tough as nails. He can do whatever it takes to be done.

ROBERT GREENE

Did you have anacondas actually right there at the part where you would be swimming near the . . .

DANIEL EVERETT

We killed alligators right there. That exact part.

ROBERT GREENE

How can you go in the water?

DANIEL EVERETT

Well, if the Pirahã are around, I will. I mean, I have to say that I have been swimming in the river in lots of places, and I don't feel comfortable doing it unless I am around the Pirahã.

ROBERT GREENE

Oh, okay.

DANIEL EVERETT

But I have jumped in the madeda [sounds like] too.

ROBERT GREENE

Oh, what was that? That's a river . . .

DANIEL EVERETT

That's the dark, muddy water.

ROBERT GREENE

Where you don't know . . .

DANIEL EVERETT

You don't know what's under there.

ROBERT GREENE

But there were people around you who were . . .

DANIEL EVERETT

No, I remember jumping in one time and the boat owner said, "God defend us." It scared him to death. He says, "I have never in my life jumped in that river. I will never jump in that river."

ROBERT GREENE

Oh, because you can't see whatever.

DANIEL EVERETT

Yeah.

ROBERT GREENE

Why did you do it?

DANIEL EVERETT

To take a bath. I was hot. But I have been on the bank when I saw nothing. Then, a big alligator stuck its head up and put it back down in. You see nothing.

ROBERT GREENE

And they kill people, right?

DANIEL EVERETT

Oh, yeah. They are one ton, 21 feet long.

ROBERT GREENE

Fascinating.

DANIEL EVERETT

They could crush you in half. But I don't know. The Pirahã are pretty laid back and it is difficult to be around them without absorbing some of that.

ROBERT GREENE

Sure. Well, the final section here is, I have this idea in the book that a certain point of evolution, humans had powers that we are actually losing -- powers of consciousness.

They could orient themselves in an environment in a way we could never do

anymore. I clip things out as examples of it. There was the tsunami a few years ago. I forget if this was, not Indonesia, I think maybe New Guinea, where all of the people in the village and the tourists, when the water went receding, they all walked out, thinking this was great and a lot of them got killed. But there was a tribe, still an indigenous tribe . . .

DANIEL EVERETT

Right. I remember reading about that.

ROBERT GREENE

It just went up to the hills and they knew it.

DANIEL EVERETT

Yeah.

ROBERT GREENE

They sensed it, although they had never seen a tsunami in their lives.

DANIEL EVERETT

Right.

ROBERT GREENE

That kind of thing.

DANIEL EVERETT

Yeah.

ROBERT GREENE

I kind of collect stories like that.

DANIEL EVERETT

Yeah.

ROBERT GREENE

You kind of hinted at a few of these among the Pirahã. Like they see things in the jungle that you don't see.

DANIEL EVERETT

Mm-hmm.

ROBERT GREENE

They can sense maybe when someone is going to die.

DANIEL EVERETT

Yeah. They do know those things. They know about rain.

ROBERT GREENE

Okay. Tell me about that.

DANIEL EVERETT

Just things like this. I have had to make trips before at the beginning of the rainy season, when it is not quite raining every day. But when it does rain, it is a violent storm. And

I have found the Pirahã to be trustworthy predictors of the rain. They look around, to me it looks the same as the day before when they said it was going to rain. They are prepared for the weather. In the rainy season, you just know it is going to rain all the time. In the dry season, it is not going to rain much. But even in the dry season, they will see a cloud off the horizon and because of the direction, because of the formation, they know exactly whether it is going to rain or not. And I picked up some of that. I know that when I am out there with them, I can sense something is different. And that's not good. I have learned that it is not good when you sense that the environment is different. It either means somebody is coming or something is happening that is out of the ordinary, and that is almost always bad. That is almost always bad. I get very, I can get agitated if I sense things like that.

With the Pirahã, you walk with them in the jungle and they can just stop and tell

you what is around, because their senses are so much better attuned to what is going on. And part of that is they have learned what the background hum of the jungle is. There is a constant hum in the jungle. And when you have absorbed that pattern of sonority, you know in some way when it has been disturbed. And a disturbance in that background pattern is usually not good.

ROBERT GREENE

And do you have an example of something where they sensed a jaguar or something in the environment or a threat that later was right that you . . .

DANIEL EVERETT

Well, they sense, certainly, when things are passing. You know, when there is a plane coming.

ROBERT GREENE

Long before . . .

DANIEL EVERETT

Long before anybody else can. Even when the pilot says he can't imagine how they could do that.

ROBERT GREENE

Right.

DANIEL EVERETT

But animals, there is always signs about animals. Part of that is they can see actual things that are there that I am just not used to looking at. So, they can tell that animals have recently been here or they can see . . . like going down the river and seeing bubbles. They know whether the bubbles are caused by a fish, by a rock formation, or something that just fell in the water. To me, they are just bubbles. So there is such a mastery of their environment. Complete mastery that any variation is immediately perceptible.

ROBERT GREENE

That's interesting. And you gained a little bit for yourself.

DANIEL EVERETT

A little bit. I can sometimes hear things that are ways away.

ROBERT GREENE

What about this thing where they can see that somebody was going to die?

DANIEL EVERETT

They really look at a person. I don't know what they are looking at. But they have told me in the past that this person is going to die or that person is going to die, and I saw this person in extreme discomfort in bed. But I am not prepared as a Westerner to believe that somebody is just going to die. So, start treatment. They don't think it makes much sense in some cases to start treatment. They are willing for me to try, because they love this person. So they are willing to go, just as we would be, to trust somebody if they think they might know it.

ROBERT GREENE

You had that story of the baby that you were . . .

DANIEL EVERETT

Yeah, the baby.

ROBERT GREENE

That they killed, essentially.

DANIEL EVERETT

Yeah, they did. There was a strong smell of alcohol when I came back on the baby's mouth. So, I knew that they had put the alcohol and just caused it to go into convulsions. It was such a fragile state. But they felt the baby was dying. It had passed the point of no return for their culture from which they had never seen anybody recover.

ROBERT GREENE

But they see something or they smell something on them or I don't know, maybe not.

DANIEL EVERETT

I don't know what it is. But I know that they react differently to illnesses, and that reaction is based on whether they see it as fatal or not.

ROBERT GREENE

Okay. Well, I just had a couple of really small things.

DANIEL EVERETT

Okay.

ROBERT GREENE

First of all, did you have any thoughts, because you said you were interested in the subject of creativity. You read books about it and you [inaudible 1:16:10].

DANIEL EVERETT

Yeah.

ROBERT GREENE

Do you have any kind of personal theories yourself about your own creativity and ideas about moments where you have had an idea or an epiphany about where it comes from or the process yourself? Or you could say no. But I am just curious because you have read and you are interested in the subject.

DANIEL EVERETT

I think that my process is similar to what I read for many other people, which is that

I work very hard to absorb every bit of information I can about something. And think about it very, very hard. And just be engaged with it for a long time, and then the answer usually comes when I am not thinking about it. I will return to it. It is like reaching a plateau in language learning. I work very hard at learning this language, and then I reach a point where I have been working so hard and so long that I am tense and I am not doing well. And then I go away for a while and I come back and it has had time to sit in my brain.

ROBERT GREENE

That is very common.

DANIEL EVERETT

Yeah. I don't know what it means for something to sit in your brain.

ROBERT GREENE

Well, I know there are some very interesting theories about that.

DANIEL EVERETT

To sleep, you know?

ROBERT GREENE

They call it incubation.

DANIEL EVERETT

Yeah.

ROBERT GREENE

There are theories about that.

DANIEL EVERETT

Yeah. I know there are some theories about it. But experientially, that works for me.

ROBERT GREENE

Yeah.

DANIEL EVERETT

There is no way that I just see a problem and the answer comes to me.

ROBERT GREENE

Right.

DANIEL EVERETT

But after a lot, a hell of a lot of work and thinking about it, and mastering everything I can about it, it is similar to the way I used to preach when I was a preacher and the way I still speak publicly. I almost never use notes when I speak.

ROBERT GREENE

I don't either.

DANIEL EVERETT

Because I just try to absorb and immerse myself in the material. I have tried to think about it from different angles so that something is unusual about my perspective.

ROBERT GREENE

Right.

DANIEL EVERETT

And I am not just repeating what other people have said. And then I am ready to talk at any time about it.

ROBERT GREENE

Right. Right. It comes alive because you are not sitting there reading notes.

DANIEL EVERETT

Yeah.

ROBERT GREENE

You are in the moment.

DANIEL EVERETT

Sometimes I help myself figure it out when I am talking about it.

ROBERT GREENE

Yes. Oh, yeah, definitely.

DANIEL EVERETT

I will say it and it will get me on a roll. And then I start playing with my own ideas here.

ROBERT GREENE

Yeah.

DANIEL EVERETT

It's great.

ROBERT GREENE

These are all thoughts that I have already had in the book.

DANIEL EVERETT

Uh-huh.

ROBERT GREENE

It is great. Any others that you can think of as far as your own little, your own creativity?

DANIEL EVERETT

For the immediacy of the experience principle, which, I was at the Max Planck Institute in Leipzig. I was thinking a lot about what made Pirahã different. I knew I disagreed with what Peter Gordon had said

about the Pirahã in science, because he was trying to say that they didn't count because they had no numbers. To me, they didn't count or have numbers because they didn't need them. I was trying to think of what that all meant. I basically went out drinking a lot with some friends and came back about 3 o'clock in the morning and started writing.

ROBERT GREENE

Oh, alcohol.

DANIEL EVERETT

Yeah. I didn't come up with the immediacy of experience principle, but I just started, I said, "Okay, I am going to face this problem." So I started listing all the things that had been bothering me.

ROBERT GREENE

Yeah.

DANIEL EVERETT

And then tried to think about it. Okay. That is when it came to me.

ROBERT GREENE

That is a similar thing to the other one you were describing.

DANIEL EVERETT

Yeah.

ROBERT GREENE

It just sort of comes to you.

DANIEL EVERETT

Yeah.

ROBERT GREENE

But you needed something to distract you for the moment, like alcohol.

DANIEL EVERETT

Yeah. So that is about all I can say about it. It just takes a lot of work.

ROBERT GREENE

If there's something I have never covered or I am missing. I am curious if you have some new . . .

DANIEL EVERETT

Well, if I think about something, in the meantime, I will let you know. But, to me, that is about the most mysterious thing I have

encountered. Every major breakthrough I have had conceptually about the language or about linguistics or about life in general has sort of been that way.

ROBERT GREENE

Okay.

DANIEL EVERETT

It is a combination of what makes me unusual and the society in which I am embedded and the thoughts, all of the work that I put into thinking about something.

ROBERT GREENE

I just don't want to be too deductive myself and come to you with all of my own theories.

DANIEL EVERETT

Yeah. Well, I mean, it is great if other people are repeating these kinds of things.

ROBERT GREENE

They are.

DANIEL EVERETT

The book I hope to write next after this one is one I have the title in my mind as "Wisdom

from Strangers." And that is all of the things I have learned from very different people.

ROBERT GREENE

Oh, that sounds very good.

DANIEL EVERETT

Yeah. That have affected the way I think about the world.

ROBERT GREENE

I am hoping, this isn't why we are doing this, why you would do it, but I hope I definitely give your books a boost in sales.

DANIEL EVERETT

That would be wonderful.

ROBERT GREENE

Because I have a fairly wide readership and a different kind of readership than what you are getting.

DANIEL EVERETT

Yeah.

ROBERT GREENE

I am also going to be putting this on Facebook and promoting it.

DANIEL EVERETT

Oh, fantastic. That's great.

ROBERT GREENE

Maybe we could give a little push.

DANIEL EVERETT

Yeah. That wouldn't bother me at all.

ROBERT GREENE

Because "The Cognitive Fire" sounds really interesting. If you ever have an advanced copy of it, I would love to see it.

DANIEL EVERETT

Yeah. I'll have Andrew send you a copy of it. Yeah.

ROBERT GREENE

Okay. Really nearing the end, for two minutes, can you talk in Pirahã, so I have it on record? This is going to absolutely drive the transcriber crazy.

DANIEL EVERETT

[laughs]

ROBERT GREENE

Although they are hearing me say that.

DANIEL EVERETT

Yeah.

ROBERT GREENE

So can you just go off . . .

DANIEL EVERETT

[speaking Pirahã 1:21:51 to 1:22:10]

ROBERT GREENE

What was that?

DANIEL EVERETT

That was, "I learned the Pirahã language many years ago. Long ago when I was like a child, I went to the Pirahã and said I really want to have a straight head. And they said okay, come with us and we will teach you how to have a straight head." Which means to learn their language.

ROBERT GREENE

Uh-huh. Did you put some recursion in what you just said?

DANIEL EVERETT

No. In the translation . . .

ROBERT GREENE

In the translation.

DANIEL EVERETT

. . . but not in what I said. Often I create confusion, because I translate things into idiomatic English.

ROBERT GREENE

Yeah, I know.

DANIEL EVERETT

So English has recursion. But there was no recursion in what I said.

ROBERT GREENE

Now, one more example and then I won't bother you anymore. One more bit of Pirahã. I love hearing this stuff.

DANIEL EVERETT

[speaking Pirahã 1:22:583 to 1:23:06] That means, "Tie the arrow on like this and use dried wood so the arrow tip doesn't come to warp."

ROBERT GREENE

Oh, okay.

DANIEL EVERETT

That was actually one of the first phrases I learned in Pirahã. I was collecting texts that I

didn't understand. I learned how to say them as well as I could even though I didn't know what they meant. I would go around telling people these stories about how to make an arrow, and I didn't even know what the story was. I knew it was about making an arrow.

ROBERT GREENE

How were you able to get the sounds so good? Because I imagine just a little bit off and they can't understand what you are trying to say. A lot of practice?

DANIEL EVERETT

A lot of practice and I can hear, I am fairly good at phonetics.

ROBERT GREENE

Well, you asked them questions, like stick, so you could hear one word. They are not rambling on sentences for you?

DANIEL EVERETT

Sometimes they are and sometimes they aren't. But you have to try to isolate one word at a time. Another way I was able to do it, when I am writing down the story, I have

the tape recording of the story that I am writing down.

ROBERT GREENE

Yeah.

DANIEL EVERETT

I am just trying to copy him exactly. I am just doing my best to imitate. Then I try with people. And they say, "Whoa. That's great." But, I don't know what I said.

ROBERT GREENE

That's when you're a parrot.

DANIEL EVERETT

Exactly. So they just find it fascinating. Nobody has ever been able to do that. Then they start talking to me and I don't know what they are saying and they don't know how to compute that. So, it is like a parrot. I earn my reputation as a parrot from my early recitations of things that I didn't know what they meant.

ROBERT GREENE

You mentioned these other channels, like the whistling . . .

DANIEL EVERETT

Yeah.

ROBERT GREENE

Can you communicate in any of those other channels?

DANIEL EVERETT

Yeah. I can produce things in those channels. I am not as good when they are speaking fluently in those channels of following. Let me give you an example. If I say there is a paca, a large road for food, over there, I would say, [speaks Pirahã]. There is a paca over there. In whistle speech, that would simply be [whistles]. And all of the tones, the syllable structure, the intonation, everything is present in the whistling.

ROBERT GREENE

Wow. Literally. See, I didn't know whether the whistling was kind of a mix between iterating . . .

DANIEL EVERETT

No, that's it.

ROBERT GREENE

It's pure whistling.

DANIEL EVERETT

Pure whistling.

ROBERT GREENE

So can you say something again in the whistling channel?

DANIEL EVERETT

Yeah. Let's say, here's the phrase in spoken Pirahã. [speaking Pirahã] Don't speak to me with a crooked head, speak with a straight head. [whistles]

ROBERT GREENE

Wow.

DANIEL EVERETT

Same thing. Hum speech would be the same.

ROBERT GREENE

The hum speech is when you don't want people to hear you or you are trying to . . .

DANIEL EVERETT

Yeah. It like is when you are trying to be quiet, two people -- a mother and child or a young couple.

ROBERT GREENE

Yeah.

DANIEL EVERETT

Or you are just talking about somebody so you hum. It is especially good when your mouth is full.

ROBERT GREENE

Uh-huh. I see.

DANIEL EVERETT

You can hum. So, they have overcome the problem. We can't talk with our mouth full because you could choke.

ROBERT GREENE

Oh.

DANIEL EVERETT

But they can hum, they can talk with their mouth full without worrying about it.

ROBERT GREENE

Oh.

DANIEL EVERETT

So that is an advantage to them.

ROBERT GREENE

Well, there is kind of an equivalent in English where sometimes you can just hear somebody's intonation and you know what they said.

DANIEL EVERETT

Yes. As long as the context is severely circumscribed.

ROBERT GREENE

Right.

DANIEL EVERETT

But with the Pirahã, it could be about anything.

ROBERT GREENE

Yeah.

DANIEL EVERETT

It is not quite the same, but English does give a flavor for it. "Hmm." You know?

ROBERT GREENE

Or sometimes I'm convinced my hearing is not so good as it used to be. With my sister or my mother, they say something. I didn't hear

what they said. But I know what it is, because I hear [mumbles] and I know.

DANIEL EVERETT

Yeah. And you can often with intonation you can tell if somebody is a native speaker or a non-native speaker of English just by listening to it from afar. There are circumstances in which we can use that information in English.

ROBERT GREENE

Yeah.

DANIEL EVERETT

But they are much more limited than they are in Pirahã.

ROBERT GREENE

Yeah.

DANIEL EVERETT

But it just shows how you could take that tool and develop it further. We haven't done it in English.

ROBERT GREENE

Because we don't need to.

DANIEL EVERETT

But we could. And we could be just as good at it as the Pirahã are.

ROBERT GREENE

Right.

DANIEL EVERETT

We have simply chosen not to.

ROBERT GREENE

Right. Okay. Very interesting.

DANIEL EVERETT

Yeah.

ROBERT GREENE

On your books, you have rewritten the books on monolingual situations.

DANIEL EVERETT

I have written, in the field methods book that is coming out from Cambridge, in their introductory textbook series, there is a chapter on that. And I have another chapter on that in another book from a slightly different perspective.

ROBERT GREENE

You have created new methods or new strategies?

DANIEL EVERETT

Not really. I have codified the things that have worked for me. But the person who pioneered that, and I haven't seen much reason to change it, is Ken Pike.

ROBERT GREENE

Okay. Are there any in particular in that field that you see as generalizable? Sort of puristics for learning a language that could be applied elsewhere in principle?

DANIEL EVERETT

Yeah. A lot of what is in this field methods book is about that.

ROBERT GREENE

It is about linguistics?

DANIEL EVERETT

Yeah. I think if you are going to learn another language and you believe that language and culture are intertwined, you can't learn it in the classroom. That can only give you a few

useful phrases. You have got to go live in the community and do what I call submissive learning and combine the culture and the language together. That is the only hope that you are going to have for really learning. Well, I shouldn't say it is the only hope. Some people are just better at it than others. But it is going to be a better way to do it. But there is no quick fix.

ROBERT GREENE

Okay.

DANIEL EVERETT

The Rosetta Stone probably works because in the videos it gives you the impression that you are in the culture. So, it does bring some of the culture to it. But it is no substitute for living in that country around those speakers. If you don't need it, you won't use it.

ROBERT GREENE

Okay. Any other?

DANIEL EVERETT

I don't know.

ROBERT GREENE

I'm asking everyone. Is there anybody else you think, that you know, that is brilliantly creative, not in linguistics, that you think I should consider interviewing? I have a neuroscientist, you. I am considering you, I hope you don't object, as an anthropologist/linguist. Or a linguist/anthropologist.

DANIEL EVERETT

Yeah. That makes much more sense, yeah.

ROBERT GREENE

Someone studying animal cognition. A musician. Do you know Herbie Hancock?

DANIEL EVERETT

Yes.

ROBERT GREENE

I will be doing him.

DANIEL EVERETT

Oh, amazing. That's fantastic.

ROBERT GREENE

An architect. A boxing trainer.

DANIEL EVERETT

Wow.

ROBERT GREENE

A man who is a business genius, and then this physicist. And an artist that I haven't found yet. But is there somebody that you know and that you have come across that you would say, "Oh, that is somebody."

DANIEL EVERETT

Yeah. I think that one of the most unusual people that I know, one of the smartest people I know, he walked away from a tenured professorship at Stanford and lives in an Indian tribe in British Columbia, is Bill Poser. He is from Boston originally.

ROBERT GREENE

Bill Poser.

DANIEL EVERETT

Yeah.

ROBERT GREENE

What is he?

DANIEL EVERETT

He is a linguist. So he might not be. You asked me for somebody outside of linguistics. I just remembered that constraint. So I

would think philosophy would be a really interesting area.

ROBERT GREENE

Philosophy. But the concept of this paradigm of creative and being, moving inside something.

DANIEL EVERETT

I think the best philosophers would probably do that. I'm not sure.

ROBERT GREENE

Okay. But there is nobody that comes to mind that you know of?

DANIEL EVERETT

Well, several philosophers come to mind. I am just sitting here trying to think of one that might be more interesting from that. Yeah. I'm not sure.

ROBERT GREENE

Oh, you can sit on it. ♦

**TERESITA
FERNÁNDEZ**

ROBERT GREENE

You as the artist, I hadn't really done a lot of research, I must admit. It's kind of a whim. There's a lot of things that you've written. In the back of my mind I was thinking, what if I go there and I didn't really like it. But it was the opposite. I really, really liked it.

TERESITA FERNÁNDEZ

This is crap. I'm not working about this stuff.

ROBERT GREENE

So I was really excited, and I don't usually feel that way about a lot of modern art. It was a very wonderful experience. I'm glad I did it. I wouldn't have been able to really . . . it really changes [inaudible 00:41]

TERESITA FERNÁNDEZ

Yeah. It's about being there. My work really doesn't function in photographic images at all.

ROBERT GREENE

Well . . .

TERESITA FERNÁNDEZ

It's sort of like a garden. It's sort of what Adam Weiss talks about. There's this bird's eye view of the garden that you never understand the garden in that way. You understand it by facing the geometry of it with your moving body. So you unravel it. That's important to me. It's something that you just capture eventually.

ROBERT GREENE

Yeah. I kind of did fairly well in looking at your book and really putting myself in the environment in my head, but it's not the same. It was really great. What's your favorite garden? Do you like the . . .

TERESITA FERNÁNDEZ

I go to Paris a lot.

ROBERT GREENE

Yeah. I'm wondering if there's something I don't know.

TERESITA FERNÁNDEZ

You know, no. Not one in particular. I go to Paris often, usually for work, and I just walk.

I just walk and walk and walk and walk, and then I eat and then I walk. It's just something about thinking and walking. The city, I think that's what it's about. And then after three days, I get really, really sad.

ROBERT GREENE

Sad?

TERESITA FERNÁNDEZ

Yeah. Paris makes me very sad after three days.

ROBERT GREENE

I wonder why.

TERESITA FERNÁNDEZ

I don't know. It's a very somber city somehow.

ROBERT GREENE

It is. The light.

TERESITA FERNÁNDEZ

Something about how the light hits the architecture. I don't know what it is. The grayness.

ROBERT GREENE

The people.

TERESITA FERNÁNDEZ

The people. The stuckness of the people, I think, more than the people themselves. The idea that it's [inaudible 02:37].

ROBERT GREENE

[inaudible 02:40]

TERESITA FERNÁNDEZ

Yeah, sure. There's nothing that alive for me. I don't know, it's like walking to a . . .

ROBERT GREENE

Museum.

TERESITA FERNÁNDEZ

Yeah. It's like, I don't know. It's like walking into this amazing fantasy of something that looks very exotic and different than what I'm used to anyway.

ROBERT GREENE

Why would that be depressing?

TERESITA FERNÁNDEZ

I don't know. I have no idea, but it's not a bad depressing. I can indulge in it. I can like it as well. It can be very cathartic in fact. But yeah, after about three day, there's a heaviness. Maybe depressed is the wrong

word. But it starts to weigh on me somehow. And it's so different than New York somehow, for example, where you're energized by people around you anonymously. It's the opposite of that. So after three days, it's sort of like you're sucked by . . . I don't know. By the stones and by the . . . I don't know what it is, but I love it. I love it.

ROBERT GREENE

Well next time . . . you can still the book, but what I want you to do, your assignment, is to go to the [inaudible 03:58]. I think since you haven't been there and you have all this history and interest in it.

TERESITA FERNÁNDEZ

And I've written about [inaudible 04:03] is the funny thing. Because it was always this sort of counterpoint.

ROBERT GREENE

It's a little hard to get to. You have to go to this town called Milon [SP]. You have to take a taxi or something. There's no direct way to get there. It's fabulous. The gardens and the

actual architecture. So, when I went through there, I took a lot of notes on the paintings, and one thing that . . . I kind of had these general thoughts. One general thought was that you've got a really developed or refined sense of what I would call visual intelligence. I got that word, actually from Paul Valery who writes about Da Vinci, and Da Vinci had once tried to write a book, and he never did, about visual intelligence and to create a grammar of visual language, because he thought that that was a superior language to spoken language, or written language.

And I just thought looking at it that there's an intelligence there and a refinement is just really noticeable, and I don't really often have that feeling. There's a real intelligence behind the work, but a way of thinking that's sometimes hard for me to put into words. So, I want to kind of get to that towards the end, but I asked you in the beginning, go back a little bit. It's a little bit chronological. I don't want to go into your childhood and all of

that, but there is an element where I want to find out where you emerged and where this visual intelligence might come from. So, can you think of a moment or a period when you were young when it became clear to you that working in art or a visual medium was where you were headed at?

TERESITA FERNÁNDEZ

Yes, but I didn't call it that.

ROBERT GREENE

What did you call it?

TERESITA FERNÁNDEZ

I didn't. I just thought it was a strangeness.

ROBERT GREENE

Explain that. A strangeness:

TERESITA FERNÁNDEZ

Yeah. A kind of alternative way of sensing. And not just visual. I actually think that all of my . . . to use your word, which I guess is good, I'm flattered. I think any visual intelligence that I have comes from my emotional intelligence, and I always felt going through art school, certainly, that there was

really no value placed upon that. In fact, there was never even any forum with which to process how it is that you see the world and how it is that that effects a kind of output, whatever that output may be. In my case, it happened to be materially, but it could be anything. I really don't think that being an artist is that different than being a writer or a musician or a scientist.

Certainly, when I've gone on these MacArthur Award winner conferences, they don't call it that. I've spent a weekend in a Frank Lloyd Wright house with 50 other MacArthur fellows from all disciplines, most of them not artists, and it's fascinating, fascinating, fascinating. For starters, everyone has a very similar kind of humility. I thought it was going to be a nightmare. I thought, 'Oh my god. I don't want to go to this thing. A bunch of pretentious genius wannabes.' But there was this kind of humility, and almost like a kind of innocence to how the world was perceived and a sincerity.

So I'm trying to access what that may have looked like as a child. I have very subjective memories specifically where I remember things, but I was a kid who observed. I was a kid who would . . . I was fascinated by a kind of voyeurism, and I spent a lot of time just eavesdropping on the adults. So I always had this sense of what was really going on, and that there were very important things happening and being exchanged that were never spelled out for children, but which were infinitely more interesting than playing outside or doing all the regular things that were kid things. So yeah, I remember that.

ROBERT GREENE

Do you have any particular memories of something striking in your observing, or any kind of moments of epiphany as far as this visual sense that we're talking about? Or is it just something wrapped up with everything else?

TERESITA FERNÁNDEZ

I don't know. In that sense, there's kind of a connection between the auditory sense of observing and creating a kind of visual for that. This sounds really cheesy when you start from the beginning. If you start by describing this, this is going to be like Steve Martin. 'I was a poor black kid growing up . . .' You know what I mean? That whole, bring out the violin. The Jerk.

ROBERT GREENE

The Jerk. Okay.

TERESITA FERNÁNDEZ

And his wife, Anne Stringfield, is the person who interviewed me for the interview.

ROBERT GREENE

Oh really?

TERESITA FERNÁNDEZ

Yeah. And she's great. She's great.

ROBERT GREENE

That was good. That was one of the better parts of the . . .

TERESITA FERNÁNDEZ

We worked hard on it. She was fantastic. Yeah, so it sounds cheesy.

ROBERT GREENE

What's the . . . I missed . . .

TERESITA FERNÁNDEZ

No, no, no. Cheesy is to sort of what I was going to say. But I remember childhood memories as a way of explaining . . . like you have to be really old, like Louise [inaudible 10:53] old for those memories to not sound totally cheesy to explain a phenomenon.

ROBERT GREENE

Let me [inaudible 11:02]

TERESITA FERNÁNDEZ

Okay. I know, but I'm self conscious about it. But I used to hide under things a lot.

ROBERT GREENE

[inaudible 11:11]

TERESITA FERNÁNDEZ

No, no, no. My parents, my whole extended family were all Cuban immigrants who came the year of the revolution. So they worked

hard. And all of the women in my family were seamstresses. From haute couture to . . .

ROBERT GREENE

Oh that's interesting. Nobody's ever brought that up before. That's very telling.

TERESITA FERNÁNDEZ

Because nobody cares.

ROBERT GREENE

I wrote this down. It seems like, I don't mean to trivialize it, but some of the things seemed almost like haute couture in dresses. The one on the floor was just so beautiful. Eruption I think.

TERESITA FERNÁNDEZ

Oh, Eruption, yeah.

ROBERT GREENE

It almost looked like a dress or fabric. Beautiful. So anyway, that's very interesting. So, who, your whole . . .?

TERESITA FERNÁNDEZ

All of the women in my family. All of the women in my mom's side of the family who were all Cuban immigrants, they all made

living . . . they all went to one particular school in Havana that was very famous, called Madieta de Sevella [SP] that was a very highly regarded school of sewing. And it was like five sisters, so one was into haute couture, and she worked . . . we always had beautiful things made for us, but she basically sewed for rich people. I always remember all of my clothes were made for me from a very young age even though we were not wealthy.

And then another sister did interior design. So she would do drapes and interior stuff. I kind of grew up spending a lot of time in her atelier, in her shop. When they do curtains and drapes, they need very, very big tables. There are very big scissors, big shears, like this size. A lot of industrial equipment, which I used from the time I was five, because they just put us on it.

ROBERT GREENE

You did what? Just played with it?

TERESITA FERNÁNDEZ

They put us to work to keep us busy, and because we wanted to do it. It was play. It wasn't like we were put to work. But at a certain point, we kind of learned how to do it. They were totally really dangerous industrial machines that could pull your finger off. Anyway, we grew up around that, and with the drapes, they need very, very big cutting tables. So basically the table is the size of the actually drape when it's opened up. So it would be like say from here to there. Like as wide as this table and to there.

And my world was sort of underneath that table. And I made stuff. I made stuff. So all the scraps would come down, and I would . . . from here down, everything was mine. [laughs] And I would take all the scraps, and I knew how to use the machines, so I would make things. I didn't feel like I was making art or anything like that, but it was more about seeing how things were made and put together and taken apart.

ROBERT GREENE

Did you like working with your hands?

TERESITA FERNÁNDEZ

I did, but I was never the kid who thought of themselves as a good artist. There's so many cliches associated with that with children that I have nothing to do with . . .

ROBERT GREENE

I'm going to avoid those cliches. I'm just wondering . . .

TERESITA FERNÁNDEZ

I wasn't. We didn't call it that. So, that was just my little world. And then just listening, listening to the radio all day, because they had the radio on, Spanish radio. And listening to them talk about these sort of very important themes in their lives.

ROBERT GREENE

Like what?

TERESITA FERNÁNDEZ

They were totally uprooted. They were in a different country. They totally assimilated, and they all sort of became versions of the

American dream, and they all became . . . not all of them, but in my case, my father became a very successful businessman, and from junior high on, my lifestyle was very different as well. But yeah. Just things about their family. In the immigrant experience, there's always this sense of loss and remembering. And then just everyday stuff, just kind of eavesdropping on stuff.

ROBERT GREENE

Are you an only child?

TERESITA FERNÁNDEZ

No. I have two brothers and a sister.

ROBERT GREENE

Did you spend a lot of time alone?

TERESITA FERNÁNDEZ

No. No, we were always . . . in fact, out of the four of us, I am the third. My older sister is was always very scholarly, and she has a graduate degree from Duke, and she was sort of the person on Spanish literature of the Golden Age. She was very well-known for it. And then she found God, and she became

this born again Christian. And it was very strange, because she was always this very academic person, very intellectual person.

ROBERT GREENE

Are you Catholic, or your family?

TERESITA FERNÁNDEZ

Yeah, but not . . . you know, Catholics are the worst.

ROBERT GREENE

But she was a born again Protestant?

TERESITA FERNÁNDEZ

Yeah, like Christian. Yeah. So anyway, I grew up watching her, and she basically was a kid who was in her room reading all the time. She was a bit of a nerd and bookworm and socially awkward. And my older brother was kind of a baseball star, as were most Cuban boys in that period. At that time, Cuban boys all got scholarships to college based on their baseball. So my brother was a bit of a baseball star. And then my little brother was always this sort of eccentric brilliant, brilliant kid that didn't fit into anything. It's like, you

can be that bad as a child, and if you can't figure out how to stay that way as an adult . . .

ROBERT GREENE

It can be difficult.

TERESITA FERNÁNDEZ

It can be difficult. So, he's fine. He's quite normal now, but he is. He's a really sort of brilliant person.

ROBERT GREENE

There's a lot of brains in your family.

TERESITA FERNÁNDEZ

Yeah. Not a lot of practical skills though, for him anyway. So I was sort of like the normal one. I was the easy one. I was the third child. I was the easy one, I was the normal one. I wasn't on either extreme. I wasn't the hyper kid. I wasn't the bookworm kid. I wasn't the celebrated first son. I was just kind of left alone kind of.

ROBERT GREENE

[inaudible 18:37]

TERESITA FERNÁNDEZ

Yeah. But I wasn't alone. There were no expectations put on me, so I just kind of . . . I was easy. I was the easy, normal kid. And that's why whenever I see families where they thing, 'Oh, so and so is this, and so and so is that.' It's like, uh-uh. Actually, the one that you kind of always think is the normal one is the interesting one usually, because they have more time to figure it out.

ROBERT GREENE

Well you developed in your life as well.

TERESITA FERNÁNDEZ

Yeah. And the kind of resourcefulness and privacy that is never made public to everyone else. So yeah, that was me. But I had a pretty uneventful childhood. It was just a pretty normal childhood. Healthy, happy childhood.

ROBERT GREENE

So, if you could say that you had any inclinations towards something, it wasn't necessarily towards art, it would be towards something scholarly?

TERESITA FERNÁNDEZ

No, it wasn't that either.

ROBERT GREENE

I mean, for instance, I always knew that I wanted to be a writer since I was eight years old. So I pretty much stopped there and never really left [inaudible 19:49].

TERESITA FERNÁNDEZ

It's not that. It's just that I didn't know what to call it, because I grew up in a family that had a very middle class existence, where it was about just taking a vacation once a year and paying your bills and doing homework and getting to the next day. So there was a routine built into it. I wasn't exposed to . . . we didn't travel a lot. I wasn't exposed a lot. Now, my father, who had basically a 6th grade education and went on to become a very successful businessman. He had no formal education, higher education at all. But we had a humongous library, and he read constantly. And so we just had . . . it was so funny. I always laugh. I was obsessed with

the Sonia Sotomayor hearings, and when she says the line about the encyclopedia. The Hispanic family . . .

ROBERT GREENE

I didn't . . .

TERESITA FERNÁNDEZ

You know, she grew up in the projects. I didn't grow up in the projects.

ROBERT GREENE

Her family was from Cuba.

TERESITA FERNÁNDEZ

No. Puerto Rico. But her apartment was the only one that had an encyclopedia, and all the kids would come over, and the encyclopedia in the projects, and this whole thing. And I had four encyclopedias. I had the kid one, I had the Britannica. I had like three adult ones and one kid one, and we had a humongous library, and it was all historical and biographies. That's what we read. We read every day. So even though my parents weren't intellectual in any way , my father had this great love of books and reading.

ROBERT GREENE

Nothing about art though in particular.

TERESITA FERNÁNDEZ

No. My aunts, the seamstress ones, they all went to art school.

ROBERT GREENE

So, when were you first finding yourself drawn to art in a way? You use the word calling, which is kind of what I'm . . . I'm going to be talking about it in the book, because it's something that kind of interests me. And there's a sense of a person, usually as a child, you feel in some ways that you're different and you're marked for something. You're drawn to it, even though you can't verbalize it. You don't know what it is. In retrospect, maybe it's a little artificial to put a word to it. But you do feel drawn to things. That's what I want to mime a little bit with you. I guess it's interesting. The haute couture seems very telling to me. The industrial stuff, making things. Things are really crafted. And perhaps the fabrics . . . I don't know.

TERESITA FERNÁNDEZ

No, it's not that neat a package. It just isn't. Because I remember liking to make things. No, it's not that obvious, and it's not that . . . no, it's not like a sound bite that way, although that would be lovely if it made sense that way.

ROBERT GREENE

I didn't mean that, to reduce it to that.

TERESITA FERNÁNDEZ

No, no, I know. I'm not offended, it's just it's not right somehow when I think about it. I'm like, nope. That didn't do it for me. That's not at all what I was thinking. No. It was more about . . . and it's not a specific thing. It was more about feeling like I was walking around in the world with this heightened sense of everything around. And it happened all the time. It didn't matter where I was, I always felt like I was kind of watching something from a distance. It's very abstract, and unfortunately, it doesn't make a good story.

ROBERT GREENE

It does make a good . . . you're saying something that I actually . . .

TERESITA FERNÁNDEZ

Maybe I could draw it out, I don't know. I'm curious myself. It was spatial as well. It was spatial.

ROBERT GREENE

Try and explain that a little bit.

TERESITA FERNÁNDEZ

Oh gosh.

ROBERT GREENE

What do you mean by the word spatial?

TERESITA FERNÁNDEZ

Well, it's spatial and visual. So for example, I always did really poorly in math, except for geometry, because at a very young age, I decided that certain numbers looked heavier than other numbers. There's some kind of weird . . .

ROBERT GREENE

You have synesthesia.

TERESITA FERNÁNDEZ

I know. I have some weird synesthesia.

ROBERT GREENE

I thought that when I was looking at your work, and now I'm realizing that more.

TERESITA FERNÁNDEZ

Yeah. I'm sure it can be called all kinds of things. But because I was really highly functioning . . . some kids have issues with sensory stuff that impairs how they navigate the world. I was very highly functioning, and I was a good student, so nobody ever . . . it all fell through the cracks. There was nothing special about it. It was a very private sense of the world. But yeah, I definitely had this very synesthetic view of the world. So five was always . . .

ROBERT GREENE

You definitely have synesthesia.

TERESITA FERNÁNDEZ

Yeah. Five was always just bigger than seven. And there was no way of explaining that, but it was absolutely true.

ROBERT GREENE

One of the people that I'm interviewing is a neuroscientist named V.S. Ramachandran who does a lot of studies . . .

TERESITA FERNÁNDEZ

I know his work. It's fascinating.

ROBERT GREENE

He does a lot of studies with synesthesia, and five . . .

TERESITA FERNÁNDEZ

See, that I didn't know. I had no idea about that.

ROBERT GREENE

And when I was looking at your shapes, I kept thinking of bouba and kiki. Because he has this famous way of explaining the relationship between sounds and concepts. And he thinks synesthesia is the origin of all intelligence and abstract thinking.

TERESITA FERNÁNDEZ

Oh, well there you go. I have not had this conversation with anybody.

ROBERT GREENE

I'll get you that book. So, we'll go on more about the spatial . . .

TERESITA FERNÁNDEZ

It's spatial as well, and sensory.

It's impractical.

ROBERT GREENE

Impractical?

TERESITA FERNÁNDEZ

Yeah. Sometimes it's very impractical. I think that whole sense of . . . I'm not obsessive about it, because it's all in my mind. But I do have this sense of sort of visually balancing spaces. I know some people have it in a very physical way where they're obsessively balancing themselves and things like that. I know people that way, and it's really weird. So I don't do that, but I feel like I do it mentally sometimes, where I'll walk in and a kind of heaviness on one side of the room will balance . . . sometimes it happens based on spatial things that are sort of above and

below. So in my own way, I've come to think of it as part of just my thinking.

So I'm always really interested in this sort of plane that you as a viewer are standing on and this idea that there's something above you and something below you, and there's this hypothetical plane, which is where you stand on. But that it is hypothetical. There are all kinds of things above you and below you. And sort of trying to not privilege our kind of narcissistic sense of vision emanating from our eyes, but of happening . . . I've always been really interested in what's happening behind your head and behind your back. So it's very full round sensory perception of the world.

ROBERT GREENE

And you had that early on in life in ways that's sort of hard to verbalize the feeling.

TERESITA FERNÁNDEZ

Yeah. It is hard to verbalize. It's hard to . . . I can remember instances, but yeah. I basically

always felt like I was navigating the world that way from a very, very early age.

ROBERT GREENE

Navigating the world in what way?

TERESITA FERNÁNDEZ

With this heightened sense of visual and spatial situation. From a very young age, I always felt like I was assessing visually and spatially for no particular reason.

ROBERT GREENE

For what?

TERESITA FERNÁNDEZ

For no particular reason. It never . . . I suppose now it's practical, because I can make art based on it. But at that point, there was really no practical sense of it. It was just something that I did automatically. And then what happened is I just think that as I got older, I got much faster at it. And so right now, the way . . . and it sounds so pretentious, but the way my mind works right now is so transparent to me that I have this access to it. And it's something really like in the last five

or ten years, I've gotten so fast at that that I don't even . . . it happens very, very, very fast.

ROBERT GREENE

We're going to be getting to all that.

TERESITA FERNÁNDEZ

I get to things really quickly. And more than that, I have to say . . .

ROBERT GREENE

That's very exciting to hear. That's the . . .

TERESITA FERNÁNDEZ

Well you'll have to tell me what it means, because . . . [laughs]

ROBERT GREENE

It's the whole point of why I'm writing the book, what you just talked about.

TERESITA FERNÁNDEZ

Okay.

ROBERT GREENE

[inaudible 32:11]

TERESITA FERNÁNDEZ

No, no, no. I'm following your lead.

ROBERT GREENE

Okay. So, it was sort of impractical. It manifested sometimes when you were in a room or with the space around you. You didn't really know what to do with it, I guess.

TERESITA FERNÁNDEZ

It was just there. It was just part of who I was. It was uneventful, but it was there.

ROBERT GREENE

When did it transfer into something starting to become practical, where you feel like, I could maybe use this? Now I'm self conscious about getting too pad [??] with my assessments of you.

TERESITA FERNÁNDEZ

It's okay. I don't have an answer either. Honestly, I haven't thought about a lot of this.

ROBERT GREENE

None of the people I'm interviewing have, so I'm kind of getting them to talk about it, unless you don't want to talk about it.

TERESITA FERNÁNDEZ

No, I just have to think about it, because I've never asked myself that question. I've never had to ask myself that question. When I was in high school, I was sort of in the art group.

ROBERT GREENE

How did that happen?

TERESITA FERNÁNDEZ

What's interesting about it is that it had nothing to do with what I do. So I ended up . . . I always liked art, but always in that way that art is presented to kids. It's not sophisticated. It's about making. It's about not having to be . . . it's where you end up if you're not a good athlete or you're not a good this or you're not a good that. And I kind of ended up there. It was a place that was really comfortable for me. Some kids ended up in drama. The drama kids were like that, too. They ended up there, because they clicked with the teacher, and they just had more freedom there and could make stuff and draw

and things like that. So I definitely ended up in that group.

I never in high school felt that I would be an artist or that one could be an artist and that that would be the thing that I did. It always felt more like this very self conscious activity that had nothing to do with the things that I just talked about. So it was this very sort of artificial . . . nothing, nothing at all to do with that. And then when I started college, I took one class that was a sculpture class. I played with clay and things like that, and none of it did it for me. It felt like an extension.

ROBERT GREENE

You were an art major?

TERESITA FERNÁNDEZ

Not at that point. At that point I was just taking requirements. A little bit the first year of college, of undergraduate school. And I remember very specifically that I wanted to learn how to work with metal. And so I got . . . this is my big boy phase. I really, I got really, really into forging metal, casting metal,

welding. And all of my undergraduate work is very handmade metal stuff.

ROBERT GREENE

Why were you drawn to metal?

TERESITA FERNÁNDEZ

Not for the material itself, but because there's this . . . and this I actually remember realizing this. There's this thing that clicked in my minds when I started to take a big piece of metal with heat and change the shape of it, where I all of a sudden became aware of how everything in the world was made and how . . . I could walk out my door and be like, 'I know how that was made.' So there was this sense of what things look like and how they get to that point and of understanding . . .

ROBERT GREENE

The process.

TERESITA FERNÁNDEZ

And how material changes. It's very visceral when you have a piece of molten metal, and you hit it, and it goes like that. And you hit it again, and you can make it do that. And

then you hit it again, and you can make it look like skin. So there was something super empowering about that for me. And I think super . . . and that's why I'm refuting the whole haute couture thing. Because it wasn't about that at all. In fact, it was just the opposite. It was something really hard, and really not easy. Materials are very, very resistant. They don't want to change. It's not fun. They're really, really very much in their whatness. So, all of a sudden, I had this way of channeling, of imposing myself on something that was very resistant.

ROBERT GREENE

And you like that for whatever reason.

TERESITA FERNÁNDEZ

I like that. Yes. And at that point, I was really into metal, and I was really into the process. And it was a very immature . . . yeah. So now, after I go through that, there was a kind of rush to doing that. And I remember that people were always . . . I would make these huge things, and people were always very

surprised that I made them, because I'm not a big person, and yet I was completely fascinated with this idea that I could make something that looked nothing like me but that looked a lot like what was inside of me somehow. So I could defy somehow my physical presence by making stuff, by making stuff that took the place of me somehow.

ROBERT GREENE

Interesting.

TERESITA FERNÁNDEZ

Yeah. And there is something super empowering about that, because you put all of this energy onto something else, and then that thing has a presence in the world, and that thing has the power to create change and to enter people's minds. It's almost, even now, it's this very . . . through the work, there's an access to a very intimate aspect of other people somehow. When it works. It doesn't always work. So I'm only ever interested in that 5% of viewers that are actually engaged.

I don't really care about convincing the whole world.

ROBERT GREENE

These metal pieces, they were large? They were big scale? Were you using space like you sort of do now in a way?

TERESITA FERNÁNDEZ

Yep, yeah. They became installations, and they became just big sculptures. So I outgrew this very . . . what I mean by immature is that it was this very direct connection between 'Metal, power, I can change this.' What happened after that was that I developed this much more sophisticated way of making very ordinary materials, transforming them into doing things that they normally wouldn't do. So that became more of a challenge. It's like, how do I get this thing . . . there's nothing special about it. How can I take this thing and change what it does? So it's a much less literally form of that original changing the metal into a shape. Now I do that with all kinds of materials.

ROBERT GREENE

You're an alchemist.

TERESITA FERNÁNDEZ

I am. I really am. That's the other thing my kid wants to be. He wanted to be an alchemist for a long time. He wanted to be an alchemist. He's obsessed with it. Just watching him, I really became interested in alchemy as well, but I often define . . . I don't want to make a homonculus, but I don't really . . . it's a bit of a wild goose chase.

ROBERT GREENE

Alchemy?

TERESITA FERNÁNDEZ

What I do in relation to what the role of an alchemist would be.

ROBERT GREENE

Where's the homonculus?

TERESITA FERNÁNDEZ

Because alchemists wanted to make homonculuses. I'm not interested in that part of it, but in the kind of . . . there's this sense of this wild goose chase where . . .

ROBERT GREENE

For you or for alchemists or both?

TERESITA FERNÁNDEZ

Well for me, but I think for alchemists, too.

ROBERT GREENE

The philosopher's stone.

TERESITA FERNÁNDEZ

The search becomes the sort of really valuable part. Once you find it, you really just want to start searching again. It's unattainable. There is really nothing to get. But it's such a thrill to get close to it that you keep wanting it and challenging yourself to . . .

ROBERT GREENE

To get close to what?

TERESITA FERNÁNDEZ

Making something that changes the world or has an impact, or says something visually that has never been said before. Inventing something. Inventing something. In my case, [inaudible 42:07]. I'm obsessed with the idea of inventing something that doesn't exist.

Maybe that's pretentious, but the way that I use materials, the first thing I do is just research. I found out what's been done with it.

ROBERT GREENE

We're going to get to that. We can put a hold on that. Let's get back to all that. You're sounding more like Da Vinci every moment.

TERESITA FERNÁNDEZ

I love Da Vinci.

ROBERT GREENE

You do?

TERESITA FERNÁNDEZ

Sure. In fact, a lot of those pieces are about . . .

ROBERT GREENE

To me, the drawn water scene . . .

TERESITA FERNÁNDEZ

Completely.

ROBERT GREENE

His sketches of water, and I guess you use graphite.

TERESITA FERNÁNDEZ

It completely comes from that. It's in the book I think.

ROBERT GREENE

But his whole thing was it's all about invention. There's an Italian phrase, but I can't remember it. But the creators to invent or whatever it was. So everything made had to feel like an invention.

TERESITA FERNÁNDEZ

He was paranoid of floods. He had this real fear of flooding water.

ROBERT GREENE

Well, I read a fabulous biography. Have you read Serge Bramly's biography of Da Vinci? It's really good. He was obsessed with all kinds of chaos. Water probably was the big one, but even fires and conflagrations. Anything chaotic just really obsessed him, water in particular.

TERESITA FERNÁNDEZ

And systematic, too. You can learn a lot from just watching those systems and how they completely run the gamut of possibilities.

ROBERT GREENE

Like water you mean?

TERESITA FERNÁNDEZ

Like water or like fire. They're this endless source of information.

ROBERT GREENE

This is all very exciting for me, but I have to [inaudible 44:23]. I want to get to that later. To made things or to be one of those MacArthur geniuses or whatever you now are.

TERESITA FERNÁNDEZ

It's so ridiculous.

ROBERT GREENE

I interviewed another woman a couple weeks ago who is another MacArthur genius award . . .

TERESITA FERNÁNDEZ

They don't use the word genius. Everybody else does, but . . .

ROBERT GREENE

What is it called?

TERESITA FERNÁNDEZ

Just MacArthur fellowship.

ROBERT GREENE

Okay. The sense of being disciplined and patient with time, letting time take its course in building something or creating something. So children find their way to that, some never do. Do you have a particular relationship to being disciplined and to working on something over time and seeing results? Anything like that, or is that something you came upon later in life? Because you must be very disciplined.

TERESITA FERNÁNDEZ

I'm really, really disciplined. But I think disciplined is the wrong word. I think I'm really efficient, and I have learned how to layer a lot of things onto one another.

So, I always feel like I'm doing five things simultaneously mentally. For me it's not about sitting and waiting for something to reveal itself. I actually work all the time. I feel like I'm working all the time. There are certainly things that I come in here and begin, and there's a beginning, middle and end, but that's more to do with just executing something than thinking about something. I can think about something for a long time, and I can concentrate on something really, really intensely and deeply.

ROBERT GREENE

That's very interesting. Has it always been that way?

TERESITA FERNÁNDEZ

Yes. Yes. And it's not passive.

ROBERT GREENE

It's not passive.

TERESITA FERNÁNDEZ

It's not passive. It's maybe a little obsessive, but there's a kind of drive. It's not a career

drive. It's an intellectual drive. And there's a thrill.

ROBERT GREENE

Do you derive any pleasure from being able to focus on one thing very deeply or whatever?

TERESITA FERNÁNDEZ

Yeah. There's a thrill to it. It's not always pleasant. It can be very frustrating as well, but I know how to work around things too. But I am a bit relentless when it comes to figuring something out. And so I can be patient. I can be patient, but not passively.

ROBERT GREENE

[inaudible 47:49] persistent.

TERESITA FERNÁNDEZ

I don't have time actually for it. I don't have time.

ROBERT GREENE

Time for . . .

TERESITA FERNÁNDEZ

For I don't know, sitting in a cafe with a sketchbook. I don't do that.

ROBERT GREENE

That's not really what I meant by discipline. That's more the active sense that you're talking about.

TERESITA FERNÁNDEZ

I tend to write a lot of things down. For example, right now I have on my desktop four different folders of things that I'm kind of researching, that I'm a little bit obsessed by, and I have no idea what they're about. But I've broken them down into what seems like these sort of major subjects maybe. And so when I see something, I kind of put it in there. I tend to not . . . I'm kind of really obsessed with this idea of blindness, because I work kind of blindly.

So I kind of start . . . actually, I remember doing this as a very young kid. I remember making lists. I would make lists, and the list would have things that were completely unrelated, but that were related somehow in my mind. They could be totally arbitrary. They could be serious. I remember maybe

being, I don't know, 11, 12 and doing that as a way of understanding that certain things belong together even though it would be nonsensical if you read it. There would be no . . . and what they had that was similar was a tone. That's all.

ROBERT GREENE

You found the similarities.

TERESITA FERNÁNDEZ

In my mind, although I don't know that it would make sense to put it out there in the world. But it's just part of the work to arrive at why something ends up looking a certain way, for example. I do remember that. I remember being able to identify very disparate things that had a very similar quality that I was trying to get. But very abstract. I don't know that I could even . . .

ROBERT GREENE

The distillation process.

TERESITA FERNÁNDEZ

It is. It is.

ROBERT GREENE

Abstract into other things that you do maybe. That's interesting.

TERESITA FERNÁNDEZ

So I still do that. I have, they're not lists, but they're bundles of information that I . . .

ROBERT GREENE

Do you do that? Do you go through that process?

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

I do that, too.

TERESITA FERNÁNDEZ

But I need to just dump everything in there, and then sometimes nothing happens. Sometimes I hit the jackpot.

ROBERT GREENE

This probably doesn't apply to you then, but a sense of feeling like there was this sort of destiny or a calling that you have. I like to use the word destiny, because some people feel that way from very early on. There's a word

... I'm reading a lot, in this book I'm using a lot of Goethe, and he has a word called intellecky [SP], which is a Greek word. And it means bringing out what is completely unique about yourself. Everybody has that. It's this sort of lifelong process. He relates it to what a plant goes through. It develops into a flower. You don't really seem to be someone who necessarily had that kind of clarity early on. It was more sort of a fumbling around until you found it kind of thing.

TERESITA FERNÁNDEZ

I had no sense of what it looked like. And I think that this is a big . . . I talk to students about this all the time. Where there's a sense of trusting yourself and trusting . . . I do, I believe in destiny actually.

ROBERT GREENE

You do?

TERESITA FERNÁNDEZ

Completely.

ROBERT GREENE

Okay. Well that's good.

TERESITA FERNÁNDEZ

I'm really sort of very fascinated by the idea of destiny, because it fits right into this sense of drive and working towards something. It's just I don't always know what the goal is, and I don't always know what it's called. And I think often people feel this way all the time. When people look at what I do, they think I've got it figured out. And I often sense that people who are searching and struggling think that it's somehow easier for me because I have this set of problems that I'm working with. And I just plug things in and get different versions of things. And it's not like that at all. So I feel like I carved the way of that destiny. But it's not an egocentric kind of destiny somehow. Because I think a lot of people imagine themselves as a great filmmaker, a great writer, great artist . . .

ROBERT GREENE

That's ego. That's not destiny.

TERESITA FERNÁNDEZ

Okay. Well, I wanted to clarify. I don't sense that at all. I have no clue what I'm doing. I just do it. So early on, I don't think I had that sense of destiny. Now I do.

ROBERT GREENE

Interesting.

TERESITA FERNÁNDEZ

Yeah. Now I do. I want to be making art when I'm 90.

ROBERT GREENE

So when did you have this sort of sense of destiny? Later on, maybe in your 20s, 30s?

TERESITA FERNÁNDEZ

Yeah. My 20s.

ROBERT GREENE

What is it that you tell your students? I was interested in that.

TERESITA FERNÁNDEZ

That you sometimes have something, and you recognize something. It's just you don't know what to call it. And when you don't know what to call it, it's very hard to give it form

and to defend it and to claim it. But if you just kind of trust in that destiny, you can actually peel back the layers, and you become very efficient at working towards that destiny.

ROBERT GREENE

Do you think some people give up because they can't put a name to it . . .

TERESITA FERNÁNDEZ

Because they don't know what to call it. Yes.

ROBERT GREENE

. . . or they don't have clarity.

TERESITA FERNÁNDEZ

Because they don't know what to call it. I think actually the most amazing thinkers are people that don't know what to call it for a long time. And so, I have feel a kind of compassion for people who don't know what to call it, because I think there's something really, I don't know, just really human about being in that moment, especially in a world that privileges sped over emotional intelligence.

ROBERT GREENE

Or it privileges verbalizing everything without really knowing what you're saying.

TERESITA FERNÁNDEZ

Exactly. Exactly. Or promoting yourself. We live in a world that celebrates the skill of self promotion. I'm guilty of it as well. It's not a bad thing.

ROBERT GREENE

It's nothing to feel guilty about.

TERESITA FERNÁNDEZ

Huh?

ROBERT GREENE

It's nothing to feel guilty about.

TERESITA FERNÁNDEZ

No, no, no. I don't. I use it. I know when to use it. I know how to use it. I think it's a really useful tool. I don't reject it in any way. But certainly, it's a lot of smoke and mirrors. You could go around acting like you're really good at something by how you promote yourself and in fact be pretty mediocre.

ROBERT GREENE

Is there a fair amount of that in the art world?

TERESITA FERNÁNDEZ

In any world.

ROBERT GREENE

Every field.

TERESITA FERNÁNDEZ

I think in any world. There's a lot of that certainly in New York.

ROBERT GREENE

And in writing, too.

TERESITA FERNÁNDEZ

Yeah. You get by. Sometimes it's really good, because it's a way of getting a break, too, if you can convince somebody. You get a break and then you can . . .

ROBERT GREENE

Yeah, but usually, unless there's some foundation of real, it doesn't really lead to anything. Okay.

TERESITA FERNÁNDEZ

And even when you know what to call it, then you're kind of fighting this idea that you know what to call it.

ROBERT GREENE

Sometimes putting a word to it feels like you've betrayed your idea a little bit.

TERESITA FERNÁNDEZ

I don't feel that way. It just sometimes feels more mechanical or like it's figured out. More pat somehow, more defined, more systematic.

ROBERT GREENE

Well I've got through my first card. It took a little bit longer than normal, but that's fine.

TERESITA FERNÁNDEZ

An interview of this length starts to border on analysis.

ROBERT GREENE

It is a little bit.

TERESITA FERNÁNDEZ

Like an AA meeting, confession, all kinds of things.

ROBERT GREENE

Oh, come on. That's not fair. [inaudible 57:34] feeling like that?

TERESITA FERNÁNDEZ

No, no. Not at all. You would know if I were uncomfortable.

ROBERT GREENE

I know you have a big thing about cliches.

TERESITA FERNÁNDEZ

No. Come on. I'm a cliche. Everyone's a cliche. No, no.

ROBERT GREENE

I'll turn it into something . . .

TERESITA FERNÁNDEZ

No, no. Just do your thing. You will so know. If I'm like not responding, you'll know.

ROBERT GREENE

I already sense the parts where you weren't responding.

TERESITA FERNÁNDEZ

I'll let you know if I'm uncomfortable. I'm not.

ROBERT GREENE

One thing I wanted to backtrack on a little bit was the apprenticeship idea. It's sort of sticking in my craw a little bit.

TERESITA FERNÁNDEZ

I know. I noticed. Okay. Go ahead.

ROBERT GREENE

It's an idea that nobody kind of is born from the forehead of Zeus fully formed. So you don't have a signature style, but there is something that kind of connects your work together. It all comes from you, and you have a certain way of looking at the world and a certain process you go through, and there must have been stages along the way. So, I'm wondering if there were things you did wrong, lessons you learned, dead ends that you hit where you said, "I don't want to be an artist like that. I don't want to work like that," where you kind of formed yourself through your experiences that could be illuminating.

TERESITA FERNÁNDEZ

They are, but I don't want to be too revealing to the world. You know what I mean? I don't want to turn it into some nice story. But I can tell you some part of it, but no, it's not like some horrible thing happened to me. And I trust that if you use this, you'll rephrase it in a way that's useful. Because what I don't like is I don't like sentimentality, and I don't like things being read as poor me kind of thing. But I have always had this sense that nobody would help me.

ROBERT GREENE

Okay. Starting when?

TERESITA FERNÁNDEZ

Always. So the work became of a way of helping myself.

ROBERT GREENE

You don't know why you had the feeling that no one would help you?

TERESITA FERNÁNDEZ

See, I don't want to get all weird about it.

ROBERT GREENE

I don't know. I don't really know where to go with this, because I'm not quite sure either.

TERESITA FERNÁNDEZ

There's a sense of self sufficiency, so I think . . .

ROBERT GREENE

I'm very interested in that.

TERESITA FERNÁNDEZ

It comes out of a kind of need, and then it becomes a kind of obsession. So it starts as a kind of defense mechanism for just . . .

I don't know. I think surviving or just not falling apart or not dying or not disappearing. And then it turns into a real strategy for . . . attaining power is the wrong way of describing it, although that has something to do with it. Control maybe.

ROBERT GREENE

[inaudible 0:03:48]

TERESITA FERNÁNDEZ

No, no, no. It's empowering. I like the word empowering more than power, because power

always implies what you do with it out in the world, and empowering just means that you're strengthened by it. So it's the same thing, but I'm talking more about feeling empowered. I think that when you've figured out a strategy to do that, you can be productive, and you can somehow contribute to something that's . . . I have this sense of something much bigger than me. It's not about me.

ROBERT GREENE

I told you this isn't about you anyway. I'm just using you for the purposes of my book. You don't have to worry that it's about you.

TERESITA FERNÁNDEZ

Yeah, yeah. But I'm just saying as a maker, as an artist. I never really think it's about me. I always feel like it's about something bigger than me. It again plays into this whole idea of destiny or calling or something like that, or I was meant to be this, or I always thought I'd be that. It like, I didn't always, but . . . I never felt like it was about making a version of myself. It always is about its bigger sense

in the world, if that could make any sense. The other thing that I thought of the last day is this very specific idea that I operate on, which is that I'm always aware of making work that's about an audience of one. So, I'm not interested in big changes. If I did, I'd probably be trying to find some cure for something. I'm interested in these very small sort of changes that are connected to aspects of consciousness that are abandoned.

ROBERT GREENE

You mean for the viewer or the reader.

TERESITA FERNÁNDEZ

Yeah. An aspect of the viewer or the reader that's completely abandoned. I think that because of that, some people are more or sensitive or receptive to the work than others. But it's not about convincing everybody. It's really about an audience of one person and touching upon or creating a catalyst that really triggers something that could be completely difficult to describe, but very deep somehow, and very primal, too. I think

very primal. But unspoken and mute in its manifestation, which is why it's hard to make a story out of it.

ROBERT GREENE

Story out of what?

TERESITA FERNÁNDEZ

You know, what it's supposed to do when one explains one's work. How do you want the viewer to respond to this? I have all kinds of answers that I use for those questions that are true, but that are just about optics or space or da da da. And that's not really what I'm interested in.

ROBERT GREENE

Okay. But as far as this formation along the way where you really want to be self sufficient, no one helped you. There weren't incidences or experiences that stand out where you learned this lesson the hard way? That's kind of the idea from the apprenticeship. It's like learning from your own mistakes and from experience, and not necessarily even the teacher. It's just yourself.

TERESITA FERNÁNDEZ

I'm trying to think, because I don't have some horrible thing that marks . . .

ROBERT GREENE

It doesn't have to be horrible.

TERESITA FERNÁNDEZ

. . . my awakening or something.

ROBERT GREENE

It seems like it was very gradual, so it's hard to . . . you were working with those heavy metal things in college. You were already there, you were doing similar things to what you're doing now, but it just sort of slowly evolved. So it's maybe kind of hard to say because it's very gradual.

TERESITA FERNÁNDEZ

I'm trying to find an answer for you. All I can say is that I think that you have to have something to resist against. For me, that's what that was, just this sense that I wasn't lucky and that nothing would be handed to me. So I was very resourceful and very hardworking and very driven and ambitious.

I honestly think, this is another thing I was thinking about, I don't think I'm a master at anything. I don't think I'm a master at what I do. I just think I . . . perhaps it just a really kind of sophisticated coping mechanism.

ROBERT GREENE

You want to withdraw yourself?

TERESITA FERNÁNDEZ

No. I don't care how you use it. I'm just saying . . .

ROBERT GREENE

But if you don't feel like there's a sense of mastery that undercuts the . . .

TERESITA FERNÁNDEZ

But it's not about the mastery. The mastery is just a symptom of it. The mastery is just . . . it's not like you set out to master something, is what I'm saying. It's almost like I'm talking about myself in the third person when I talk about mastery, and that's not how it feels. So how it feels is different than how you will write about it or phrase it.

ROBERT GREENE

We'll get to that later. That's trouble for me.

TERESITA FERNÁNDEZ

Which part? The third person part?

ROBERT GREENE

No, no, no. That it doesn't ever feel like mastery.

TERESITA FERNÁNDEZ

No, no. There's mastery in the process. There's mastery in the process, but it's not . . . the goal is not about mastering. If you mastered something, then there would be nothing to master.

ROBERT GREENE

Well, that's not how I'm going to be defining it. It's all about how you use words. It's just a word.

TERESITA FERNÁNDEZ

Yeah, that's true.

ROBERT GREENE

And the word to me is once you've mastered this one artwork piece through . . . your sense of process is different from scientists for

instance, with graphite, and you struggled against and it resists you. What do I do with graphite? At first, I'm not really sure, and then slowly you find your way and better ideas come. Maybe it's sort of an exciting process, working against the resistance. At first it's kind of daunting, and this graphite, and this is you. Slowly you're getting up to the point where it's you and graphite kind of together. And then you move on to the next this that you have to do.

TERESITA FERNÁNDEZ

I guess what I'm trying to say is that it's never about . . . what you're mastering is not the thing you do, but yourself.

ROBERT GREENE

That's what this is about.

TERESITA FERNÁNDEZ

I'm not trying to master graphite. I have to master graphite, because if I don't master graphite, then I can't master myself. So it's about the kind of will. But what I'm trying to master is myself, not the work.

ROBERT GREENE

That's exactly what this is all about, self mastery.

TERESITA FERNÁNDEZ

I don't think I'm an expert in art making. I think I'm . . .

ROBERT GREENE

The word expert isn't entering here. If you don't feel like you're a master of anything, that word doesn't apply to you. I want to be open to people tell me. I don't want to be imposing my schema on them, so it's a little bit difficult.

TERESITA FERNÁNDEZ

I just fell like if I don't master myself I'll die. That's how I feel.

ROBERT GREENE

That's exactly what I'm talking about.

TERESITA FERNÁNDEZ

I feel like if I don't master myself, there's no other option.

ROBERT GREENE

Right. All right. We'll get back to that when we talk about that feeling that you have, things coming fast. To me, that's what it is, but I don't know.

TERESITA FERNÁNDEZ

Well, I'm not writing a book on mastering anything, so it's . . . it manifests itself very differently when one is in it. It doesn't always look the way you're calling it somehow.

ROBERT GREENE

The way I'm calling it?

TERESITA FERNÁNDEZ

Yeah, yeah. What you're calling it doesn't always look the way it feels.

ROBERT GREENE

Then what do I do?

TERESITA FERNÁNDEZ

I don't know. It's your book. I don't know. I'm just being really honest with you, because I don't think it's so accessible.

ROBERT GREENE

What's so accessible?

TERESITA FERNÁNDEZ

The information that you're trying to get at or how you give meaning to it. I don't think it's an easy thing to get at. I think it's really, really deep rooted in some pretty serious stuff.

ROBERT GREENE

So you're questioning the whole. . . [inaudible 0:14:38].

TERESITA FERNÁNDEZ

No, not at all. I'm questioning myself. I'm questioning myself.

ROBERT GREENE

Well, it's a groping in the dark that I'm trying to express something that no one's ever written about. So I always set myself a ridiculous challenge. If I can get 20% there, then I've expressed something 20% more that's never been expressed before.

TERESITA FERNÁNDEZ

I'm sure you can do it. I have no doubt about that or concern. I'm just trying to think about how I can be helpful and how I can . . .

ROBERT GREENE

Let me try and be the midwife here.

TERESITA FERNÁNDEZ

Okay. I'm a little chilly.

ROBERT GREENE

Do you want to go somewhere?

TERESITA FERNÁNDEZ

No, it's fine. Okay. I'll let you be the midwife.

ROBERT GREENE

So, we'll close the door on apprenticeship. I give up on that one. I think I've got something. Actually, I'll figure it out.

TERESITA FERNÁNDEZ

It's interesting. It's a very confusing word. It's a very, very confusing word to me. What do you do if have no . . . what do you do if you have nothing to . . . if you have no one to mentor you?

ROBERT GREENE

I look at myself. I don't want to talk about myself. This will be the last time I talk about myself.

TERESITA FERNÁNDEZ

Note to self.

ROBERT GREENE

Yeah, note to self. So, I've always wanted the write, but there are these things that happened in my life. I had no mentor obviously. Writers rarely do. But the mentors were writers that I loved when I was younger, and I read them all, and they got into my blood inadvertently. So, your mentors could be other artists.

TERESITA FERNÁNDEZ

I grew up in Miami. We had like Miami's aquarium. We had no museums. I grew up not seeing any art at all. I grew up completely . . . my mentor is my fantasy life. That's my mentor. My mentor is a hugely active imagination and books.

ROBERT GREENE

And books.

TERESITA FERNÁNDEZ

And traveling. That's my mentor.

ROBERT GREENE

Okay. So for instance, I was in high school, and I wrote an essay, and the teacher . . .

I thought it was brilliant in 5th grade. He gave me a very bad grade, and it was a teacher I really liked, an English teacher. He said, 'Robert, when you write, you're not writing for yourself. You're not trying to impress yourself. You're not trying to show off. You're thinking of the other person. You have to really think of the person you're communicating with. That's why writing is about. It's not about just expressing your own ego and stuff like that.' I never forgot that, and it completely changed how I approached writing for the rest of my life.

Then, there were other moments like that where I would go off and make mistakes, like the one I made with him. Then I would realize, my awareness, 'Oh my god, that was really stupid. I'm violating that one tenant. Or I'm writing something that I'm not suited for. This is what I'm suited for.' Slowly, I find

my way to a [inaudible 0:17:57] form that suits me, which was the first book. So I've sort of self formed and self educated myself, somewhat through experiencing things and reevaluating them and learning very deeply the lessons that they contain and why they don't suit me. Things that don't suit me, they come from the outside. They're not what I should be doing. So it's like sloughing off dead skin until you emerge to who you are. So, there's no single person doing it. There's no mentor, but that's the formation process. Otherwise, it would just be a mystery who I am in the present. Do that . . .

TERESITA FERNÁNDEZ

Mm-hmm. Yeah, I know what you mean. I think then it's about resistance. It's about all of the things I didn't want to be.

ROBERT GREENE

You don't want to talk about that?

TERESITA FERNÁNDEZ

Well, growing up in Miami is like growing up in LA maybe. It's a very, very superficial

culture. There aren't a lot of . . . and I will get in trouble for saying all of this, because they don't think of themselves that way. But there's very little value placed on any kind of intellectual pursuit. I always felt like an alien, because I could physically blend in, and intellectually, I was completely lonely. Again, that sounds pretentious, because I'm sure there are plenty of interesting people in Miami. But I didn't really feel like I belonged there, so it was always about this search for an alternative to that. So the minute I left, things started happening, and I started to feel a connection to things. But I also fantasized a lot. It's almost like I imagined angst or something. By being in a place that was so beautiful and lush and pleasant.

ROBERT GREENE

Happy.

TERESITA FERNÁNDEZ

Happy and healthy and golden. I developed a really, really sharp sense of what was somber and what was quite and what was intuitive

and what was emotional and what was difficult. I developed a really, really sharp sense for a tone that was exactly the opposite of that. And it's the same tome that you see throughout all my work. People usually think it's the opposite. They'll see water, and they'll say, 'Oh, Miami.' And it's like, Miami water doesn't look like that. That looks like the Seto Inland Sea. So it's about finding . . . the extreme opposite was what was interesting to me. But in that context, it was like a caricature of itself. It was like fake angst or something.

ROBERT GREENE

Early on.

TERESITA FERNÁNDEZ

Yeah. Pounding metal and stuff, yeah. You try putting a big pounded metal sculpture in front of the sculpture studio and your university, and it's like hibiscuses in the background. It doesn't work. But yeah, aesthetically, that's where that comes from.

ROBERT GREENE

This was the University of South Florida that you went to?

TERESITA FERNÁNDEZ

It's Florida International University. It's a state school in Miami.

ROBERT GREENE

Florida International University. Where is that?

TERESITA FERNÁNDEZ

It's in Miami.

ROBERT GREENE

It is in Miami.

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

So when you went there, I forgot the word that you used, things changed for you or something opened up.

TERESITA FERNÁNDEZ

The material. Actually working with the material and transforming it really gave me this sense of access to the whole world, and

that I understood how it was that things in the world were made and existed. The idea of imposing oneself on the material, changing it was very empowering for me. And it's what I still do. So now it's not necessarily about physically working that hard at changing the material, but intellectually and psychologically changing material.

ROBERT GREENE

What is it about that that particularly excites you?

TERESITA FERNÁNDEZ

It's like magic. It's like magic. It's like alchemy. It's like making something from nothing. It's like inventing something, and it's like creating a character . . . not a character character, like a Kanji, like a Chinese character. It's like inventing a character that you put in the world, and then you can just watch how . . . you can also, it's also a way of manipulating people I think.

ROBERT GREENE

Manipulating people?

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

You mean their subjectivity, their experience?

TERESITA FERNÁNDEZ

Yeah. I kind of get off on the voyeuristic aspect of feeling like I'm inventing something and putting it in the world and then kind of watching and learning from it. It's not manipulative in a self serving, in a bad way necessarily. Sometimes it's manipulative in a really constructive way. But I like that. I like the thrill of observing that power that something has, because it's almost like . . . yeah, if you relate it alchemy, it's almost like you've created an elixir, and people are completely seduced by it. I know how to do that. I know how to make things that do that.

When you put people in that state, they in turn are affected by you as a person and you're treated differently somehow. So by making the work, I'm actually mastering myself. By making the work, I'm actually . . .

I think there's something inherently . . . on the one hand, I think that it's about putting something in the world that's much bigger than me, but the kind of efficiency of it or healthiness of it depends on this totally narcissistic impulse that's about measuring. It's like I'm the measure of whether it works or not, like what comes back to me is like the measure of . . . it's like a nourishment thing. Does any of that make sense?

ROBERT GREENE

It makes perfect sense. Very good.

TERESITA FERNÁNDEZ

Okay. I'm speaking. I've not thought about these things out loud, I have to say.

ROBERT GREENE

I will knit it all together. Did you know that the word magic and mastery and etymologically related?

TERESITA FERNÁNDEZ

No, I didn't. I didn't. But I'm fascinated by this idea. When I'm making art, not doing the research, not putting something together.

But when I really get to those points, like we noticed yesterday where something clicks, I do feel like I'm making something from nothing, something that doesn't exist.

ROBERT GREENE

[inaudible 0:26:25]

TERESITA FERNÁNDEZ

So much pressure. You see right under your charger there. I was reading the paper yesterday, and I found this image.

ROBERT GREENE

This here?

TERESITA FERNÁNDEZ

Yeah. Pull it out. And I found this image. And I have no idea, but I ripped it out and I put it there, and I've been obsessed with this image. It's sap being harvested from maple trees, and I just thought it was an amazing image. And I know I will make a piece one that that relates to this. Isn't that cool?

ROBERT GREENE

What I find exciting is how it just kind of goes on zigzagging forever, kind of like one of

those Rube Goldberg things, like those toys where the ball bounces easier.

TERESITA FERNÁNDEZ

No, but there's actually sap flowing through it all. So it's almost like the whole landscape, the whole scene has been turning into this kind of body, into this system, into this body that's been imposed on it. And even the fact that it's blue. It's almost like a prosthetic device or something.

ROBERT GREENE

Or a vein.

TERESITA FERNÁNDEZ

Yeah. That's what it is. It's like a . . .

ROBERT GREENE

I wonder what they use the sap for. What is sap for?

TERESITA FERNÁNDEZ

It's syrup. It's maple syrup.

ROBERT GREENE

That's a great image. Yeah. Let's talk a little bit about your relationship to materials. You seem to get kind of excited by the materials

themselves, certain materials like graphite, maybe gold is going to be the next one. Is it something that starts the process, or do you have an idea and then you sort of search for the material that excites you? Do you ever just start with the material?

TERESITA FERNÁNDEZ

Never.

ROBERT GREENE

Never.

TERESITA FERNÁNDEZ

Never. I actually don't find materials, I search for materials. It's very, very different. I never see a material that's interesting and just say, 'Hey, I could do something with that.'

ROBERT GREENE

How did you find graphite?

TERESITA FERNÁNDEZ

It took me a year to find it.

ROBERT GREENE

What were you searching for?

TERESITA FERNÁNDEZ

I was searching for . . . this is that part of my research, which is very easy to explain. The first thing I did was figure out where graphite is mined in the world. And then I found several distributors. I basically have to become an expert at the industry, educate myself. Most of it honestly depends on forming a relationship with a real person. So I'll go there, and it's very hard when you're an artist to get online or on the phone and say, "Hi. I'm an artist. I'm interested in this." There is no vocabulary. You have no common vocabulary whatsoever. In most cases, they won't even talk to you. So for the graphite, for example, I started by just ordering the smallest amounts that I could.

ROBERT GREENE

How did you get on graphite in the first place?

TERESITA FERNÁNDEZ

Because of the whole landscape and the Arno Valley drawing by Leonardo Da Vinci. We talk about that.

ROBERT GREENE

Yes. So you started off with that.

TERESITA FERNÁNDEZ

And then I got to Borrowdale and the idea of a drawing and a landscape being a drawing.

ROBERT GREENE

So it's like the association of the drawings by Da Vinci were in graphite, and you were curious to learn about graphite. Is that it?

TERESITA FERNÁNDEZ

Yeah. And then I became interested in the material graphite because of Borrowdale and because of being able to mine it and the idea that graphite is used to make a mark, but it's also a three-dimensional material. So I wanted to make sculptures that were drawings and drawings that were sculptures, so I needed a lot of graphite in order to build or construct something, which I also didn't

know how to do. So, I did a lot of research. I got samples of graphite from all over the world. From Russia, from Pennsylvania, from Sri Lanka, from everywhere. And if you line them all up, they all look very, very different. They have very different qualities.

ROBERT GREENE

Interesting.

TERESITA FERNÁNDEZ

They have different colors. They're completely different. So, the kind of graphite that I liked comes from Sri Lanka, which is where all my graphite comes from.

ROBERT GREENE

Why did you like it?

TERESITA FERNÁNDEZ

Because it had the highest luster. You saw it in Cleveland. Those buckets are full of it. It had the highest luster, and it was just a very seductive material, and it was soft and I could work with it. But mostly because of the way it worked. It reflected the most light, and it was just almost liquid in its appearance. So I went

with that, and then when I found it, I had to see how I could buy it in big enough pieces. So I . . .

ROBERT GREENE

You went to Sri Lanka?

TERESITA FERNÁNDEZ

I didn't. I dealt actually with someone who distributes their graphite here. So I went and met this person and spent the day with this person whose life couldn't be more different than mine. And surprisingly enough, I find that when you're generous with your time and your ideas, people are so, so eager to help you and respond. So I had one contact, and this person . . . I went and spent the day with them, and he was willing to work with my strange idea. He makes people where he works sort out the pieces that I want. Stuff that they don't do for other big orders. It really kind of handpicked. Each piece is handpicked.

ROBERT GREENE

Don't graphite evoke any particular feeling for you personally?

TERESITA FERNÁNDEZ

Personally?

ROBERT GREENE

Yeah.

TERESITA FERNÁNDEZ

After using it?

ROBERT GREENE

Both. Just graphite itself. Even the look of it. You say seductive.

TERESITA FERNÁNDEZ

Yeah. But it's more than that. For me, graphite represents a very, very, I want to say primal in this case. A very primal aspect of thinking and being human, and I don't really make a distinction between drawing and thinking. So it all started to blend together. When I went to this graphite distributor, for example, I was in the showroom looking at stuff. I was like, 'I don't want to see the showroom. Show me the stuff. Show me

where miles of this stuff is. Show me who's working with it.' And so he did. I put on boots and a hardhat, and I went out.

And it was basically, if you can imagine . . . I have pictures of it actually. If you could imagine men workers completely covered in graphite, where every surface of their clothing, their shoes, everything, their glasses had a kind of sheen to it. My floors used to be like that. But if you can just imagine everything like that, everything. From their hands, everything. So it was so surreal, because it was this scene that was like this living drawing. So yeah, there's an immediacy to it, because the graphite gets on you, too. So it's like, you make a mark with it, but it also makes a mark on you. There's something very earth about it somehow.

ROBERT GREENE

So is something similar going on with gold?

TERESITA FERNÁNDEZ

The gold. Okay. The gold, I've been thinking about metallurgy and alchemy for a while.

And when I got offered the show at the Met, the first thing I did was walk around for two hours in a daze.

ROBERT GREENE

Here or there?

TERESITA FERNÁNDEZ

In the museum. And I was a little overwhelmed, because to get to the gallery that I'm working in, you have to go through the Greco room section, the African section, arts of Oceania, Americas, modern masters, and then you get to my room. And so it's like the trek to get there is this psychological [inaudible 0:36:19] of these amazing civilizations. And by the time you get to my room, they're all stacked up on top of your head, and it's hard to top them. That's the way I describe them. It's like it's hard to put another hat on it. So I was struggling with that, and I walked around the museum and I had a million ideas of what I wanted to do. So I walked through paintings, and all of a sudden I wanted to make something about

landscape or [inaudible 0:36:47] landscape or panoramas. And then I'd walk someplace else and I'd want to do that. And it all felt so didactic and so derivative.

ROBERT GREENE

Your idea?

TERESITA FERNÁNDEZ

This idea that I would respond to something so linearly. I kept rejecting and rejecting it as I was walking along. And I kept thinking, what I really, really want to do is I want to find a way of understanding why it is that when we walk through those spaces and look at those amazing works of art from our ancestors, why is it that we have this amazing sense of awe and reverence? And how is it that you could capture that sense of awe and reverence? How can you kind of like bottle it? How can you kind of recreate it so that someone would bring that same sensibility to a work of contemporary art, which is psychologically very different.

And so for me, a lot of it was just trying to identify with that was, and it has a lot to do with, yeah you're looking at this African mask, ad you're looking at clothes. You'll see the tiny little bit of dried blood on one side of it, and it's like, this is us. There's something about being human that's in all of this. It was very clear to me that I wanted to identify what that thing was and try to make this seamless connection into whatever I make, which was kind of, on my side, lofty desires on my part. But I wanted to make something that would be read in a very universal way. And I kept going back to . . . you know the gold treasury, the Jan Mitchell . . . it's right by the African stuff. It's kind of tucked away. It's all the pre-Columbian gold.

ROBERT GREENE

Oh, at the Met?

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

Yeah, I've seen it once.

TERESITA FERNÁNDEZ

Yeah, it's my favorite. Right now it's my favorite room.

ROBERT GREENE

I'm going to go back there. I'm going there tomorrow I think.

TERESITA FERNÁNDEZ

Are you?

ROBERT GREENE

Yeah.

TERESITA FERNÁNDEZ

I might go back Monday. I can't go tomorrow, but if you're there Monday . . .

ROBERT GREENE

Maybe I'll go Monday. I might go Monday.

TERESITA FERNÁNDEZ

Okay. Well maybe we'll go. Are they open Monday? Because if not . . .

ROBERT GREENE

Oh, they might not be.

TERESITA FERNÁNDEZ

But I could get in Monday.

ROBERT GREENE

Oh really?

TERESITA FERNÁNDEZ

Which would be better to see the Met closed.

ROBERT GREENE

Oh my gosh.

TERESITA FERNÁNDEZ

Let me see what I can do. Anyway, so . . . I was already interested in gold because of this book, and its something that I had already ordered. Like a year ago, I had ordered all of these materials made out of pyrite, which is fool's gold. And I was working on a piece with fool's gold, and I ended up using this instead, this iron ore instead of this. So I still had the pyrite, and I was . . .

ROBERT GREENE

Is that iron ore?

TERESITA FERNÁNDEZ

That's iron ore. It's called Galena. So anyway, I had already been thinking about the idea of gold for many reasons, and when I went into that space and I started doing all

this research, I really kind of realized how universal gold was as a material. You can go . . . and then I walked around the museum again. You can go to any time period in any part of the world and there's an association with gold. And there's a reverence and a kind of . . . the material itself projects and requires a kind of reverence and a kind of something bigger than yourself. It's always than the thing that's it. I love this idea that most of the gold that's ever been mined is still in circulation in one way or another.

I love the idea that it wasn't like I was making this historical thing, but the idea that all the world economies are linked only by gold and that what we think of as our economy is completely based on all of these arbitrary numbers, but that there is a vault someplace with a bunch of gold bars, and that the gold standard is still how we actually physically . . . if you had to physically measure it, that's what it looks like. It looks like a room full of gold bars, even though we don't see it. It's

almost like we've lost the tactile sensual aspect of our association with gold, but it still kind of dominates the way we gauge, the way we put a number on value is still measured in gold.

So historically, politically, socially and politically, it had all of these ramifications as a material, and it was also just very beautiful and very sensual visually. I thought I could make something of this. And it connects almost every religion and every gallery in the Met. So for me, it was like a real revelation to identify a material that somehow would resonate in every other part of the Met. So at the moment, I'm meeting the curator who deals with the gold. I'm dealing with a scientist who works at the Met, the scientist that works with gold. And I'm doing a lot of research for four or five months before I even start making something.

ROBERT GREENE

So you're not sure where it's going to lead. Right now it's pretty open.

TERESITA FERNÁNDEZ

I don't know. I'm not sure what it's going to look like, but I know what I want it to feel like.

ROBERT GREENE

Can you share that?

TERESITA FERNÁNDEZ

Yeah. The gallery that I'm in, it's after you go through all those things and you go down the stairs into the mezzanine. So you go downstairs, and you go into this room, the gallery that I have, which has a low ceiling and it feels like you're underground. So there are all these connections also to mining and to extracting metal and to . . . I want somehow that you turn that corner and you enter this . . . before you even enter this room, the radiance of the room just completely . . . I want you to experience it before you actually identify it or recognize it or call it something. So, what I know I want to do is something very experiential, rather than in objects.

ROBERT GREENE

Do you think it's the radiance of gold that connects why we're so drawn to it?

TERESITA FERNÁNDEZ

There's a universal appeal. I think that there's something . . . no, I think it's because there's something magical about gold.

ROBERT GREENE

What is that?

TERESITA FERNÁNDEZ

I don't know what that is, but it's so consistent throughout everything, throughout our whole history. It's so consistent.

ROBERT GREENE

Do you have any ideas, theories?

TERESITA FERNÁNDEZ

Why?

ROBERT GREENE

Yeah. Are you not interested?

TERESITA FERNÁNDEZ

I'm not interested in coming up with a theory about it, but I do think that . . . it's almost like . . . this is going to sound cheesy, but it's

almost like it takes up more space than itself for me. So it's like, here's a piece of gold, and it's this big, but the space that it radiates is this big.

ROBERT GREENE

That's what I meant, the radiant factor.

TERESITA FERNÁNDEZ

Yeah. But it's visual, but it's also a kind of psychological radiance. So from here to here, this is not the object. Here's your eye. Here's you as a person. Here's the object. From here to here, there's this zone which is the radiance that's created by the gold.

ROBERT GREENE

That's the magic.

TERESITA FERNÁNDEZ

That's the magical part. I think actually that's really what interests people in gold.

ROBERT GREENE

That's very exciting.

TERESITA FERNÁNDEZ

It's this attraction to it that's involuntary. I like that it's involuntary that we just automatically are attracted to it.

ROBERT GREENE

Did you know that great pyramids in Egypt, originally some of them had immense gold on top? We have no idea what they looked like, but some 19th century artist tried to recreate it. I forget his name.

TERESITA FERNÁNDEZ

Yeah. It's really different.

ROBERT GREENE

It was like the sun hitting this immense thing and all the gold. I can't even imagine what that would look like.

TERESITA FERNÁNDEZ

Yeah, I know. And it's about light. It's about light.

ROBERT GREENE

Maybe that's what it is.

TERESITA FERNÁNDEZ

Because that's to what you said about Goethe, the whole . . .

ROBERT GREENE

What did I say about Goethe?

TERESITA FERNÁNDEZ

I don't know. Something that you said struck with me yesterday.

ROBERT GREENE

That was his very last words when he died.

TERESITA FERNÁNDEZ

Yeah, yeah. It's all about . . . the idea of light is so primal and it's so . . . I don't know. There is this almost animal instinct that about survival and light associate to that. But also just like all of the figurative things around it, like the golden mean.

ROBERT GREENE

The what?

TERESITA FERNÁNDEZ

The golden mean, which is a universal concept. You can trace it through 12 different religions, and it's exactly the same.

ROBERT GREENE

What is the golden mean again?

TERESITA FERNÁNDEZ

It's the golden rule. It's a very basic notion that you do unto others as you want them to yourself. For me, gold is the material representation of compassion in that sense. I think it's all about that. And the golden rule is about that. And you can trace it. It's such an ancient idea across so many different religions and cultures. It's almost identical.

ROBERT GREENE

How did we ever discover gold? I've often pondered these things.

TERESITA FERNÁNDEZ

It's the first metal that was . . . because it's surface mining. Underground comes much later.

ROBERT GREENE

So it's found in places on the surface in large amounts.

TERESITA FERNÁNDEZ

Mm-hmm. In rivers and . . . that's where the Golden Fleece comes from. The water and the rivers. They used to put it through a lamb's skin, fleece, and it would collect the particles of gold that were in the water. So the idea of the Golden Fleece actually comes from that. Many, many, many, many references like that, of how we use the word gold.

ROBERT GREENE

We could talk forever about gold. Let's move on. Do you find any connection between, since you're reading about alchemy, and your own creative process? Is there any kind of connection between that?

TERESITA FERNÁNDEZ

Between alchemy and my own creative process? Yes, yes. Absolutely.

ROBERT GREENE

What do you feel about that?

TERESITA FERNÁNDEZ

I feel like I'm chasing something. I feel like I'm privileged. I feel like I'm part of a privileged group of people that can chase that information. I don't think everybody does it. Or I should say, I think I have like . . . because it's not just about wanting to chase it, it's about needing to change it. So I do feel like I have . . . I think I have a set of skills and a kind of, I don't want to use the word gift, but an ability to chase it and to recognize it.

ROBERT GREENE

It meaning . . .

TERESITA FERNÁNDEZ

That making something from nothing, or that alchemy. But it's never about getting it, because it's not there. It's just about wanting to always get it, which I think is what's interesting about alchemy is that there is no . . . there's nothing ever found that's just the pursuit of that thing.

ROBERT GREENE

You mean it's always the pursuit.

TERESITA FERNÁNDEZ

It's always the pursuit. It's not about finding anything.

ROBERT GREENE

Well they were in search of the philosopher's stone, but they never found it.

TERESITA FERNÁNDEZ

They never found it. But that's precisely why . . . how is it that something so intangible and something so, I don't know, vaporous can prompt such a passionate search? So it's really about the search. And I think then that the outcome, the actual thing to find actually looks nothing like what we think it looks like. That's another thing I believe.

ROBERT GREENE

In your work?

TERESITA FERNÁNDEZ

In my work and in my life. It's that the thing that we search and search for actually looks nothing like what we think it's going to look like.

ROBERT GREENE

Can you give an example?

TERESITA FERNÁNDEZ

A tangible example . . .

ROBERT GREENE

Actually, it's not that important. I'm just curious.

TERESITA FERNÁNDEZ

I can't.

ROBERT GREENE

Okay. But is it also like a distillation process itself where you're getting towards the fire of the material that you're trying to get to the essence of. So you have to distill it mentally and creatively and do you get it?

TERESITA FERNÁNDEZ

Mm-hmm. In my case it's about getting rid of everything that's not the thing itself and being very disciplined about that, even if it means getting rid of things that I like.

ROBERT GREENE

Can you give me anything tangible in that?

TERESITA FERNÁNDEZ

It's hard. I do it all the time in my own work. It's a kind of editing process, and it's a kind of taking things away, because of course I start out with a very rogue sensibility of whatever I'm trying to create and whatever's been stuck onto it as an idea. But what you put out in the world as an artist, as a maker of things, what you put out in the world doesn't function that same way. It's almost like there's a translation process. So I do my thing, and it exists a certain way in my head. Like everything I just told you about gold. It takes on a certain significance in my mind.

So, sometimes I feel like I'm a translator, like I take that information, and I'm translating it to create this new form that harnesses the essence of it but doesn't give you all the parts and pieces. Because if you give everybody the parts and pieces, then it has no effect. And I only care about the effect. So I'm taking everything else away from it. I'm processing it. I'm reducing it. And then I'm putting it out

so that it becomes purely about experience and reaction and engagement.

ROBERT GREENE

One of my favorite pieces that I saw at MOCA was "Eruption". I really liked "Eruption". Was there anything in that process? Because that's not really dealing with . . . it's little glass beads. Does that have any kind of alchemical process to it, or what was the process behind that particular piece? It's a little different from the other things that I've seen.

TERESITA FERNÁNDEZ

It's an older piece. Well, there's a painting underneath it.

ROBERT GREENE

Oh, I didn't know that.

TERESITA FERNÁNDEZ

Yeah. There's a painting underneath. The beads aren't actually colored. There's the painting underneath it.

ROBERT GREENE

We don't know that.

TERESITA FERNÁNDEZ

You don't know that, but I know that. So I made an image and I blew it up. And you don't know what that image looks like.

ROBERT GREENE

What is that image? Is it an image of something?

TERESITA FERNÁNDEZ

It's an abstract image. And then to find those beads was actually really hard, because . . .

ROBERT GREENE

Those beads are just glass. They're not colored.

TERESITA FERNÁNDEZ

They're glass. They're clear glass beads.

ROBERT GREENE

Clear glass beads.

TERESITA FERNÁNDEZ

Yes.

ROBERT GREENE

Okay.

TERESITA FERNÁNDEZ

But they're very specific clear glass beads. So, I spent many months delving into that industry. So glass looks a certain way. It depends on how it's made, if it's got too much iron in it, it looks green. If it's recycled it looks cloudy. If it's medical grade, it's like completely perfect. So there were two factors. The size, the roundness of the ball, and the clarity of the glass. So those two factors are really important in why that piece looks that way.

ROBERT GREENE

That took a while to find.

TERESITA FERNÁNDEZ

Yes.

ROBERT GREENE

But you knew you needed something as clear and translucent as possible.

TERESITA FERNÁNDEZ

Yes. Because each one of these little balls is like a microscope that distorts the image underneath it. So in a way what I've done

is I've put a lens over the whole thing, and I'm asking you to look at something that's quite different than the original painting. It's about seeing something in the distortion and distorting something in order to reveal it.

ROBERT GREENE

But it has this really kind of mesmerizing effect on you. I'm not aware of the process you went through. I'm hitting upon all of these associations. For me, it was obviously a volcano, but then there was the galaxies or the stars or Pompeii. For some reason it evoked mosaics in Pompeii, things like that. You're not intending any of these things. You almost . . . was it by accident that it creates these effects?

TERESITA FERNÁNDEZ

No. It's not by accident. It's not by accident. But that's the distillation, so how much can I distill it and still have you think of Pompeii when you're standing in front of it, without ever even like saying anything. It's about the muteness of the piece. The piece says nothing.

It speaks nothing. And yet something, by the color choice, by an edge . . . it's always these very . . . the information is always in these very unannounced moments that get worked into the piece, that trigger your memory.

ROBERT GREENE

So what were you distilling that one to? What's the essence that you were kind of . . .

TERESITA FERNÁNDEZ

What did I start from?

ROBERT GREENE

Yeah, I guess.

TERESITA FERNÁNDEZ

What was the image . . . it's not one thing. It's sometimes a lot of things. It's sometimes a lot of things at once. Colors are really important. Colors are a very strong way of provoking a very visceral response that's never spelled out, that stays completely abstract. I'm talking about things that function, too, on an abstract level for the viewer. So, you may call it Pompeii, or you may call it whatever else, but there are times when there's just no word attached to

it, but you are thinking Pompeii. You're just not calling it Pompeii. And so you're looking at it, and you're thinking of transformation, devastation, transition, remnant, ruins, and those are the things that get applied to the piece.

Now, you may have enough access to call it Pompeii in your mind or to remember, oh, I think I saw something like this Pompeii. But for the most part, people just enter it without that kind of awareness of why, and that's actually the most interesting place, because it becomes completely universal. It becomes completely instinctive, and it becomes completely experiential, and it becomes . . . more importantly than anything else, it becomes completely personal and emotional. And that's when the work works. My work only works if it evokes emotional response in the viewer.

ROBERT GREENE

It seems like when you create color effects, you almost have this indirect thing going on

where . . . on "Blind Landscape" [inaudible 0:59:55] colors painted on the back and is reflected, and it creates that effect in the painting underneath and it's glass. So it's almost like that's part of the magic. Somebody else creating the color, not what you think it is.

TERESITA FERNÁNDEZ

Yes. It's like a ghost. It's like a ghost of color.

ROBERT GREENE

Are you consciously doing this?

TERESITA FERNÁNDEZ

Yes, yes. I even talk about this etymological connection between spectrum and specter and spectral. So it's a spectrum that becomes spectral. It becomes color that's not to be looked at, at face value or directly, but rather indirectly. So you see it totally different, because you're really looking at light. You're not looking at color. Color is just light, but in the way that I use it, what you're really looking at is color rather than a surface that's painted. And it's that radiance again.

ROBERT GREENE

Are you cold?

TERESITA FERNÁNDEZ

Yeah, I'm a little cold.

ROBERT GREENE

Do you want my jacket, or do you want a coat?

TERESITA FERNÁNDEZ

No, no. I can get something. Let me see what time it is. It's noon. Do you want to get lunch? Do you want to talk a little more?

ROBERT GREENE

Let me just get to the end of this card. It's a card and a half left.

TERESITA FERNÁNDEZ

Okay.

ROBERT GREENE

Then we'll go. But do you have time in the afternoon after lunch?

TERESITA FERNÁNDEZ

I have nothing today.

ROBERT GREENE

All right.

TERESITA FERNÁNDEZ

I have nothing today. I'm completely available.

ROBERT GREENE

This thing of having . . .

TERESITA FERNÁNDEZ

You know what though, I am going to . . . I get cold very easily. Okay. Better.

ROBERT GREENE

Okay. Good. The fact that you have no . . . not creating a signature style. You kind of move each piece like an undiscovered country that you're exploring. This is a very conscious creative strategy for you. Correct or no? Boredom is a big factor for you, so you want to deliberately put yourself in a place that's a challenge where you have to kind of recreate yourself in a way.

TERESITA FERNÁNDEZ

Yeah. It's less about wanting to not have it . . . it's not that I don't want to have a signature style, and that's why I do it. It's more that I don't know how to do it when I know how to

do it. I don't know how to . . . all things that I'm trying to evoke in the work, I have to actually feel and experience myself, and so if I know how to do it . . . and I certainly know how to fool other people and do it. That's very easy. But when . . . I can't fool myself. And so when something feels familiar to me, I immediately recognize it as the wrong way to go.

ROBERT GREENE

When something's familiar to you?

TERESITA FERNÁNDEZ

Yeah. When something is familiar, the solution to something becomes familiar or effective in a very easy way because I've used it before, I tend to reject it a little bit, partially because I'm bored because I did it already. And partially because if I'm not engaged, I can't ask the viewer to be engaged. And because I just feel like so much of what my work is based on is this kind of elusive search for how to do something. So I can be in it, and I can do it, but I can't make work

about it. If that makes sense. I can't make work about being elusive. I can't make work about . . .

ROBERT GREENE

Some people do, but . . .

TERESITA FERNÁNDEZ

. . . being somber. I can't make work about being ephemeral. It's like, it can be ephemeral, or it can be elusive, but it can't be an illustration of something. I can make work about the behavior of fire. I can't make fire. I can't make a sculpture that looks like fire. So again, it's this moment of making and being and a kind of presence, and so I have to be present, and I have to go through the work of it in order to make something that, in the end, the viewer cannot look at passively. I can't be demanding somehow unless I've worked at it somehow. Does that make sense?

ROBERT GREENE

Mm-hmm.

TERESITA FERNÁNDEZ

Okay. And it's very easy for me to recognize when I already know the answer.

ROBERT GREENE

Is there any example . . . I hate to be so banal, but where you realized that something was familiar and then you had to eliminate it?

TERESITA FERNÁNDEZ

All the time.

ROBERT GREENE

Just give me one. I'll understand it better. It's my own alchemy I go through. You've mentioned before that things start off a little cliché, and you're always trying to . . .

TERESITA FERNÁNDEZ

The clichés usually end up being the best works, because I'm fighting so much against the cliche that I inevitably have to invent something so different. It's more like the . . . because it's easy for me to think visually, I sometimes can be . . . like when it doesn't work, it's just optically or visually scintillating, but not intellectually scintillating. That's what

it means for me is when I can make a work that gets the same response from people, but I know doesn't have the invention in it. It doesn't have that sense of invention in it. It's just . . .

ROBERT GREENE

Do you have an example of [inaudible 1:07:33] two to three . . .

TERESITA FERNÁNDEZ

Or I can show you a piece that doesn't work for me?

ROBERT GREENE

Yeah. But I can't show that in the book, and I can't show that on the tape, but I can go through it in my mind.

TERESITA FERNÁNDEZ

I don't do it very often anymore.

ROBERT GREENE

Do what?

TERESITA FERNÁNDEZ

That. Settle for that kind of solution where it's just not quite doing it or I'm fooling myself. But I think it's a level of maturity. The older

I get, the less time that I have for things that don't work.

ROBERT GREENE

And so . . .

TERESITA FERNÁNDEZ

I'm quicker. I throw them out faster. I recognize them. I recognize the flaws and things very, very quickly.

ROBERT GREENE

I guess I want to know a moment where you recognized a flaw, a particular flaw and you moved forward.

TERESITA FERNÁNDEZ

In a work?

ROBERT GREENE

Yeah. If you can't talk about it, you can't talk about it.

TERESITA FERNÁNDEZ

Okay. No, it's not that I can't talk about it. It's just that I think that sometimes the flaws are really important, too. I kind of embrace the flaws a little bit. I believe in making bad work sometimes, just maybe not showing

it. I'm fully aware of . . . I feel actually very vulnerable about bad work, and I think that it's very important to have a private space where one can indulge in bad work in all its glory. So I do that. I can do that. But it's like writing. You know that there's some cool book that you could write that everybody would just love and that would probably be pretty easy for you to write.

ROBERT GREENE

But I won't do it.

TERESITA FERNÁNDEZ

Exactly. You won't do it. You won't do it. So that's the same kind of thing that happens with me. I'm trying to come up with a solution, an example, but I can't.

ROBERT GREENE

I think I can figure it out. We're talked about it. It just means that I have to not be so lazy and do a little work.

TERESITA FERNÁNDEZ

It means I'm not as prolific as other people. I don't make tons and tons of stuff.

ROBERT GREENE

I'm just trying to think also with the writing process [inaudible 1:10:13]. Just on a more day to day level, do you create for yourself space, time where you can just wander and not have a deadline and not . . . where it's just sort of unstructured time that you can . . .

TERESITA FERNÁNDEZ

It's the middle of the night.

ROBERT GREENE

Hmm?

TERESITA FERNÁNDEZ

The middle of the night.

ROBERT GREENE

The middle of the night. Has it always been that way for you?

TERESITA FERNÁNDEZ

Always.

ROBERT GREENE

That's why you don't sleep.

TERESITA FERNÁNDEZ

That's why I don't sleep.

ROBERT GREENE

So literally it's like midnight to 4:00 in the morning?

TERESITA FERNÁNDEZ

It's changed. When I was 20 I was like that. I would start to work in the studio like a 9:00 at night when no one was around. I always likes working at night. Things are very clear to me at night, visually too. I feel like there's something about . . . I'm talking about me in art school at 20, but if you take like the setting of Miami that I described before and you make it at night, all of a sudden, the tone is totally different and much more conducive to the kinds of images I was thinking about. So, just something about obscuring something in order to see it, or dimming it in order to see it, which are all ideas that I still use. I would start at 9:00 or 10:00 and I'd work all night, usually alone. And then I would sleep during the day. I did that for a very long time. I've always done that.

And when I had kids, it was like a whole other ballgame. I lived next door so it was easy, but I would basically put them to bed at 8:00 or 9:00 and then that's when my work day would start. And I'd work until like 4:00 in the morning. It means I don't sleep a lot, but the only time that . . . during the day in here, it's all about things getting done. I have assistants. I'm running a studio. I have people emailing me. I have stuff that needs to get taken care of. It's not when I think. It's not when I make art. It's when I come in here at night that I make art. And I have to be alone to be in that . . .

ROBERT GREENE

So that you can really focus and concentrate on something?

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

Is that more what it is?

TERESITA FERNÁNDEZ

Yeah. It's like a very private, almost . . . it's behind the scenes.

ROBERT GREENE

Yeah. I think a lot of people are missing that. That's sort of the point I want to be making.

TERESITA FERNÁNDEZ

What, which?

ROBERT GREENE

Being able to retreat into yourself and have that space. Everyone is so distracted on the surface that they don't have time to go deep in something. In order to do that, you have to kind of be alone. If you're around people, you're always more or less on the surface.

TERESITA FERNÁNDEZ

Well, knowing how to multitask is very practical. It means you can do a lot of things at once, and I've definitely mastered that. But what you can't . . . how can I explain it? It's like that speed that I'm talking about. It's almost when things are the slowest or quietest

that that's the fastest, that the thinking is the fastest.

ROBERT GREENE

Oh, when you're not multitasking.

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

Yeah. I know exactly what you mean. That's very good.

TERESITA FERNÁNDEZ

So it's like the slower everything else is, the faster those connections are.

ROBERT GREENE

Yes. I know exactly what you mean.

TERESITA FERNÁNDEZ

It's like the energy can go to one place.

ROBERT GREENE

Okay. I think it's time to stop at this point.

TERESITA FERNÁNDEZ

How am I doing? What purple card am I on?

ROBERT GREENE

The purple cards are the basement. We're on the first floor here. The purple cards were the

back up where I went through your books, and they transformed into the red/pink cards. So, we have 4B and 5 to go through, and 5 is very short. So it's really like two cards.

TERESITA FERNÁNDEZ

Okay. Are you feeling productive?

ROBERT GREENE

Yes.

TERESITA FERNÁNDEZ

Or is it feeling like . . .

ROBERT GREENE

I knew that an artist was going to be harder.

TERESITA FERNÁNDEZ

Is it feeling like molasses here?

ROBERT GREENE

No. Probably the molasses and a little bit of resistance will be good. It's a good thing.

TERESITA FERNÁNDEZ

It's hard when your work is visual, because when I put things into words it sounds really silly to me.

ROBERT GREENE

There's a whole thing I want to get into in the book about visual intelligence. So there's a whole history of great scientists for instance, all the greatest scientists think visually. They don't think in terms of words. Einstein had [inaudible 1:6:20]. I can trot out a million examples of people, of scientists coming up with their great discoveries by an image in their mind. And the reason, perhaps, is that words are very precise and limiting. And the truth and what you're trying to get at can't be fit into this narrow little formula of words. But an image can connote three or four or five or six things at the same time.

TERESITA FERNÁNDEZ

Hundreds.

ROBERT GREENE

Or hundreds. So that image it forms in your mind triggers the solution where you can't access it through a word, because the word is this, and the image is this. And through that larger expansion, the idea comes you that

solves the problem. And so people live too much in the words, and they're like a jacket that just doesn't fit anymore.

TERESITA FERNÁNDEZ

The thing about the image is that, unlike a word, which is like this kind of communal currency that we can exchange and that has one value. The thing about the images is that you build upon them, and you never return to them the same. It's cumulative and it's completely subjective, and so every time that image is uttered, say like the word is uttered. Every time the image is uttered, the image is actually completely different, and it's got everything that you that you've already layered on it along with everything that you remembered you layered on it as well as everything . . . the image encompasses your past, present, and your future relationship to that image. It is very schizophrenic, but it's always existing between things. It's never one thing. It's certainly never one thing to

everybody, but it's certainly never one thing to oneself.

So in the same way that you watch a film and you remember this film as being so important when you were 20 and it changed your life.

And then you watch it again when you're 30, and you can never recreate the first sense that you had of it, but you also can't replace the current sense that you have of it. And then you walk away from it, and you're constantly projecting onto your own rationalization of those relationships. So the film isn't really the film. The film is this thing that's exactly the same, and what changes is you. And this is the beauty of images is that you shape the image, and you actually make the image.

The image is just a catalyst. My job is to put a catalyst in the world, and in fact what creates and completes the circuit of meaning is the viewer, readers . . . This kind of endless process of reevaluating is precisely where its power lies, not in the image per se.

ROBERT GREENE

That's very excellent. Yeah.

TERESITA FERNÁNDEZ

So it's hard to quantify. It's hard to explain to people, because it's endless.

ROBERT GREENE

That's why it's going to be really difficult to try and do it. When I was a kid, I was always obsessed by the idea that . . . there would be things in science. They would show you what the world looks like [inaudible 1:20:04], or how a cat sees the world, or how a hawk sees it. It's not what we see. So it's like the world we see is a creation of our limited . . . we've biologically evolved this sort of visual system that fits very much what we need, but it's a world that isn't really the world. It's a partial, it's a little tiny look at the world. It can be seen 1,000 different ways. To an animal or to someone from another planet, it wouldn't be the same world. I don't know why that always . . . that thought I was sort of obsessed with.

TERESITA FERNÁNDEZ

Yeah. Very little of what you see is what you see with your eyes.

ROBERT GREENE

You're constructing it all the time.

TERESITA FERNÁNDEZ

All the time. All the time. It's like alchemy. There is no getting it and walking away from it. You're just constantly in this moment of reevaluating it.

ROBERT GREENE

Well, there is. There is a way out, perhaps. I'm fascinated by Zen Buddhism.

TERESITA FERNÁNDEZ

Do you practice?

ROBERT GREENE

I do. I don't like to say that I do. I meditate, and I [inaudible 1:21:23]. I've always been fascinated by it. And they talk about original mind. How like when you were a child, there was no separation that occurs later on as you form a personality. The world is all there, and you're in it. And that's what you're going back

to. How do you get there? Well you get there through this process that's been elaborated over 1,000 years. It's impossible to put into words, which is why they have these exercises and all these things. But since I'm not there, I have to trust that these other people are. I don't know if that's what you were talking about. That would be a way of escaping.

TERESITA FERNÁNDEZ

Yeah. Or maybe . . . yeah, I don't know about escaping. Maybe just turning it off for a minute.

ROBERT GREENE

Turning it off. That's a better way of putting it.

TERESITA FERNÁNDEZ

And the advantage of turning it off is that when you turn it on again, it reveals new things.

ROBERT GREENE

Definitely.

TERESITA FERNÁNDEZ

So return to that. It's all about amounts. Too much and you see nothing, just like too little and you see nothing. We talked about this before. We even talked about this in relation to "Art of Seduction". It's like, too much and you don't see anything. And too little . . . I talked about it too in relation to the fire, hanging the things. It's about quantities. We talked about squinting and amounts of seeing.

ROBERT GREENE

Yeah. Exactly. I think in Japanese . . . you probably know better than me. They have 12 different ways of the word seeing. Well not 12, probably 6. And the different forms of seeing. There are levels.

TERESITA FERNÁNDEZ

The Japanese have a very sophisticated sense of seeing as removed from the body, the distance. Seeing things from a distance.

ROBERT GREENE

What do you mean?

TERESITA FERNÁNDEZ

There's a real connection to the landscape and to the kind of very intimate and small space of the Japanese interior, traditional Japanese interior, which is very dark, too. It's completely composed around this idea of seeing something from a distance and removing this wall so that in this tiny, dark interior . . . and that plays into the idea of gold a lot, too. And a lot of these Japanese interiors, you'll have one wall or a screen that's all gold, and you walk in and it's completely dark. It's dark, these interiors. And then there will be a tiny, tiny, tiny bit of light, and that tiny bit of light will light up that entire golden panel. So there's this sense of this vastness, this kind of bigness, this kind of immensity and experience always in this very kind of dark, humble, contained, intimate setting. It's never grand.

ROBERT GREENE

That's true. That's right. I feel like they have a very sophisticated visual sense, more than our culture.

TERESITA FERNÁNDEZ

Yeah. I would say that's true.

ROBERT GREENE

There are other cultures like that, but I've never been there, so I don't know.

TERESITA FERNÁNDEZ

If you go, I'll tell you where to go. Now is not a good time to go, but if you ever want to go, I'll tell you where to go. It's pretty great.

ROBERT GREENE

I planned [inaudible 1:25:53] go to a Zen place in [inaudible 1:25:55] Japan for six months.

TERESITA FERNÁNDEZ

I can tell you where to go. It's Koyasan.

ROBERT GREENE

Koyasan.

TERESITA FERNÁNDEZ

Koyasan is this town on a mountaintop, which is the birthplace of Buddhism in Japan. It's very hard to get to, and it's all Buddhist temples. You go in and there are like 300 Buddhist temples. K-O-Y-A-S-A-N. And you stay at a Buddhist temple when you're there. There are no hotels. It's not developed. There are no tourists. And it's the birthplace of Buddhism in Japan, so it's . . . the cemetery there is incredible, incredible, incredible.

ROBERT GREENE

This is in the south?

TERESITA FERNÁNDEZ

It's in the south . . .

ROBERT GREENE

There's a part of the book about . . . it's not the most pretty word but about apprenticeship. What does that word mean to you in relation to your career? Did you feel like you went through that? Did you serve that? Was it at the university, or was it

actually going out on your own and making things happen?

TERESITA FERNÁNDEZ

It's funny because I believe in destiny, but I don't believe in luck.

ROBERT GREENE

Now, what does that mean?

TERESITA FERNÁNDEZ

I believe in destiny, but I don't . . .

ROBERT GREENE

But everything happens for a reason.

TERESITA FERNÁNDEZ

No. I believe everything happens for a reason, and there's a kind of destiny. But I don't believe in luck, and so I never think it's easy to arrive at.

ROBERT GREENE

Sure.

TERESITA FERNÁNDEZ

And so, it's never been easy for me. I've never had an easy go of it. I've always worked really hard at it, and so I don't identify with the role of the apprentice in any way.

ROBERT GREENE

I don't know what you mean by that.

TERESITA FERNÁNDEZ

Well, certainly not in the traditional way of a mentor. I've never had a mentor.

ROBERT GREENE

Okay. You've never had a mentor?

TERESITA FERNÁNDEZ

I've never had a mentor. I've had people that I've admired.

ROBERT GREENE

I'm going to be abstracting and say that that is a mentor.

TERESITA FERNÁNDEZ

I know that. What's a mentor?

ROBERT GREENE

Well, a human being can't learn anything in isolation.

TERESITA FERNÁNDEZ

No.

ROBERT GREENE

In our culture everything is a part of learning from others.

TERESITA FERNÁNDEZ

All right.

ROBERT GREENE

So you didn't have a living mentor.

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

I didn't really either, but you had something long-term.

TERESITA FERNÁNDEZ

I had to find my way, yeah.

ROBERT GREENE

But you weren't completely alone. There had to be people around that inspired or directed you.

TERESITA FERNÁNDEZ

Yes. I would say yes. But I don't know. I felt like I never had somebody to guide me through. I always felt like I have a real sense of self-sufficiency. And so, yes, I can think of lots of things that were really important

cornerstones to my thinking that made me click, on mostly books and places.

ROBERT GREENE

Places, like what?

TERESITA FERNÁNDEZ

Well, places that I can talk about, like Japan has always been a really important place for me. I lived there for a while, and I've been back every since I was seven or something. Sometimes, it's places, too, like really mundane places that just have . . . places can have a real effect on me.

ROBERT GREENE

So there were no teachers?

TERESITA FERNÁNDEZ

No. I had one teacher in graduate school whose name is Elizabeth King, whose work couldn't be more different than mine. But you could be writing about her.

ROBERT GREENE

Really?

TERESITA FERNÁNDEZ

Yeah. She is an amazing thinker and pursues ideas very passionately and very fully. I would say that I really admired her practice in graduate school, so I was 24.

ROBERT GREENE

She had an influence on you to some degree?

TERESITA FERNÁNDEZ

Yeah. I would say so. I would say so although I would hesitate to call her a mentor because I didn't think of her that way, and I also didn't spend that much time with her.

ROBERT GREENE

Oh really?

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

What about her had any kind of effect on you?

TERESITA FERNÁNDEZ

The specific, the fact that she taught me that the specific was much more interesting than

the general. Yeah. So that's what I feel I got from her.

ROBERT GREENE

Do you feel a disadvantage or advantage, or it doesn't even matter that you had to sort of find your own way?

TERESITA FERNÁNDEZ

I don't know. I don't know how to answer that. I think there are lots of different ways of getting some place, and I think it works differently for other people. I think it can be a burden for something to happen too easily as well, as well as too difficult. I don't know that I have a distance from it to answer that objectively.

ROBERT GREENE

Is there anything you think in the way of what kind of shaped you early on into becoming who you are now? For instance, we talked about da Vinci, and he studied under Verrachio in his studio, for about four or five years in the studio, and he learned all sorts of

technical things that became a huge part of his art.

As an apprentice he would paint little tiny figures in the background of paintings, but he didn't like Verrachio. He hated being an apprentice. He was always trying to search for his own voice, but the conflict, the resistance of the two, I thought was very important.

TERESITA FERNÁNDEZ

I can think of a lot of . . . yeah. You become something, either because of something or in spite of it. I was surrounded by examples of what I didn't want to do.

ROBERT GREENE

Okay. That's something.

TERESITA FERNÁNDEZ

Yeah. I was surrounded by examples of what I didn't want to do.

ROBERT GREENE

Like art students, art school?

TERESITA FERNÁNDEZ

Everything, you know. Everything. And then, I grew up in Miami, and I didn't have

the same goals as my peers. I was interested in a much bigger world, and I felt trapped a lot of times with the familiar setting and the familiar course of action of people I was going to school with, for example. But also, this idea of being like a local celebrity and like a local artist who somehow is . . . I don't want this to sound bad either. I don't want to offend people, but I didn't want to do that. I felt like my sense of the world was much, much bigger than that.

And so, I didn't want to be an artist who knew what my next piece would look like, and I didn't want to be an artist who was known for doing a certain kind of work. To this day, I kind of start with an idea, work with it, make a bunch of stuff, and then the next idea may look completely different.

ROBERT GREENE

You have no signature stuff.

TERESITA FERNÁNDEZ

No. I get bored. I get bored with my own. I can't make something more than once. It just does not come out.

ROBERT GREENE

So you had a lot of negative examples that you didn't want to be around you, that kind of in some way shaped you in some way.

TERESITA FERNÁNDEZ

Yeah. Yeah. I wanted to be in the moment of making something. I've always wanted to be in the moment of making something rather than looking back on something or dreaming about something. And so, that moment is very ephemeral because while you're in it, it's quite thrilling, but it very quickly sort of turns into something else. And so, there's this regenerative sensibility of how do you get back into the moment, of actually being into it.

ROBERT GREENE

Well, what about on just the technical level where you're working with material like steel

or other materials? Was there any sort of sense of . . . was each piece something new where you kind of have to learn about it, or was there a period where you developed the skill in manipulating material, the technical side?

TERESITA FERNÁNDEZ

It's less about skill and more about kind of visual invention. It's less skill because, honestly, it's easier for me. If I need a specialist, if I need something executed and I know what that thing needs to look like, I just hire the person that's best at doing it make it. I'm very, very efficient about my time. And so, I only care about the invention part of it, and everything else I can get the best carpenter or the best welder or the best whatever to do it for me.

Even though I might end up having a lot of help in here, like today my assistants aren't here because I told them to take off today. In order for me to tell them what to do, I have to invent something. I have to look at something.

I have to actually, physically play with it, see what it does easily. I'm never interested in the first 20 things that it does.

ROBERT GREENE

Right.

TERESITA FERNÁNDEZ

I try everything, and then I weed out everything that's just too easy or obvious. And then, it starts to get interesting and hard and unpredictable, and then I start becoming interested.

ROBERT GREENE

This process that you go through which is very interesting, did it just develop on your own, something that you came upon or you're just talking about now or stumble upon it, or was it something you developed in the beginning when you were first working with steel?

TERESITA FERNÁNDEZ

Honestly, I don't know. I'm not so conscious about it. I'm not even aware that I'm doing it.

ROBERT GREENE

Okay.

TERESITA FERNÁNDEZ

But it's a general dissatisfaction with what something does. I get bored easily.

ROBERT GREENE

Yes. I understand. This theory isn't going to be very easy for me to apply to you, and that's fine. I have my own idea about it.

TERESITA FERNÁNDEZ

The technical, like how I learned through making . . .

ROBERT GREENE

Well, I'm getting a sense of this as I'm talking to you that each piece is kind of like a rendition.

TERESITA FERNÁNDEZ

That's a really great way of saying it.

ROBERT GREENE

Okay.

TERESITA FERNÁNDEZ

That's exactly right.

ROBERT GREENE

So I'll think about that and how it applies to you.

TERESITA FERNÁNDEZ

And I think that's why I never feel like I know what I am doing. I don't feel like I'm an expert at anything.

ROBERT GREENE

Well, but you do because at the beginning we were talking about how things are coming faster and faster.

TERESITA FERNÁNDEZ

But I get bored faster, too. And so, I just have to be that much . . . you know what I mean?

ROBERT GREENE

I know what you mean.

TERESITA FERNÁNDEZ

You can't fool yourself.

ROBERT GREENE

You've mastered something, but it's not working with a particular material. It's an abstract process.

TERESITA FERNÁNDEZ

That's what I've mastered.

ROBERT GREENE

Yeah. But that's not what I'm talking about.

TERESITA FERNÁNDEZ

And I use that word loosely because I don't know what that means, but that's the part. If I've mastered anything, it's that, not this.

ROBERT GREENE

Well, that's the highest thing you can master. That's what makes all of the people that win the MacArthur award whatever they were in all the different fields. It's a level of abstraction. It's exactly what I'm trying to write about.

TERESITA FERNÁNDEZ

It's a level of transparency, too. For me, it's about transparency. For me, it's about reaching a point where you're not satisfied with fooling yourself, and if you can fool the rest of the world you'd be very convincing.

ROBERT GREENE

Yes.

TERESITA FERNÁNDEZ

Actually, the smartest people are very, very good at doing that. I don't know. I find that socially it's very easy for me to do that. Intellectually, it's very easy for me to do that. It's very easy for me to seem good at something or put together. It's like learning to ski or like learning to draw. There are things that if you practice, you can become very good at. I don't care that much about that stuff.. It's the other stuff is that you can't actually hide anything from yourself. When you surrender to that transparency, you get rid of so much stuff. You can just go leaps and bounds over the baggage. There's a lucidity to that transparency that makes things very, very lean but also very, very fast.

ROBERT GREENE

That's very interesting. I like that idea.

TERESITA FERNÁNDEZ

And sometimes I don't know what to do with it. Sometimes, it's very, very fast. The thing I'm most aware of now is how fast I've gotten

at that thing, not the thing I project but that very private process of getting there.

ROBERT GREENE

Well, that sort of goal trying to verbalize that.

TERESITA FERNÁNDEZ

Well, I can tell you that for me in that transparency, even recently what I've noticed is that it's not about making art. In fact, what's so empowering . . . that's not the word I'm looking for. What's so addictive about it is that it's not about making art, it's about everything in your life. It's about every aspect of your life happening simultaneously at that speed and how one thing informs another.

Again, I go back to this idea of emotional intelligence which is a term that's overused, but you can call it emotional intelligence or visual intelligence. For me, there's no separation between an encounter I may have with a total stranger, a kind of awareness of something, a recognition of something and a material. In fact, sometimes they're very closely related in ways that I don't want to

make into a list, but they are kind of a list. They're all these things that happen on all these different levels.

We're just not given the format to look at them all at the same time together, but which is not a stretch because we are doing those things all the time at the same time altogether. If you have access to that, it's kind of amazing because you can see how the things that affect you in one area of your life are, in fact, the very things that propel you to make decisions about very abstract things in your life, like what a piece of music might sound like or what a work of art might look like.

The decision making, if you look at it on a microscopic level is really tied to these sort of schizophrenic mental meanderings.

ROBERT GREENE

Well, we're going to talk some more about this.

TERESITA FERNÁNDEZ

All right.

ROBERT GREENE

But just to finish on this before we transition, the idea that every piece has no sense of closure, oh, I've learned with what I need to learn. Each piece is like you have to learn about it. That's sort of very important to you.

TERESITA FERNÁNDEZ

Yes.

ROBERT GREENE

That's very important to your creative process, that you feel like you know something. You're already bored with it. Would that be a correct way of assessing it?

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

Making every piece alike you are like a student is kind of what's exciting to you. It's part of the adventure.

TERESITA FERNÁNDEZ

I don't know that it's making things as a student. It's just making things as a master because I don't feel like a student either. There's definitely like a means to it. I have access to it, but I don't know how people in other fields function. I think that in science sometimes the question is very obvious or evident. How do you find a cure for this? It's a very concrete thing.

There's no question if you are an artist. There's no problem. You can make the problem, and then you can make the question. In a way, that's much harder coming up the interesting question. It's so much harder. So identifying the question is actually, at least, 50 percent of the work because it's hard to come up with a good question. If you're an artist, it's like floating in ether. You're just giving form to something that's completely abstract.

ROBERT GREENE

Can you give me an example of a question that you actually came up with?

TERESITA FERNÁNDEZ

Well, like these pieces, for example. These pieces all started, all of the graphic pieces, started with . . . I talk about it in the interview, but I was really interested in . . . For me, drawing is like . . . I call drawing everything because drawing to me is the quickest connection between what you think and what you output. It's just a visual way of thinking. Everything else goes through like a whole process, but drawing is like immediate thinking. It's very raw. It's very unedited, and I think of everything as sort of a drawing. And, of course, I'm really interested in landscaping. I started to think of landscape drawing as opposed to landscape painting which is a whole other history. [phone conversation in foreign language] Sorry.

ROBERT GREENE

That's okay. So like the graph, the landscape . . .

TERESITA FERNÁNDEZ

Yeah. So I was really interested in this one Leonardo da Vinci drawing of the Arno Valley. That's pretty.

ROBERT GREENE

That's the first landscape drawing ever.

TERESITA FERNÁNDEZ

Exactly. Well, in the West.

ROBERT GREENE

In the West, China.

TERESITA FERNÁNDEZ

Of course, because I have this whole sense of landscape drawing in very different contexts. But it's really significant that something so unassuming . . . it's probably one of the things that's looked at the least in Leonardo da Vinci is that one little drawing of the Arno Valley. It's so interesting that it's believed to have been drawn from memory.

ROBERT GREENE

Yes.

TERESITA FERNÁNDEZ

It's really recalling something and drawing it for its own sake not because it's the background of some portrait, da, da, da, da. But just like, I'm remembering this thing and I'm placing myself in this moment of remembering this place which is so huge and loaded and poetic and rich as an idea. If you think of it, it's revolutionary, the idea that nobody else was thinking that way about remembering the sense of place in this very graphic way, but also in this way that wasn't about anything else that wasn't justified by anything else.

ROBERT GREENE

Right.

TERESITA FERNÁNDEZ

It's sort of a kind of vulnerability in a way of the idea of memory. And so, I became fascinated by this, and I started to think, like, you know, when you think of the history of

drawing you think of cave paintings. You think of all kinds of mark making.

There's something really particular about a pencil that is irreplaceable. I don't know. I became really interested in the idea that it's still the most immediate and also because I'm really very interested in this connection between the tactile and the visual. There's something about a pencil in particular that fuels my thinking in a very different way than if I use a pen or any other kind of writing utensil.

I started to think of the history of the pencil. It's another kind of that rabbit hole sort of thing. The history of the pencil and then the history of the pencils and then, of course, the history of graphite, and then the history of graphite is linked to a particular place that's basically like a landscape that's made out of graphite. You're standing in this rural landscape. You're standing on solid graphite,

so it's as if you're standing in the drawing, on the drawing.

All of a sudden then, the drawing became three dimensional and sculptural and a place, and so drawing as a place physically, literally and figuratively. I just kind of starting building upon that and getting very excited about these connection points. The first thing that I did was look for what had been done with graphite, not as a drawing but as a sculptural thing.

I was basically trying to make three dimensional drawings, like big smudges made out of graphite, like a gestural drawing but made out of something three dimensional which is very hard to do with resistant materials. It's kind of hard to make materials do anything that's ephemeral or that's kind of a suspense of . . .

ROBERT GREENE

You're interested in creating something out of graphite, by the way, aren't you?

TERESITA FERNÁNDEZ

Yeah. I want to make sculptures that feel like drawings or films.

ROBERT GREENE

Where does that come from? What's your fascination with that? Does it feel more like life is or something?

TERESITA FERNÁNDEZ

I don't know. It's almost like a very Baroque sensibility again of this moment that something actually takes place in that moment. It's an event. It's about kind of a witness to an event or placing the viewers as well as myself in the moment of presence where you're actually experiencing something real time.

ROBERT GREENE

Is it ephemeral? Does it last?

TERESITA FERNÁNDEZ

The thing itself is only a catalyst to promote that sense, that response in you. And so, when you walk away from it you're kind of still in that moment of remembering and

engaging in it. So you're always in the act of being in the piece rather than isolating it or understanding it.

There's a great willingness on the part of most viewers to want to believe in something being real and something being true. I love this kind of innocence sometimes and viewer not being jaded or cynical but really kind of even though there's no trick to it. You can see how it's made. There's this desire for it to be psychologically moving or ephemeral or not material.

ROBERT GREENE

Right.

TERESITA FERNÁNDEZ

I think people really want that. It's why I'm successful in creating that is because if I have a willing viewer, it's really half of it. It is a good chunk of why the formula works somehow, when you have it.

ROBERT GREENE

People are hungry for that. They want to know where they can get it, where they can get the whole experience.

TERESITA FERNÁNDEZ

It's become, I think, the greatest commodity is experience. I think, more and more so it will be the experiences that aren't mediated are at the core of what will be the great currency.

ROBERT GREENE

I agree. Well, I'll close the door on that apprenticeship word and move on. I wanted to go into the creative process which we're sort of talking about already. You do a lot of research, and research isn't necessarily visual. It's also literary, history. How does it start? You mentioned graphite, the rabbit hole that you went through. And then, you just spread out from there, or had the spreading out led you to this idea of the pencil and the drawing. In other words, where do you begin with your research? Is it like a feeling you have?

TERESITA FERNÁNDEZ

I don't know. It's like I'm a visual pack rat. And so, everything goes in the pile. And then, sometimes the pile might have a label.

ROBERT GREENE

There has to be some direction to this.

TERESITA FERNÁNDEZ

Yeah. Yeah. Well, it's tributary. It's tributary. It's like, you start here, and then this takes you there, and then that splits off in the end. And so, it gets very, very big. That network gets vast, and then it starts growing itself. Then, I start to throwing things out. Things just get moved to the bottom. That's all. They don't get thrown out. They just get moved to the bottom.

And then, sometimes what I'm really searching for when I'm doing that, is it's like this one . . . Sometimes, something makes sense academically for lack of a better explanation, but that's not enough either because I'm not a scholar, I'm not writing an essay about it. Sometimes, I'll have a topic

that's really interesting to me and that I've researched in sort of the traditional way, although I feel no good thing about being an artist. You have no responsibility to any circle.

You can kind of pillage and take whatever you want and use it however you want which is a great freedom, but it's also a great responsibility because you have to do something with it that hasn't been done before. So it's a challenge as well. I can do that. I can kind of take all the stuff, and I can make a statement about it.

That's just interesting as an idea, but what I'm really searching for when they do all that research is usually one quirky element that's been completely ignored that all of a sudden personalizes all of this information and makes it completely accessible in a very universal way, in a way that's meaningful even though it might be a piece of information or a detail that's very trivial. But that within that context

makes the whole thing into kind of a poem rather than a speech.

ROBERT GREENE

Can you give me an example of when this process would occur?

TERESITA FERNÁNDEZ

I'm trying to.

ROBERT GREENE

So we can be specific instead of general.

TERESITA FERNÁNDEZ

Yeah. The specific is how it manifests itself in the piece.

ROBERT GREENE

I understand what you mean intellectually, but it would sure help if I could hear an example because I go through that myself.

TERESITA FERNÁNDEZ

Okay. I'll give you an example. I did all of the research on Borrowdale and the mining and the history of how graphite became this commodity that was completely volatile and how the market was controlled. It was tulips in Holland. It was this material that could

be very, very expensive when there was a lot of demand for it, and then they would finish a vein of graphite and then there would be nothing left, that kind of stuff.

All of this information is really, really interesting. Lots and lots of information like that is interesting, that makes an interesting story. And then, I read something. It sort of took me to just what the place was. What happened to this place? It still looks exactly like it did when graphite was mined there.

ROBERT GREENE

Borrowdale?

TERESITA FERNÁNDEZ

Yeah. It's totally rural. It's just rolling hills, a lot of farmers. I think I ended up on a tourist website for the lake region.

ROBERT GREENE

What's in the lake region?

TERESITA FERNÁNDEZ

In some little line I read how it was discovered. Shepherds would just mark the sheep with the graphite. You know, it's in

the ground. You take it out, and you mark the sheep.

ROBERT GREENE

Right.

TERESITA FERNÁNDEZ

This light bulb went off in my mind of all of these sheep walking around with drawings and the idea of animation and the idea of the graphite and the sheep making this really beautiful animated drawing, the first animated drawing in the landscape. I shouldn't say that, but when that kind of light bulb goes off it's like I know that no one ever thought of marked sheep as an animation, you know what I mean? Maybe, I'm being presumptuous, but it was, all of a sudden, a very different way of reading, for example, Leonardo's drawing of the Arno Valley as this animation of a memory.

It's almost like this little lynchpin that all of a sudden inserts this tone and this quality and this sensitivity to all of the scholarly information which is just stuff. It's just stuff.

When I can extract, and sometimes that happens more than once, but when I hit upon moments like that they start to define how I want something to feel. When I have access to that, I know what to start doing with the material. I know how I can manipulate a material to start feeling that way or capturing the essence of something. Does that make sense?

ROBERT GREENE

Oh yes.

TERESITA FERNÁNDEZ

Okay. So, that's one example I can give.

ROBERT GREENE

But in a way you begin the process in a scholarly manner, trusting, blindly moving ahead, trusting that this will simply show up.

TERESITA FERNÁNDEZ

Yes.

ROBERT GREENE

And it probably usually does because you're ripe for it, and the smallest thing could trigger an idea. I don't know . . .

TERESITA FERNÁNDEZ

No. No. I'm on a quest. It's not passive.

I'm definitely on a quest. Just recently, that happened to me again where . . . I often think about this idea of blindness. This is not one of those ongoing things.

ROBERT GREENE

Blindness?

TERESITA FERNÁNDEZ

Blindness, yes. Not being blind, not the obvious blindness, but this idea of not seeing or degrees of seeing and degrees of not seeing. There's still something there that I haven't quite figured out, but I started to think about all kinds of things, like how you close your eyes to remember but also forget, or how the visual is tied to this whole sort of accessibility or inaccessibility of getting to something else, either by looking at something or by not looking at it.

For a few days I was really obsessed with the word, squint. It's a great word. It's a great word because it's somewhere in between. It's

like an effort to see more, but you're actually closing your eyes. And so, it's this narrowing in order to amplify vision. And so, anyway, I was just thinking about the word, squint. You get ten things that you expect to get, and then the picture.

ROBERT GREENE

She's showing me the picture.

TERESITA FERNÁNDEZ

I've been looking at it for a long time. It's just a lot of stuff. Here I am. I'm 42 years old, and I had no idea that squint was a noun in the physical . . . Huh? Huh? But the world is full of things like this.

ROBERT GREENE

It's disappearing, too.

TERESITA FERNÁNDEZ

This idea that you could find something like that, that it so completely relates to this much bigger thing that I'm thinking about. I don't know. It's just this little secret thing where something is harnessed.

ROBERT GREENE

It's interesting that it's like intended to be a direction so that people can see it, but then, maybe, the others don't know that they're seeing it.

TERESITA FERNÁNDEZ

Exactly. Exactly.

ROBERT GREENE

So that's what's kind of interesting about it.

TERESITA FERNÁNDEZ

What's cool about it being oblique is that it becomes this three dimensional representation of a two dimensional representation of something, of like linear perspective lines at angles, you know?

ROBERT GREENE

Yeah.

TERESITA FERNÁNDEZ

It's almost like when you look at the drawing of a garden, the bird'-eye view, and you have this graphic representation of something that really doesn't work that way. And so, here you have this totally three dimensional

phenomenon that's based on an almost two dimensional idea, like if you took . . . here's the church, here's the nave, here's the transept and doves.

If you could literally turn it into a linear perspective drawing, essentially what you'd have, you'd have that. You'd have a squint. You'd have this graphic two dimensional thing being applied to this real three dimensional space with lepers, and the lepers kind of make it really cool, too, because it's just like these layers.

ROBERT GREENE

But also sometimes squints would replace to enable nuns to observe the services without being seen and give up their isolation.

TERESITA FERNÁNDEZ

Or I'm sure it was just segregated anyway. But I could go into a whole other bunch of research that's about the political implications of a hole in the wall, a squint.

ROBERT GREENE

Do you know the etymology towards it?

TERESITA FERNÁNDEZ

I looked it up. I have it somewhere. I don't remember. I have so much.

ROBERT GREENE

But from what language? Oh, straubism.

TERESITA FERNÁNDEZ

I probably didn't. Yeah. Exactly, anyway.

ROBERT GREENE

That's fascinating. I get their idea.

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

It could be, but I forgot where you were coming from.

TERESITA FERNÁNDEZ

It was about how I research.

ROBERT GREENE

Yeah, but how did squint come up in your research?

TERESITA FERNÁNDEZ

Because I was interested in blindness and that scene and turning back to something in order to see it and a heightened sense.

ROBERT GREENE

Oh, that's right. What is it about the word, blindness, particularly?

TERESITA FERNÁNDEZ

Well, it's connected to some of this stuff that we're talking about. It started out with that. Actually, here is another moment that Claude glass . . . did you see that in the book?

ROBERT GREENE

Sorry. Remind me.

TERESITA FERNÁNDEZ

It's a little, the Claude glass is . . .

ROBERT GREENE

Claude glass?

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

C-L-A-W-D?

TERESITA FERNÁNDEZ

Like Claude Lorrain, the painter, the French romantic.

ROBERT GREENE

I remember reading about this. What about it? Remind me.

TERESITA FERNÁNDEZ

A Claude glass is a little 19th century device. It's a piece of curved glass, black glass, or sometimes it was made out of obsidian. It's about the size of a post card. Painters who wanted to learn how to paint, Claude Lorrain would use it as kind of a device for looking. I think it's exactly like the Photoshop function of high contrast.

And so, they've gotten the landscape to where they were going to paint something, and they would turn with their back to it, and they would hold up their little Claude glass and the scene would be reflected but not as the reflection of the black glass. You'd only get the highest highlights and the deepest shadows, really, like of like what you would do in a Photoshop function of just doing highlights and contrasts. So, it breaks up the composition.

ROBERT GREENE

Had Claude Lorraine done this himself? Had he created that?

TERESITA FERNÁNDEZ

Well, he made paintings that were based on that kind of looking.

ROBERT GREENE

Consciously? He literally did that, or that's just how it ended up.

TERESITA FERNÁNDEZ

That's how they look. The way he's doing that, probably by squinting. He's probably squinting at the scene in order to create that kind of contrast so people that wanted to paint like him much later after his death would use this as a way of helping them see those extreme lights and shadows to form the contours of something.

Now, of course, the difference is that Claude is probably squinting at the real landscape in order to see that, and these other people are turning their back to the thing that they're doing.

ROBERT GREENE

Do we know that about Claude Lorrain?

TERESITA FERNÁNDEZ

Which part, that he squinted?

ROBERT GREENE

Yeah.

TERESITA FERNÁNDEZ

No. I'm interjecting that as part of what we were just looking at. I mean, we all squint certainly.

ROBERT GREENE

But, maybe, Claude Lorrain had some kind of visual . . .

TERESITA FERNÁNDEZ

No. He was looking at the scene. It was plein air, kind of straight painting, yeah.

ROBERT GREENE

Okay.

TERESITA FERNÁNDEZ

Yeah. I mean, he's a landscape painter. He's painting landscape, but the piece that's interesting to me is this idea that you would turn your back to something in order to see it

which, of course, implies seeing something in a different way. History is like full of endless, endless examples of that way of seeing. It has nothing to do with your eyes. It's access to information that is represented as visual, so looking into the future but by cutting off eyesight or what we traditionally think as eyesight or reducing it, like squinting or veiling or camouflaging or da, da, da.

ROBERT GREENE

What do you think it means?

TERESITA FERNÁNDEZ

I don't know what it means. I don't care what it means. I'm interested in where it takes me. I think that it places a lot of value on something that is not at face value. What it means to me is that we actually see using our minds, not our eyes.

ROBERT GREENE

Right.

TERESITA FERNÁNDEZ

And that's what's interesting is that filling in the blanks, and in the book I talk about the

viewer as a reader more than a viewer. I don't like the word, viewer, at all. I mean, I use it to explain things just because to fill in the blank, but I don't believe in the word, viewer. I believe in a visual reader, and I really think my work searches that text that you project onto.

ROBERT GREENE

Vision itself isn't just a passive process. We know that scientifically it is reading. Everything is interpreting.

TERESITA FERNÁNDEZ

Exactly.

ROBERT GREENE

The brain cannot interpret anything.

TERESITA FERNÁNDEZ

So that's what I'm interested in.

ROBERT GREENE

Did you finish that thought?

TERESITA FERNÁNDEZ

I think so. I think we started out talking about research and my process.

ROBERT GREENE

Yes. So you're accumulating things that aren't necessarily going to literally be in there.

TERESITA FERNÁNDEZ

They're almost nothing.

ROBERT GREENE

Are they going to be kind of in there somehow but then they disappear in the object?

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

But then it's important that you go through this accumulation.

TERESITA FERNÁNDEZ

It's how I get at what I . . . I have to have a reason to make something. There are no stabs in the dark for me of just trial and error. I don't even touch a material or even begin to think of how something, the presence of something materially until I have a sense of why it's interesting to me. These are the kind

of connection points that start to make sense for me.

ROBERT GREENE

I see. So then, let's take fire, the discovery view. What was the origin of that? I mean, how did you first . . . You just did researching about fire and were curious about it, really the alchemy or . . .

TERESITA FERNÁNDEZ

Yeah. I've always read a lot of Buschelata.

ROBERT GREENE

Oh right.

TERESITA FERNÁNDEZ

I was interested in the image of fire or the phenomenon of fire as a psychological space that I hadn't explored. With pieces like that, I often do sort of put them aside for a long time because it's hard to find a way of dealing with them that isn't a clique. I really struggle with it. Until I know how it's not clique, I put it on the back burner, no pun intended, but I kind of put it on the back burner. There are a lot of

pieces like that that stay on the back burner until they can mature somehow.

With that piece I wanted . . . I don't know. I kind of wanted to . . . I didn't want to represent fire. I was interested in behavior of fire and how I could make something that was active and alive and moving because for me that's what defined fire without actually making it move. I'm not interested in making films. I'm not interested in making kinetic art, but I am interested in the fact that our eyes move and that I can control something, just so I can make you be the animated element or you be the element that actually can animate something in the very visceral way.

So that's what that piece was about. It was about how other people could kind of set this piece into motion.

ROBERT GREENE

By walking around it?

TERESITA FERNÁNDEZ

Yeah. You walk around it, or you can stand still. And other people can walk around it, but it's a bit of an optical illusion which has much, much less to do with what's in front of you than how it is that your eyes work. It's very simple, actually, the way it's made.

ROBERT GREENE

This was before you kind of came upon the materials that sort of made it happen, the threads and everything. Even before that, it was just something in your mind, an obsession that you had for a while and you put it on the back burner?

TERESITA FERNÁNDEZ

It was a curiosity. It was, can I make this?

ROBERT GREENE

Yeah.

TERESITA FERNÁNDEZ

Can I make something that is not fire but that isn't scared to be referenced as fire. So something that's enough of its own thing that it's okay if you called it the fire piece. I don't

care, but that would still completely surprise you and do something unexpected and place you in the moment of engagement, which is the moment that I give most importance to. It's the hardest one to do.

ROBERT GREENE

What's the hardest one to do?

TERESITA FERNÁNDEZ

It's the hardest thing to prompt in the viewer.

ROBERT GREENE

What is?

TERESITA FERNÁNDEZ

Engagement, being in the act of engagement, being aware that you're in the act of engagement.

ROBERT GREENE

Are you consciously trying to create that?

TERESITA FERNÁNDEZ

Yeah.

ROBERT GREENE

And so, I'm very interested in that. Is it possible to talk about the process of thinking how to create that?

TERESITA FERNÁNDEZ

For me, it has to do with not filling in all the blanks.

ROBERT GREENE

Yes.

TERESITA FERNÁNDEZ

And so, the work has to be generous and gratuitous, and it goes back to editing. So if there's too much information, it's gratuitous. If there's too little information, it's completely abstract. It doesn't do that. So it's about amounts of information but also kinds of information. Somehow, these little moments are the ones that tweak it and give me the tools with which to decide what's important or not. I'm not sure how that leap is made for myself, but I think it's partially I have to be inspired myself and be engaged myself.

And so, when I come across these moments that are truly engaging for me, that are just kind of like this amazing sense of discovery, I somehow try to then do the piece with that same sense of revelation and epiphany.

ROBERT GREENE

Is that easy to do?

TERESITA FERNÁNDEZ

No.

ROBERT GREENE

Is that the hardest part?

TERESITA FERNÁNDEZ

It's really hard to do. In making things, it requires a very light touch, and it requires this assumption that your viewer's infinitely more intelligent than you are.

ROBERT GREENE

What do you mean by that?

TERESITA FERNÁNDEZ

More sophisticated and more . . .

ROBERT GREENE

Than you are?

TERESITA FERNÁNDEZ

In a way, yes. Maybe, not more than you are but not assuming that your viewer is a generic entity. I always assume that even though my viewer may not intellectually make all the connections because they don't have to,

because I'm not putting a label next to it with all my research, they will instinctively and how it is that I can draw that. I don't believe that everybody has it. I'm not interested in the people who don't bring it to the work.

ROBERT GREENE

You said only five percent?

TERESITA FERNÁNDEZ

I threw that out. I don't know what the percentage is. I don't know. I don't know what it is. People respond to things in different ways. I just never under estimate who that's going to be or why or how because I find that people have access to things in very different ways. Sometimes, the people that know the least about art are the most sensitive to being in the moment the work is doing or sometimes, the people that are surprisingly most resistant are the easiest targets in a way. I don't know, all kinds of things that are unpredictable.

Once I put it out in the world, I kind of sit back and watch because it never plays out the way you think it's going to play out.

It's like that a little bit with public art. You get to these big proposals, and public art is always about this interaction and how the public uses the space and engaging with the surroundings. I can plan it out and design it to the last detail, and every single time I learn from how people use what you put out there.

I'm really interested in that very kind of . . . I think of myself as a conceptual artist, but I only think the conceptual is interesting when it's personal and when people are affected by it in a personal way. So when people put the conceptual into kind of action. I could care less about defending it as conceptual art because I can do that with my eyes closed. I can write an essay talking about the development like a concept. That's easy to do, but I can't always prove that it'll do that. It has to do it in real life, too. It has to kind of

do it. It has to transcend what it's trying to do and actually be that thing.

ROBERT GREENE

I noticed in some of the pieces that really affected me. They all affect me in different ways, but I'm thinking of the vertigo and, I guess, it was the blind landscape.

TERESITA FERNÁNDEZ

The wild piece, the cut metal?

ROBERT GREENE

The cut metal. They're evocative in many ways, but one thing that strikes me but also in the effect was the shapes that kind of come through. The shapes are very visceral, very interesting, and I don't know why, like the line landscape or the kind of blobby, puzzley shapes that trigger in me many associations and probably in other people. Does that come from deep within you because a lot of your work has these sort of weird blobby shapes?

TERESITA FERNÁNDEZ

Yeah. Yeah. And it's funny because I struggle with those shapes because it's like, how do

you make something that's a really specific blob? And so, it's easy to make a blob. You can make a blob. It's really hard to make a significant blob.

ROBERT GREENE

Yeah.

TERESITA FERNÁNDEZ

And so, that thing is still hard for me to do. It's kind of morphing. It stretches one way and then another, and then at some point it arrives at this point where it's not a cloud. And it's not a this, and it's not a that, and then it becomes just what it is. It can be any of those things, and you can read any of those things into it, but it doesn't quite give you enough information to complete that image in any illustration as an image. It doesn't complete the illustration.

ROBERT GREENE

That's what makes it so interesting, and it makes it kind of alive.

TERESITA FERNÁNDEZ

Because you have to fill in the blanks.

ROBERT GREENE

Yeah. But I'm wondering how you do that.

TERESITA FERNÁNDEZ

I don't do that. The viewer does that because the viewer can't be passive to do that.

ROBERT GREENE

But you trigger that.

TERESITA FERNÁNDEZ

Yes.

ROBERT GREENE

It's not easy because there is a fine line where it becomes, as you say, too literal or too subtle.

TERESITA FERNÁNDEZ

I'd stop just short.

ROBERT GREENE

Yeah. But I don't know how you do that. That's why I saying, it's my thought that somebody who's very visually . . . I usually think of myself as fairly smart, but you're someone who's a lot smarter than me, and I'm interested in how you create it. For instance, the projection screen, you know which one I mean? If you're looking at it, you're seeing,

your mind is having like a hallucinatory effect on you, and you're bouncing from one possible shape to another. I don't think it's that easy to create that illusion. It is an illusion.

TERESITA FERNÁNDEZ

It's very man made. It would be very easy to take the dimensions of that rectangle, plug it into a computer and just have a program do a scatter, but that's not the way that piece was done.

ROBERT GREENE

No. I know.

TERESITA FERNÁNDEZ

The way that piece was done . . . well, it would be very hard to actually tell the difference. You can only tell in your feeling of it.

ROBERT GREENE

My idea from this book and the reason why I wanted a visual artist is I feel like the artist has to feel something in order for it to communicate.

TERESITA FERNÁNDEZ

Yes. Yes.

ROBERT GREENE

And that's what draws me to anything. So, I feel like you're feeling something, and that's what kind of communicates it although I'm getting a little bit into voodoo here.

TERESITA FERNÁNDEZ

No. No. No. I mean, it's the transparency thing again. It's impossible to engage someone else if you're not engaged, and it's impossible to . . . I talk about that in the book. It's impossible to be elusive unless something is elusive to you, too.

ROBERT GREENE

Right.

TERESITA FERNÁNDEZ

I first have to identify it in myself in order to make a work that does that. I don't just know how to do it. I only know how to recognize elusiveness in myself. I actually don't know how to do it, but I know how to recognize it.

And so, when I hit upon something that that's the reaction that I have, I keep it.

ROBERT GREENE

I see. Okay. There's an element of serendipity involved. It happens, and then you recognize it.

TERESITA FERNÁNDEZ

It's not passive serendipity. Yeah. I guess there is a little serendipity that implies a sort of devil may care, sort of look of the draw, sort of sometimes you get it, sometimes you don't.

ROBERT GREENE

Well, for instance, finding when that woman went to the . . . that was a bit of serendipity, and you hit upon it immediately. You recognized that that was right. First you had to know her. Second of all, she had to muck walk into that place.

TERESITA FERNÁNDEZ

The machines had to be all be on and working because that place was dismantled shortly thereafter. I saw that place, a real important historic textile place. I saw it in its

last month of operation. If those machines had not been moving, if the mechanical moves had actually not been weaving, it would not have reported to me.

ROBERT GREENE

Well, then, maybe, it doesn't matter.

TERESITA FERNÁNDEZ

No. I think it was a very conscientious choice to get there. I don't think it was . . . There was no stumbling upon, kind of. But I don't know. Maybe, I'm being cynical not to. Maybe, there is, sometimes, yeah. There is an element of it although I don't think of it as . . . I think you really have to be looking for it to recognize it.

ROBERT GREENE

It seems like a lot of your work has a strategy of keeping them open-ended so that you're always a state of exploring and finding. You'd get bored, I guess, otherwise.

TERESITA FERNÁNDEZ

I'm always, yeah. I'm always working. It never turns off. I mean, I don't sleep.

ROBERT GREENE

You don't sleep?

TERESITA FERNÁNDEZ

Yeah. I sleep very little. I sleep very, very little and very poorly. It's constant.

ROBERT GREENE

You don't look like it.

TERESITA FERNÁNDEZ

I don't look like I don't sleep?

ROBERT GREENE

Yeah. I have that problem, but . . .

TERESITA FERNÁNDEZ

I don't need that. But I find, especially when other things turn off during the day it gets really intense. The mental part gets really intense because I'm not multi tasking although it's always there. I'm always thinking. I'm always working on the work of it. I'm always looking. Anything's game. It doesn't matter where I am. I write things. Sometimes, when I see somebody has done a picture, I'll write it and file it away, not quite knowing what's important about it.

ROBERT GREENE

Well, probably having as much sleep sometimes I get really interesting and creative when I'm not sleeping very well.

TERESITA FERNÁNDEZ

Sometimes, I just get really tired.

ROBERT GREENE

It doesn't look that way at all. Now, I know artists hate this. I'm going to say it anyway.

TERESITA FERNÁNDEZ

Okay. Go ahead.

ROBERT GREENE

The element of craftsmanship seems very detailed, a sense of detail. I look very closely at this, at the cut glass and the metal. Do you find any kind of pleasure in that, or is it something like you want to hit me with a broomstick to bring the word out?

TERESITA FERNÁNDEZ

No. I think it's really . . .

ROBERT GREENE

Do you have a sense of its being 19th century or something like that?

TERESITA FERNÁNDEZ

To me, it's really funny because I don't think it's that well made. I don't think it's that perfect. I mean, it's a little bit like . . . I can't explain it. I get this all the time, like exquisite execution and all that. I guess, I don't. But, no, people really think that of the work when they see it. They sense it to be that way.

ROBERT GREENE

I hate that word, exquisite.

TERESITA FERNÁNDEZ

It's not. I don't think it at all. I kind of think it's a little messy.

ROBERT GREENE

Oh, you're not. You don't know the perspective on it. The one, for instance, Eruption. That's extremely well crafted even though I know there are . . .

TERESITA FERNÁNDEZ

Here's the thing. I'm not a high tech person. I don't make things in a high tech way. I'm not into it although I love what technology does for me. Even though those things look

very mechanical and they're very, very hand made . . .

ROBERT GREENE

That's what nice about them.

TERESITA FERNÁNDEZ

But there's a quirkiness to it. It's like drawing a straight line with a pencil. It can look pretty straight. You can call it straight. It looks straight, but there's this sort of, for lack of a better word, a sort of . . . I don't want to say warped. That sounds horrible but a kind of presence to it. Each one of those little glass things is hand made and polished, silver to the back, but not because it's so important to me. It's just that I really can't find anything else that does it.

I'm picky about how . . . I never, ever find the material that's made. No. Never.

ROBERT GREENE

I know.

TERESITA FERNÁNDEZ

I want to sometimes. It would certainly be faster and easier and cheaper, but I never,

ever, ever do. The proportions of things are really important to me, even something like this. Even the fact that this piece which is a huge piece, there are like thousands and thousands of these chains which don't look like chains when they're installed. They look like rigid little lines.

There's this shift in the dimension. I had these made for me. These were made in Korea based on my specifications to finish everything, and so there's this shift in the scale that's almost imperceptible. When you look at it, it's almost imperceptible, but when you're feeling it there's this kind of flickering that happens.

Those are all the same size, but look at it. This one and this one are different sizes. See the difference.

ROBERT GREENE

Yeah.

TERESITA FERNÁNDEZ

Okay. So it's not something that you read as being important, but you feel as being important. There's like all of these almost invisible tweets on the proportions of things and the edge of things that from a formal point of view is really important to me.

ROBERT GREENE

Right.

TERESITA FERNÁNDEZ

But it's less about quality or how well it's made and more about the relationship between things or the edge of something or how something . . . This is not a finished piece. This is just a pattern. You can see me trying to figure out what the right density is. In this piece, in this pattern, I'm just trying it out. It doesn't even have the graphite attached to it. It's too dense. And because it's too dense, it looks too graphic and it doesn't have the sense of [??]. You can see there how the line is really too hard. Then, if you look at

that piece, I've taken everything and made an inch more space around each one.

And so, where it becomes more dense happens very, very gradually. So you're actually not aware of the edge. You're just aware of the complete effect of it as opposed to the self-conscious edge. When it's start to get to that, it just gets to a point where the image itself starts dissolving, and that's where the piece starts to become like film to me or like drawing, where it just starts dissolving as an image.

In order to do that, I sometimes have to run a lot of tests. With the fire piece, for example, I did lots. Actually, you can still see these strings hanging here where the distance is between the four layers of silk. You have a circle, right? So it's like one layer of silk, another layer of silk, and then the other side of the circle is two layers.

So you're looking at four layers. Each of those layers has different colors that are working

together, but if I put it this far apart, if I spread those two layers this far apart and I put them in front of you, you would basically see the door to the bathroom. You would see right through it.

And if I put them too close, it would look like a painting., so solid. But if I put them at just the right distance, it would kind of dance in between protruding and receding and this completely abstract sense of depth.

ROBERT GREENE

Yeah.

TERESITA FERNÁNDEZ

But those are formal things. Those are not . . .

.

ROBERT GREENE

They are. They are. I think I see what you're saying. It's probably about quality craftsmanship in it as well.

TERESITA FERNÁNDEZ

I also crack my knuckles, a sign of the masterful mind, right? It's a sure sign.

ROBERT GREENE

Is it?

TERESITA FERNÁNDEZ

I'm a knuckle cracker.

ROBERT GREENE

Okay. I think I know what you're doing here.

TERESITA FERNÁNDEZ

They're like solutions. They're like okay . . .

ROBERT GREENE

They're a little bit obsessive about find the exact right moment where you are going to get that visceral effect on the . . .

TERESITA FERNÁNDEZ

Yes. It's not obsessive. That part just has to work, but that part's not my biggest challenge.

ROBERT GREENE

It's not your biggest challenge?

TERESITA FERNÁNDEZ

No.

ROBERT GREENE

What is your biggest challenge, getting it to be engaged?

TERESITA FERNÁNDEZ

Figuring out a formal solution to how to visually tweak things, not that it's easy. It's just not my hardest.

ROBERT GREENE

No. I understand. Okay.

TERESITA FERNÁNDEZ

That I have an ease with, for sure.

ROBERT GREENE

That you have an ease with?

TERESITA FERNÁNDEZ

Yeah. I feel like that's just kind of like a natural instinct almost, but I don't get to that point until I have a real sense of why I'm making this thing and what I wanted to do.

That's much harder to figure out.

ROBERT GREENE

That's sort of like having an emotional connection to something where something sort of vibrates within. It's not just intellectual.

TERESITA FERNÁNDEZ

Yeah. Yeah. No. The intellectual has to become emotional, and the emotional has

to become physical in a way, physically harnessed somehow.

ROBERT GREENE

I noticed that . . . I could be projecting. It's kind of a primitive quality. That's what sort of excites me because I'm kind of a primitive myself, obsessed with primitive art and shapes and cave art and religious art because there's something really sort of visceral in the shapes that they chose because they're obviously feeling something very powerful and evoking it somehow.

So that you're trying to strip . . . I don't know. I feel like I'm projecting. You're trying to strip away until you get it, that kind of primitive experience, immediate primitive experience in relation to something. Does that have any validity in what I'm saying?

TERESITA FERNÁNDEZ

I think it has a lot to do with instinct.

ROBERT GREENE

Primal?

TERESITA FERNÁNDEZ

Yeah. I suppose instinct can be primal, yeah, in the sense of instinctive knowledge about something. Is that what you're talking about, a kind of trusting an instinct as a way or an instinctive impulse as a way of decision making.

ROBERT GREENE

I wasn't talking about that, but that's a nice tributary to follow. I was referring to our primitive relationship to fire, for instance, which we're not aware of, the importance of fire in our life.

TERESITA FERNÁNDEZ

Okay. I understand the question.

ROBERT GREENE

And so, if you literally recreate a fire, it has no effect. If you create the effect of fire, it can have that effect. You can make a stink about that. And I find that in a lot of your pieces. I found it in Eruption. I can't remember the other one. I'm wondering if that's just me because it happens to be my proclivity

or whether there's something in you that's attracted to something elemental in Fireball.

TERESITA FERNÁNDEZ

No. There is. There is.

ROBERT GREENE

You remember the word, telluric?

TERESITA FERNÁNDEZ

No.

ROBERT GREENE

It's having to do with the earth and deep within the earth.

TERESITA FERNÁNDEZ

No. I am absolutely drawn to those things. I'm really interested, especially now, and I'll tell you what I'm working on now, too, which isn't here. But I'm really interested in things that are universal.

ROBERT GREENE

Okay.

TERESITA FERNÁNDEZ

I'm interested in a kind of collective understanding, usually of materials that's beyond . . . Yeah, collective universal

meaning not cultural. There's a knowledge and a kind of deep understanding of things on a really gut level, especially of materials, that I think is deeply ingrained.

ROBERT GREENE

In everybody.

TERESITA FERNÁNDEZ

Yeah, in our biological sense of the world, that runs deeper than just the cultural read on something or all of the other things that are layered on top of it. Yeah. I think that. I think it's why I use landscape as this kind of blank slate because it can be anything and because I can look at a formal garden and look at one set of problems, let's say, or one set of situations within this large context of how it is that we have this connection to the ground and distance and how vision is inexplicably and intricately tied to distance and how landscape is always framed as something that is far away.

And so, yeah, all of those things are things that I think are very, very raw, very base, very, very common denominator.

ROBERT GREENE

So in that sense it's like the alchemy where you're trying to get to the basic elements. That's what alchemy is all about it, instilling it into the ultimate essence.

TERESITA FERNÁNDEZ

I always end up working with those same kinds of images, the land, water, air, fire. They're endless. You're not saying much about them by calling them an element because there are endless specific qualities and shapes and permutations of all of those things. But there's an attraction to them that I think is universal and a kind of deep rooted understanding of those materials or images as materials that's quite extensive, even though we may think of ourselves as urban beings that don't. People come up with all kinds of ways of not recognizing that instinct in themselves.

ROBERT GREENE

Well, a major thing that's obsessing me in this book is the element of time and the fact that as humans we've evolved over three million years and been civilized for, maybe, four or five thousand years, if you want to go that far. So, an immense stretch of time that you can't really conceive of three million years. It's so deeply embedded in us.

TERESITA FERNÁNDEZ

Right.

ROBERT GREENE

Every day, the act of just seeing anything, how long it took for the brain to evolve to the point where we can do just things that we're not even aware of. It's so immense. And I'm really wanting to bring that out because I think it's so important. It's almost miraculous that we can do anything, simple things.

TERESITA FERNÁNDEZ

I am with you on that. ♦



PAUL GRAHAM

ROBERT GREENE

Well, it is kind of blingy. That was the idea. But [50 Cent] is an interesting entrepreneur himself.

PAUL GRAHAM

Yeah.

ROBERT GREENE

You might be surprised. It is not like a hip-hop biography. It is more about his . . .

PAUL GRAHAM

How he makes money.

ROBERT GREENE

How he makes money.

PAUL GRAHAM

I actually look down on making money somewhat. I have often wondered whether that is just some sort of an advantage. Or is that my secret weapon? Or is it actually a disadvantage?

ROBERT GREENE

I have the same thing. And look where we both got.

PAUL GRAHAM

Yeah.

ROBERT GREENE

Probably, to some degree, it is because of that.

PAUL GRAHAM

Maybe. Maybe. It might be. It might be helpful, or it might not be. I honestly don't know. I've often thought of that.

ROBERT GREENE

Well, for me, it would be helpful. If I wanted to, I could probably make three times what I make, but I wouldn't have any fun.

PAUL GRAHAM

Hmm.

ROBERT GREENE

It would kill the soul of the whole process.

PAUL GRAHAM

Are we talking about anything specific, by the way? Or do we just talk?

ROBERT GREENE

Well, I have a whole bunch of things to talk about.

PAUL GRAHAM

Okay. Go ahead. Talk about them.

ROBERT GREENE

I'm just going to give you a little introduction to the book. If that's okay.

PAUL GRAHAM

Sure. Yeah. I'm curious, actually, what it is about.

ROBERT GREENE

Well, the overall frame is I've been doing a lot of work on the brain and neuroscience, because I am very interested in it. The gist of it is that I am going to be saying that the brain was designed. If you can think of something like that being designed over the course of thousands of years for a very specific purpose. I am trying to say that the brain is the ultimate tool that we have been given. It has limits, but it is an incredibly powerful tool, which had, essentially, one great function. All of the powers of the brain funneled into one very particular function. That function . . .

PAUL GRAHAM

Having offspring?

ROBERT GREENE

No. I guess you can say that about seals or monkeys. I'm talking about the human brain.

PAUL GRAHAM

Yeah.

ROBERT GREENE

Is to make things.

PAUL GRAHAM

Yeah.

ROBERT GREENE

Material culture.

PAUL GRAHAM

Hmm. Tools.

ROBERT GREENE

Tools. For instance, language, the great, most interesting theories about language say that it came from the sequencing of making tools. And language, the grammar of language, just follows the making of tools.

PAUL GRAHAM

Really?

ROBERT GREENE

Yeah.

PAUL GRAHAM

Not organizing hunting parties or something like that? Because you know the ancient take on this would have been that man had evolved forwards living together with other men.

ROBERT GREENE

Yes.

PAUL GRAHAM

In fact, the distinctive thing about humans as a species was that they were the political animal.

ROBERT GREENE

Social. The political animal, the Machiavellian intelligence, the whole social aspect is a very important part.

PAUL GRAHAM

And that seems quite different from tool making. Not that you're wrong. I would like to believe it was all about making things and not the politics.

ROBERT GREENE

Well, I had to explain and refine that idea, because the brain has many functions. The idea was that as it evolved, long after we were hunting for thousands of years or whatever, all of these other functions of the brain became hijacked by this idea of material culture and making things.

PAUL GRAHAM

Talking about tool making...

ROBERT GREENE

Well, I mean, because the idea on the surface, you bring up good counter arguments. But we are a social animal. But chimpanzees are the primates, are the most complex social animals on the planet.

PAUL GRAHAM

Yeah.

ROBERT GREENE

From which we have evolved. They are called the Machiavellian primate. We are, and they are. They have, particularly chimps, have all kinds of very complex arrangements. Political

arrangements and all that. That is a great part of how we develop as social creatures. But I am saying the whole idea, I don't want to go into detours, but the whole thing about mirror neurons, where we are able to . . . you know about that?

PAUL GRAHAM

No. Is that something that helps you copy people's emotions or something like that?

ROBERT GREENE

Yeah. This is a recent discovery. They did it with monkeys and with humans. When you pick up something, certain neurons fire in the brain. They show that there are these synapses that are burning for you to take and do something like that. But when you see somebody do it, like I see you pick that up, the same neurons fire, as if I were doing it.

PAUL GRAHAM

This only happens with humans?

ROBERT GREENE

And primates. It is sort of the origin of empathy, of imitation, of learning by watching somebody else.

PAUL GRAHAM

I had noticed the uncanny, how strikingly easy it is. No. No. Myself.

ROBERT GREENE

Oh, right.

PAUL GRAHAM

If you want to learn how to do something . . .

ROBERT GREENE

Yeah.

PAUL GRAHAM

. . . it is much easier if you orient yourself in the direction they are. If you are not facing them, you turn yourself around.

ROBERT GREENE

Right.

PAUL GRAHAM

It is better to watch over your shoulder.

ROBERT GREENE

Yeah. Yeah. I have that same thing as well.

PAUL GRAHAM

I am sure it is with everyone. Right?

ROBERT GREENE

Yeah. It probably is.

PAUL GRAHAM

No, I have never heard of these things.

ROBERT GREENE

Yeah. it is all interesting. All amazing. Because so many interesting things come out of it. But, all that is geared, I am saying, towards making things. Where I am leading to is over the course of evolution, as the brain was refining this power, to me, the ultimate point would be the Renaissance, where the idea of craftsmanship and apprenticeship and learning from a master until you have the same level of mastery.

PAUL GRAHAM

Yeah.

ROBERT GREENE

What I mean by that is that became a model for not just making things, because this isn't just about making things. It became a model

for science, for education, for being a civilized literate person. The whole process of going through years of training until you reach a higher level is a relatively recent concept.

That, to me, is the ultimate paradigm for this brain and this tool and how to use it to its maximum purpose. We are kind of losing a sense of that. It is not just about making things. But in how to make things well. It can be applied to a movie, to software, to whatever it is that you are producing. So this is a book that focuses you on that and how it can be applied to the 21st century, because it seems something very old-fashioned.

PAUL GRAHAM

You mean taking advantage of all of these latent abilities you are hard wired for.

ROBERT GREENE

Yes.

PAUL GRAHAM

Right.

ROBERT GREENE

That are lying around and you are not doing them.

PAUL GRAHAM

Yeah.

ROBERT GREENE

It is very much changed. Particularly the young, this new generation, that may be overly distracted. I have it into four parts. This will be the end of my spiel.

PAUL GRAHAM

No. I am interested in this topic. If you look around, half of the books in this room are about the history of making things.

ROBERT GREENE

Well, that's why I'm seeing "Genius" and all the other books that I have.

PAUL GRAHAM

Yeah.

ROBERT GREENE

All that is interesting. So, the first part of the book is knowing who you are. I call it your life's task, what you were destined to do.

Because if you don't have a love relationship to whatever it is that you end up making, you will never get far. You will never move through this process that I will be describing.

That is the first part. Then, the next part is the apprenticeship phase. I am saying that everybody who has ever mastered anything has to go through an apprenticeship phase. There is no way of skipping it. There is no natural genius. Mozart himself, who they considered to be the wunderkind, he went through an incredibly elaborate apprenticeship phase. He didn't write a symphony that anybody considers good until he was about the age of 16, contrary to legend.

PAUL GRAHAM

Interesting.

ROBERT GREENE

Then, after the apprenticeship phase comes, we've learned the rules and the principles and how things are done, the next phase is when you learn to actually apply them and

experiment and take and play with what you have learned, which I call the creative phase.

PAUL GRAHAM

The journeyman phase.

ROBERT GREENE

The journeyman phase, which I would like to call it that, but it has a bad connotation nowadays.

PAUL GRAHAM

It does?

ROBERT GREENE

But it is the journeyman phase. Then, the ultimate is the master. That is what this book is about. Is that ultimate phase and what it feels like to be a master of something and the physiology of it, the neurology. I am saying it is the highest level of intelligence that we can reach.

PAUL GRAHAM

Mastery.

ROBERT GREENE

Yeah. Where you have a feel for what you are doing. The chess master, the violin maker, the

Stradivarius, the great hacker, whatever it is, you no longer have to think very deeply so much. It comes quickly to you.

PAUL GRAHAM

Yes.

ROBERT GREENE

There is some why and where that comes from. I am going to try and explain.

PAUL GRAHAM

It comes from closing off experiments, actually. [laughs]

ROBERT GREENE

What do you mean by that?

PAUL GRAHAM

Well, you don't explore such a large search tree in order to solve a problem.

ROBERT GREENE

Yeah.

PAUL GRAHAM

But, what that means is, there is probably some fabulous undiscovered stuff in the parts of the search tree that you were ignoring. It comes at a cost.

ROBERT GREENE

Hmm. Well, we will have to get into that.

PAUL GRAHAM

You are probably net ahead for how much you can get out of a given amount of effort. But, definitely, there are some outliers. That someone who didn't know as much as you, like who had the benefits of ignorance, could discover something that you would be smart enough to ignore because that line of reasoning wasn't likely to pay off.

ROBERT GREENE

Okay. That's interesting. Can you think of examples of that? Because usually, the people I am considering that are masters, are able to retain a very open spirit and are able to revisit their own assumptions constantly. It is true that having a totally fresh perspective brings incredible insights. But what if you were able to have that fresh perspective married to all of this experience?

PAUL GRAHAM

Well, honestly, I feel like you are not going to want to make me be one of the people in your book. But, I feel like . . .

ROBERT GREENE

Uh-oh.

PAUL GRAHAM

I mean, sure, you try to keep an open mind as much as you can. But what makes it possible for people to just get the answer without thinking about it too much is because they are unconsciously rejecting certain lines of thought.

ROBERT GREENE

But they are rejecting things that are extraneous, generally.

PAUL GRAHAM

Generally. Generally. Okay. So imagine this situation. You have one master and he is very efficient because he ignores a lot of unpromising lines of attack. Then you have 20 different journeyman and they all wonder about it randomly. 19 out of the 20 will end

up behind the master, because they went down these lines of thought that seemed unpromising because they actually were. One of them will discover the great thing that has been overlooked. So if you could split yourself into many copies and send each one down every possible path, then you would end up with the best possible result, which means the best journeyman will make the bigger discovery than the best master.

ROBERT GREENE

Well, in science, it is true that the best mathematicians and scientists, they all peak in the thirties. There is no doubt about it.

PAUL GRAHAM

Or even younger.

ROBERT GREENE

Or even younger. The mathematicians younger, scientists can go into their thirties.

PAUL GRAHAM

Yeah.

ROBERT GREENE

I think it is some of what you are saying there. But there are exceptions. And I am going to be giving in the book in the second, particularly in the journeyman phase . . . are you familiar with the word heuristics?

PAUL GRAHAM

Yeah. Very much. Are you kidding?

ROBERT GREENE

Well, in computers it is a different thing. But is it the same thing?

PAUL GRAHAM

I think so.

ROBERT GREENE

Okay, I am going to be giving you heuristics for avoiding that funneling of thinking where you are avoiding all of those other tangents.

PAUL GRAHAM

Well, that would be very interesting.

ROBERT GREENE

But I might not succeed. And then I will have hit the Paul Graham wall.

PAUL GRAHAM

Well, you can definitely keep an open mind to some extent, it's true.

ROBERT GREENE

Are you familiar with the concept of negative capability?

PAUL GRAHAM

No, I've never even heard of it.

ROBERT GREENE

It is John Keats. It is sort of a key concept in this book.

PAUL GRAHAM

John Keats, the poet?

ROBERT GREENE

Yeah. He wrote these amazing letters. He died when he was like 25.

PAUL GRAHAM

Yeah.

ROBERT GREENE

But he wrote these amazing letters in which all sorts of really incredible ideas came out of them. One of them was negative capability.

He was trying to explain how someone like

Shakespeare could exist. He says that the great thing about a genius is you are able to maintain completely contrary ideas without having to have to grab for certainty. You are able to live with ambiguity and doubt. That kind of person who can maintain that to their thirties, forties, and fifties is the ultimate. Like a Shakespeare.

PAUL GRAHAM

Yeah. Maybe. You certainly have to be willing to . . .

ROBERT GREENE

Are you running up against this now?

PAUL GRAHAM

All the time. Are you kidding? Not just now. But my entire life. Right?

ROBERT GREENE

Oh.

PAUL GRAHAM

Somehow you have to be able to be surprised.

ROBERT GREENE

Yeah.

PAUL GRAHAM

And to be surprised, if you think about it, what that means is, is to be wrong. [laughs] To be surprised means you had some theory of how things work, and it turned out to be mistaken. You know?

ROBERT GREENE

Or simplistic.

PAUL GRAHAM

Yeah. Okay. But fundamentally mistaken. Right?

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

You have to treat all of your opinions as tentative. [laughs]

ROBERT GREENE

You can do that.

PAUL GRAHAM

It's an uncomfortable way to exist.

ROBERT GREENE

Oh, no. Not necessarily.

PAUL GRAHAM

Well . . .

ROBERT GREENE

We'll come back to this, because maybe there is a flaw in my reasoning here. But I know for people who produce different things, like a book, each book becomes that new thing where you have to attack it. So I have developed heuristics for never having things solidified at the beginning. So I am always discovering and surprised by each project that I do.

PAUL GRAHAM

Yeah.

ROBERT GREENE

Then you reach a kind of a stale point. But then you find ways of regaining that fresh approach.

PAUL GRAHAM

This is a lot of how software works actually.

ROBERT GREENE

Oh, I'm sure. And what I was going to say before was I have chosen ten people, and

each person is kind of for a different reason.

I chose you because you are my computer entrepreneur genius.

PAUL GRAHAM

Hmm. Okay.

ROBERT GREENE

Because people don't associate craftsmanship with the computer age. Right?

PAUL GRAHAM

Really?

ROBERT GREENE

No.

PAUL GRAHAM

Hmm.

ROBERT GREENE

Because they don't think of it as a product.

PAUL GRAHAM

Because you can't see the software.

ROBERT GREENE

Right.

PAUL GRAHAM

Right.

ROBERT GREENE

So what I like about you, I loved your book by the way. You will see how dog eared it is. But that is sort of where you fit. I mean, you fit in brilliantly among the others for other reasons. But that is kind of it.

PAUL GRAHAM

Okay. Well, I can certainly talk about that.

ROBERT GREENE

So I was going to dive into my questions. But did you have anything you wanted to say about this in general, or questions?

PAUL GRAHAM

Remind me when you are done, and I will show you a bunch of books about the history of technology.

ROBERT GREENE

Yeah.

PAUL GRAHAM

The history of tools . . .

ROBERT GREENE

Is it okay for this on?

PAUL GRAHAM

Yeah, sure. The history of tools is probably the single thing I am most interested in.

ROBERT GREENE

Right.

PAUL GRAHAM

I have enormous numbers of interesting books here about the history of technology. Some of them you might not know about.

ROBERT GREENE

I definitely want that.

PAUL GRAHAM

The best one of all is “Medieval Technology and Social Change.” Do you know that book?

ROBERT GREENE

I read that book when I went to Berkeley. I had that book in college. It is lying on a shelf but I haven’t used it for this one.

PAUL GRAHAM

It is fabulously useful.

ROBERT GREENE

Okay. It is at my mom’s house, actually. What’s the title again?

PAUL GRAHAM

“Medieval Technology and Social Change.”

ROBERT GREENE

Yeah.

PAUL GRAHAM

Anything by Cipolla is good, too. In fact, I think he taught at Berkeley. Cipolla. I have *Clocks and Culture*. Carlo Cipolla.

ROBERT GREENE

No. I don’t know him. Wow.

PAUL GRAHAM

He was one of the great writers about the history of technology.

ROBERT GREENE

Okay.

PAUL GRAHAM

One of his books, the preface is basically the best ten page essay ever written about the history of technology.

ROBERT GREENE

The preface to what?

PAUL GRAHAM

I think it may be the preface to *Clocks and Culture*. But if it is not, it might be *Guns, Sails, and Empires*.

ROBERT GREENE

Wow. Great title.

PAUL GRAHAM

It sounds very familiar, doesn’t it?

ROBERT GREENE

Yeah.

PAUL GRAHAM

It’s a lot like *Guns, Germs, and Steel*.

ROBERT GREENE

Germs, yeah. Somebody stole that. “It begins in the summer of 1338, a galley left Venice bound for the east.”

PAUL GRAHAM

Let me see. Let me see if that’s the one. Yes. Yes.

ROBERT GREENE

All right.

PAUL GRAHAM

I think the prologue of *Clocks and Culture*.

ROBERT GREENE

Clocks and Culture.

PAUL GRAHAM

Is what you want. Just by everything by Cipolla.

ROBERT GREENE

All right. All right. So I am going to remind you when we are done.

PAUL GRAHAM

Okay.

ROBERT GREENE

Or near the end. I want to just begin with a biography. I know something about your background. But not a lot. Just tell me briefly where you grew up.

PAUL GRAHAM

I grew up in Pittsburgh.

ROBERT GREENE

Pittsburgh? I didn't know that.

PAUL GRAHAM

Yeah.

ROBERT GREENE

I thought it was Massachusetts.

PAUL GRAHAM

No.

ROBERT GREENE

Pittsburgh.

PAUL GRAHAM

I was born in England.

ROBERT GREENE

Yeah, I know.

PAUL GRAHAM

My family came here when I was three and a half, because Pittsburgh was the center . . . my father designed nuclear reactors. Pittsburgh was the center of the American nuclear industry. Both of the two big companies, GE and Westinghouse that made reactors, were based in Pittsburgh. Because the hardest part about reactors is casting containment vessels.

ROBERT GREENE

Oh. And the steel industry.

PAUL GRAHAM

Yes. You want to put the nuclear industry where the steel industry is. So I grew up in

this really boring suburb of Pittsburgh called Monroeville. Monroeville's one claim to fame is that Monroeville mall was, in its time, the largest shopping mall in the country. It is where, I forget if it is *Dawn of the Dead* or *Night of the Living Dead*, but one of those two actually takes place in a shopping mall and that was our shopping mall.

ROBERT GREENE

Good advertisement for it.

PAUL GRAHAM

Yeah.

ROBERT GREENE

So that is like hard core suburbia.

PAUL GRAHAM

Yeah.

ROBERT GREENE

I would think. No?

PAUL GRAHAM

Yeah. And football territory.

ROBERT GREENE

Yeah. They are big on football.

PAUL GRAHAM

Western Pennsylvania.

ROBERT GREENE

I was going to say that, yeah.

PAUL GRAHAM

Joe Montana was the quarterback of our high school rival.

ROBERT GREENE

Oh, your rival.

PAUL GRAHAM

So we did not win a lot of games against those guys in those years I was in high school.

ROBERT GREENE

This was in the '70s? Or the '80s?

PAUL GRAHAM

'80s. Late '70s and early '80s.

ROBERT GREENE

Uh-huh. Wow. You were kind of an outcast or were you with the nerds or how did you fit into?

PAUL GRAHAM

Well, our family was sort of unassimilated immigrants.

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

Which didn't show so clearly because we came from a country where they spoke English. But my parents were just completely different from other parents.

ROBERT GREENE

Your parents were both English?

PAUL GRAHAM

Yeah. Yeah. We came here from England.

ROBERT GREENE

Right. Oh, you were already born, right.

PAUL GRAHAM

My father was part of the brain drain. You know the famous, the original brain drain was in England.

ROBERT GREENE

After the war?

PAUL GRAHAM

Well, really because of the Labor governments, England got very poor.

ROBERT GREENE

Yeah.

PAUL GRAHAM

It was full of highly educated people . . .

ROBERT GREENE

I didn't know that.

PAUL GRAHAM

. . . who all came to America. But that was where the term brain drain was coined.

ROBERT GREENE

Oh.

PAUL GRAHAM

In the 1960s. So in 1968, a lot of nuclear engineers were coming from England to Pittsburgh, and there was sort of an émigré community there. We would get together with these people who played cricket on weekends and stuff like that.

ROBERT GREENE

Weird.

PAUL GRAHAM

So I was definitely an outcast. Yes.

ROBERT GREENE

So you felt outside from your family background and maybe also from your own interests?

PAUL GRAHAM

Yeah. Yeah. Both things. It was a double whammy. And being really short.

ROBERT GREENE

You're not that short.

PAUL GRAHAM

Well, my birthday was just before the cut off for the new grade. So I was the youngest kid in my class.

ROBERT GREENE

Oh.

PAUL GRAHAM

And I was pretty short. I was the shortest kid in my class.

ROBERT GREENE

You are like what? Five-eight or five-nine or something?

PAUL GRAHAM

Now I am five-ten and a half. I just had my height measured this morning, because I went to the doctor.

ROBERT GREENE

Oh, well, you just keep talking about your height. I thought, well, that's average.

PAUL GRAHAM

No. I know it's average.

ROBERT GREENE

It's above average.

PAUL GRAHAM

I know. I know. I know. But then, when I was a little kid, I was smaller than all the other kids. So I was smaller and I had this weird accent and my parents were space aliens.

ROBERT GREENE

Oh.

PAUL GRAHAM

You know?

ROBERT GREENE

You lost your accent.

PAUL GRAHAM

You lose it pretty quick. Unless you are old enough to be interested in girls. Then you keep it, because girls like it. But at three and a half, I just wanted to get rid of it as fast as I could.

ROBERT GREENE

So did you feel quite different in high school?

PAUL GRAHAM

Especially there.

ROBERT GREENE

In New England, yeah.

PAUL GRAHAM

Pittsburgh was really all about classic Americana.

ROBERT GREENE

Right.

PAUL GRAHAM

It was all about football and cheerleaders. Nobody was interested in the kind of things I was interested in.

ROBERT GREENE

Did you have some things that you were drawn to? Where did your mind go to? What was your sanctuary?

PAUL GRAHAM

I realize now it was stuff from outside Pittsburgh. [laughs] Books. Books were basically letters from people who lived in places that were not Pittsburgh.

ROBERT GREENE

Yeah.

PAUL GRAHAM

And programming was pretty cool. Computers were just becoming available then.

ROBERT GREENE

We're talking, what? 1980?

PAUL GRAHAM

Well, I graduated in '82. So, junior high school, when I first started programming, the Mac first came around in 1977 or 1978.

ROBERT GREENE

It's hard to believe.

PAUL GRAHAM

Right? I found the one Mac that my school district possessed. My father wouldn't buy a computer. Computers were very expensive back then.

ROBERT GREENE

Right.

PAUL GRAHAM

Computers have basically stayed the same price, but inflation has caused everything else to become cheaper.

ROBERT GREENE

Right. What drew you to the computers in the first place? Because that is a weird thing in 1978.

PAUL GRAHAM

A lot of kids just see a computer and it is immediately fascinating, because you can make it do a lot of stuff. That was obviously some visceral thing.

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

Like it is for probably almost all hackers. You see this thing and you just have a sense of the possibilities.

ROBERT GREENE

See, because I am not a hacker. So I am trying to understand that a little bit.

PAUL GRAHAM

Ah, huh.

ROBERT GREENE

Yeah. It's fascinating.

PAUL GRAHAM

You know what it's like? You know when you see a Leatherman tool, even if there is not something that you need it for . . .

ROBERT GREENE

Yeah.

PAUL GRAHAM

. . . it is kind of exciting because it can do stuff. There are so many . . .

ROBERT GREENE

Well, what could you do? Because it didn't look exciting. Those first computers didn't look exciting.

PAUL GRAHAM

Well . . .

ROBERT GREENE

What was there to do?

PAUL GRAHAM

. . . it looked exciting to me. I mean, the cases don't look exciting.

ROBERT GREENE

Yeah.

PAUL GRAHAM

But if you know that you can tell it to do anything and it will do it as long as it is precise. I mean, it might not finish doing it, but you can at least tell it. So it is sort of like a super Leatherman.

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

It is like, it has, for hackers at least, when hackers see a computer, it is like the kind of appeal that a Leatherman tool has, but just multiplied by a million, because it is a million times more flexible.

ROBERT GREENE

So where did you see your first computer? Do you remember?

PAUL GRAHAM

No.

ROBERT GREENE

When you began your love affair.

PAUL GRAHAM

No. No I don't remember.

ROBERT GREENE

Really?

PAUL GRAHAM

I mean, they are in movies and stuff like that.

ROBERT GREENE

Yeah, but didn't have a friend who had one? Where did you get your first PC? Was it a PC back then?

PAUL GRAHAM

No. No, the IBM PC, I remember when the IBM PC came out. That was a big deal.

ROBERT GREENE

So what was the Mac at that time?

PAUL GRAHAM

Where there was no Macs. They were Apple IIIs.

ROBERT GREENE

Yeah. Right.

PAUL GRAHAM

Apple IIIs were around. And there were a bunch of other computers people used. Heathkit made these computers that you had to solder together. And there was the Commodore PET. All these computers.

ROBERT GREENE

What did you have?

PAUL GRAHAM

Have long since disappeared. We had a TRS-80. The Radio Shack TRS-80, which was in its day, probably the . . .

ROBERT GREENE

You actually got your dad to get you one?

PAUL GRAHAM

Finally, yes. He got a TRS-80.

ROBERT GREENE

You made him get it.

PAUL GRAHAM

Well, I certainly nagged him and nagged him for years.

ROBERT GREENE

Okay.

PAUL GRAHAM

But the first computers I used were at school.

ROBERT GREENE

Oh.

PAUL GRAHAM

The first computer I used . . .

ROBERT GREENE

At Monroeville High School, they had them?

PAUL GRAHAM

Gateway High School was the name.

ROBERT GREENE

Gateway High School.

PAUL GRAHAM

Well, they had one. In our junior high school, they had one. It was the school district's computer that they used for printing out grade reports and scheduling classes and stuff like that. It was the school district IT department. They had this computer called an IBM 1401.

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

What we would now consider a mainframe.

ROBERT GREENE

Yeah.

PAUL GRAHAM

Except it had 12K of memory, if I remember correctly.

ROBERT GREENE

12K.

PAUL GRAHAM

Maybe it was 4K. You could see each bit of memory. It had magnetic doughnut, magnetic core memory. These little round magnetic

doughnuts drawn on wires. You would look in the case and there was the memory. The memory was not silicon chips.

ROBERT GREENE

Right.

PAUL GRAHAM

It was like little bits of metal, and you had to program it using punch cards.

ROBERT GREENE

You did that when you were in junior high?

PAUL GRAHAM

Yeah. I programmed using punch cards.

ROBERT GREENE

They let you do that on the school's computer?

PAUL GRAHAM

You know, they had in our school this gifted program. If you were in it, you were supposed to do something individualized. So I sort of used this as a way to get into the computer room.

ROBERT GREENE

So you are like an original hacker.

PAUL GRAHAM

I actually got in at the tail end of programming on punch cards. Yeah. In Fortran.

ROBERT GREENE

In Fortran, yeah.

PAUL GRAHAM

You didn't have any choice about what programming language you used. This computer only had two languages. Fortran and COBOL. I didn't want to learn COBOL. So I learned Fortran.

ROBERT GREENE

So what was the excitement for you? Just explain, because I want to get it.

PAUL GRAHAM

Well, I can't remember how I learned about computers. But I think it must have been from movies. In movies, there was the electronic brain. If anything, movies over-emphasized what computers could do.

ROBERT GREENE

You mean like "Space 2001" or things like that?

PAUL GRAHAM

Movie after movie. You look back now at things from the '60s and '70s and the computer does things no computer could do even now.

ROBERT GREENE

Especially with giant rooms and . . .

PAUL GRAHAM

People would take that deal to get the kind of things computers could do, it would take something the size of a room. You could put an entire Google server farm to work on these problems and not get some of the answers that they used to get in these movies.

ROBERT GREENE

You mean like *Star Trek*? Things like that? The TV show?

PAUL GRAHAM

Yeah. Everything. I don't remember the particular shows. It was just part of the culture.

ROBERT GREENE

Yeah.

PAUL GRAHAM

The computers were these electronic brains.

ROBERT GREENE

Right.

PAUL GRAHAM

And you can, so, of course. How could you not want to control the electronic brain?

ROBERT GREENE

Rollerball. Did you see that movie?

PAUL GRAHAM

I don't think I saw *Rollerball*.

ROBERT GREENE

That was with James Caan with the games, the computer that controlled it.

PAUL GRAHAM

Or how about *2001*?

ROBERT GREENE

Well, that's the ultimate.

PAUL GRAHAM

There were so many movies. There was this big romance about computers. Probably largely created by IBM's PR department, actually. Whatever it was, it was definitely around. So everybody knew. Imagine if you actually had grown up watching all of these movies about how computers are like these electronic brains. And you can just tell the computer some problem and some paper tape would come out the end and you look at it and it would give you the answer.

ROBERT GREENE

Right.

PAUL GRAHAM

Not about just a math problem, but something computers still can't do to this day. How could you not want to figure out how to make those brains work?

ROBERT GREENE

So the power that it could give you.

PAUL GRAHAM

Yeah. Yeah. It's the ultimate tool.

ROBERT GREENE

Right.

PAUL GRAHAM

Like a Leatherman, but a million times more flexible. Because that is what you like about a Leatherman. You look at all of those different things and they do something to matter.

ROBERT GREENE

Right. Right.

PAUL GRAHAM

Computers are this super duper Leatherman.

ROBERT GREENE

Did you feel like, when you discovered computers, that that was it? That this was what you were going to be doing for your life?

PAUL GRAHAM

No, actually. There weren't a lot of programmers around back then. So it didn't seem like, it wasn't clear that you could have a career as a software developer. I didn't know anybody growing up that I would have

called a software developer. I mean, they used computers a lot to do calculations in the design of nuclear reactors. In fact, my father was one of the first programmers.

ROBERT GREENE

Oh.

PAUL GRAHAM

But he didn't think of himself as a programmer. He thought of himself as a guy who designed reactors and he had to write programs. Just like now he would use a calculator to actually do the same things probably. But he didn't think of himself as a software developer.

ROBERT GREENE

Did you learn from, was it in the air, in the family, in the house?

PAUL GRAHAM

He surely didn't teach me anything about programming.

ROBERT GREENE

Oh.

PAUL GRAHAM

But I am sure . . . I don't remember him ever saying anything about this. But how can I not?

ROBERT GREENE

You absorbed it somehow.

PAUL GRAHAM

How can I not have heard him talking about computers? It was just in the air.

ROBERT GREENE

Right.

PAUL GRAHAM

Maybe doubly in the air since he was one of the first. He was, literally, one of the first people writing programs.

ROBERT GREENE

Is that right?

PAUL GRAHAM

Because back when the computers were first made, the first places that got them were nuclear research labs.

ROBERT GREENE

And NASA maybe.

PAUL GRAHAM

Yeah. That kind of thing.

ROBERT GREENE

Yeah.

PAUL GRAHAM

He was one of these boffins, they call them in England.

ROBERT GREENE

What is a boffin?

PAUL GRAHAM

Well, a boffin is a guy who has some kind of specialized technical expertise. But it implies that they don't have any, that they are sort of unworldly. Boffin is military slang for when the military guys, who are basically jocks, needed to get an answer to a hard problem. They would go and consult one of these Wozniak like fellows that they called boffins.

ROBERT GREENE

So, you are genetically wired to be a nerd.

PAUL GRAHAM

Yeah. My mother was actually a computer. Do you know when computers came out?

ROBERT GREENE

Your mother was a computer?

PAUL GRAHAM

Computer was a job title.

ROBERT GREENE

Oh.

PAUL GRAHAM

When computers first came out, they were called electronic computers. Like you would say an electronic accountant nowadays.

ROBERT GREENE

So you would say, "I am a computer."

PAUL GRAHAM

Yes. Los Alamos, when they were designing the first nuclear weapons, they had roomfuls of women who did computations. And I believe that was one of Feynman's jobs at Los Alamos. He supervised the computers.

ROBERT GREENE

I wonder why they were women.

PAUL GRAHAM

Well, you know.

ROBERT GREENE

Did you just have to put numbers in?

PAUL GRAHAM

They were probably willing to deal with a lot of fussy work.

ROBERT GREENE

Yeah.

PAUL GRAHAM

Because it probably wasn't very edifying just doing these calculations.

ROBERT GREENE

So that is what your mother did?

PAUL GRAHAM

Yeah. My mother worked at a bank calculating things like the net present value of annuities and stuff like that.

ROBERT GREENE

Oh.

PAUL GRAHAM

But she worked as a calculator.

ROBERT GREENE

Oh, okay.

PAUL GRAHAM

How about that?

ROBERT GREENE

So you had it coming from both sides.

PAUL GRAHAM

Yeah.

ROBERT GREENE

But you kind of went through, it sounds like, a period where you were a little bit lost. Not lost, I hate to use that word.

PAUL GRAHAM

Well, I didn't think of programming as a career.

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

Because it wasn't for anyone I knew.

ROBERT GREENE

What were you thinking you would end up doing in life? Did you have any idea?

PAUL GRAHAM

No. I had no idea. You would take these surveys that would tell you something

random, like, you are supposed to be a photographer when you grow up. You are supposed to be an insurance salesman.

ROBERT GREENE

What were you supposed to be?

PAUL GRAHAM

I don't even remember. I don't even remember. It seemed like the choices were all so boring like an actuary or something like that.

ROBERT GREENE

So where did you go to college, undergraduate?

PAUL GRAHAM

Cornell. I went to Cornell.

ROBERT GREENE

Very cool.

PAUL GRAHAM

Yeah. And it had a particularly good computer science department.

ROBERT GREENE

Oh. So that's when, as an undergrad you started getting deeper into this.

PAUL GRAHAM

Yeah. I was pretty deep into it already. By the standards of the day in high school.

ROBERT GREENE

Oh. What could you do with it already on the computer?

PAUL GRAHAM

You mean before I went to college?

ROBERT GREENE

Yeah.

PAUL GRAHAM

Well, computers, even probably the biggest computer I used before I went to college had 16K of memory and ran only Basic. So, how much of a program can you write in a 16K of Basic? You can write the *Game of Life*. Conway's *Game of Life*.

ROBERT GREENE

I have heard a lot about the Game of Life.

PAUL GRAHAM

That's a hacker symbol, a glider from the *Game of Life*.

ROBERT GREENE

Yeah.

PAUL GRAHAM

And you could do very, very rudimentary graphics.

ROBERT GREENE

I always thought the *Game of Life* was a lot of fun.

PAUL GRAHAM

Yeah.

ROBERT GREENE

It's still around?

PAUL GRAHAM

Oh, god yes. I'm not talking about the board game *Life*.

ROBERT GREENE

No, no, no. The computer game.

PAUL GRAHAM

Yeah. Well, when I first did it. When I first started dealing with that, it was on paper.

ROBERT GREENE

Oh.

PAUL GRAHAM

We would do it on paper.

ROBERT GREENE

Oh.

PAUL GRAHAM

But it was one of the first things, you know, the first things just waiting to be translated into software. I mean, the most elaborate software I wrote in high school was to calculate and predict the altitudes that model rockets would fly to.

ROBERT GREENE

Were basically self-taught? This was just you doing it?

PAUL GRAHAM

Everybody was self-taught.

ROBERT GREENE

Yeah. There was nothing you could . . .

PAUL GRAHAM

Even these days, actually, programmers are all self-taught.

ROBERT GREENE

The best ones probably.

PAUL GRAHAM

Because they start programming when they are 13.

ROBERT GREENE

Yeah.

PAUL GRAHAM

The really good ones. What happens is, they learn how to write code using a bunch of cheesy hacks, and then they show up in college with all of these bad habits. They can get shit done, but in the most egregious way. Then, in college, functional programming boffins try to clean up their act and teach them how to do everything cleanly.

I was a classic example of this. I knew how to write. I don't think I knew the concept of recursion, for example. I don't remember.

ROBERT GREENE

What do you mean the concept of recursion? I mean, I know what that means, but for computers, I don't.

PAUL GRAHAM

A recursive algorithm is an algorithm that solves a problem by referring to itself.

ROBERT GREENE

Right.

PAUL GRAHAM

For example, if you have a list of things lined up, and you can only look at the next thing. So you are walking along the list like this. An algorithm for figuring out the length is, if you are at the end, then the length is zero. Otherwise, it is one plus the length of the rest of the list. So I apply this algorithm and I am at the first thing. That means it is one plus the length of this list. Okay. Which is, I don't know. Let's see. Well, it is one plus the length of this list. Right? Eventually, you get to the end and there is no more. You say, "Well, that's zero." Then, on the way back, as the function returns, it ends up adding up all these numbers.

ROBERT GREENE

Going on the way back is the recursive element.

PAUL GRAHAM

No. Recursive, literally, means . . .

ROBERT GREENE

Embedding one thing inside of another.

PAUL GRAHAM

It means, literally, a function whose definition contains a reference to itself. That's what it means. So, the length function looks like if you are at the end of the list, the result is zero. Otherwise, it is one plus length of the rest of the list. That's a recursive function, because it has got that length reference in the definition of length itself.

ROBERT GREENE

So you didn't know anything about that.

PAUL GRAHAM

No. No. It is sort of a test for how much someone understands about computer science, whether they understand recursion, because a lot of the most elegant algorithms

are recursive. The typical cheesy high school hacker, who can get things done but in a very ugly way, would tend to do things that could be solved elegantly by recursion in some inelegant way. Essentially reinventing recursion without knowing it.

ROBERT GREENE

Oh. Wow. This is very interesting. Well, I'll explain why a little later.

PAUL GRAHAM

So, in college, I cleaned up my act. And I learned about Lisp.

ROBERT GREENE

Oh. So it was in college you learned about Lisp.

PAUL GRAHAM

Yeah. You couldn't run Lisp on any of the computers that I used in high school. It just wasn't even feasible. Not back then. But in college, they had powerful computers and people who actually knew about computer science. [laughs]

ROBERT GREENE

Wow. Exciting for you.

PAUL GRAHAM

So, I encountered Lisp for the first time in 1983. I have never been able to tolerate programming in any other language since.

ROBERT GREENE

I don't want to get too technical, because no one . . . I don't even understand it. But just briefly, what is it about Lisp that was so exciting?

PAUL GRAHAM

Okay.

ROBERT GREENE

If you could explain it to a non hacker.

PAUL GRAHAM

If anyone can, I can.

ROBERT GREENE

Okay.

PAUL GRAHAM

Because I am the explainer of Lisp. The raison d'être of Lisp is that it is what you get if you try to write a language in itself. One

kind of program that you can write is called an interpreter. There are all kinds of different programs you can write. You can write programs to generate pictures, add numbers together, do spreadsheets or something like that. But one of the many kinds of programs that you can write is a program that is self referential in the sense that the input that it takes is a program. What it does is run it. It is a program that runs other programs. And that is called an interpreter.

A number crunching program that takes numbers as inputs and tells you as output if the bridge is going to fail or not. A graphics program takes a description of the world and creates an image of outputs. An interpreter takes as input a program and produces as output the result of executing the program.

Lisp is what you get if mathematically you are trying to create the smallest thing that you can then write an interpreter for, in itself, Lisp is that thing. I wrote an essay about this.

If anything can explain this to you, this essay can. It is called *The Roots of Lisp*. And it walks you through the original paper.

ROBERT GREENE

I can get it on the Internet?

PAUL GRAHAM

Oh, yeah. It walks you through the original paper that John McCarthy, the inventor of Lisp, wrote about Lisp, where he did this.

ROBERT GREENE

Is there something intellectual or whatever about your attraction to it?

PAUL GRAHAM

Well, the byproduct of designing a language by making the language that is sort of mathematically the smallest thing that can be written in itself is amazingly elegant and powerful.

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

There are two sources of the origins of programming languages. One is machine

language, which is what the hardware itself speaks. Very primitive stuff. Move this number from this place in the memory to this number. Add two things together. Things like that. Very simple stuff.

Basically, Fortran was a way to generate machine language a little bit more efficiently. They still took it for granted that programming was machine language. But Fortran, you didn't have to write machine language for the math parts. You could have math expressions and it would translate them into the corresponding machine language. That is where the name comes from. Fortran means formula translation.

ROBERT GREENE

Oh.

PAUL GRAHAM

Because the distinctive thing about it was nothing about the structure of the language. It was just that you could write math in algebraic form. Instead of saying, when you wanted to add two things together, put this

number in this location and this number in this location and then add together those two locations and move the results somewhere.

You can just write $a + b$. And that made your programs a lot easier to read. But the earliest versions of Fortran were basically, structurally just machine language except with math in there.

Okay. So that was one source, one root of the origins of programming languages. And Fortran gradually got more powerful over the years. But, fundamentally, it started out very much compromised by its origins in whatever the hardware happened to be able to do.

The other root of programming language history is math. When John McCarthy invented Lisp, he was not intending to use it . . .

ROBERT GREENE

It was early on, like early '60s?

PAUL GRAHAM

1958.

'58.

ROBERT GREENE

It was not intended to be run on computers.

ROBERT GREENE

Yeah.

PAUL GRAHAM

It was just for use, sort of an alternative to the Turing machine as a model of computation. The problem with the Turing machine as a model of computation is, although like all Turing machine complete things, they are all the same. The problem is you would never actually want to write or read a Turing machine program, because the atoms that the programs are made out of are so small. It would be totally incomprehensible. You wouldn't even know what it was doing. It just seemed like it was punching holes on tape.

It turns out it is like calculating squares or something like that. You would never be able to tell.

Right.

ROBERT GREENE

So, Lisp was originally a model of computation that was almost as simple and elegant as Turing machines, but that you would actually want to read and write programs for.

ROBERT GREENE

Wow.

PAUL GRAHAM

Lisp was invented as a language for writing algorithms on paper. Not for running on computers. Then, one of John McCarthy's grad students got hold of his description of Lisp and he said, "I could write an actual Lisp interpreter that ran on a computer."

ROBERT GREENE

Oh.

PAUL GRAHAM

McCarthy didn't, he had never intended this. He laughed at the guy. But the guy did it. Steve Russell, he was. So Lisp was math

and became a programming language.

Whereas Fortran was hardware and became a programming language. These two sources are the two origins. What has happened is, the problem was that when Lisp was first made, because it was very much not designed thinking about the capabilities of the hardware, it was terribly slow.

ROBERT GREENE

Oh.

PAUL GRAHAM

It was not very practical. Hardware has gotten a lot faster. So now, you can afford the luxury of using an elegant language instead of one whose whole origin was the limitations of the hardware. [laughs]

ROBERT GREENE

Fortran.

PAUL GRAHAM

Even Fortran has become a lot more like Lisp now. But all of the programming languages everybody is using now, like Ruby, Python and stuff like that, if someone had produced

Ruby in 1975, and called it a dialect of Lisp, no one would have disagreed. All the popular languages now are basically Lisp because the hardware is so fast.

ROBERT GREENE

What did you end up getting a degree in at Cornell?

PAUL GRAHAM

Well, I did not have a name for what my degree was in because Cornell had this program called the College Scholar Program, where you didn't have to have a major. You could just make up what you were going to study.

ROBERT GREENE

Oh, okay. So, what did you make up?

PAUL GRAHAM

Well, what I was trying to study was artificial intelligence.

ROBERT GREENE

Oh. Artificial intelligence.

PAUL GRAHAM

Yeah. Back then, in the early '80s, everybody thought, 'Okay. This is when AI is finally going to happen. We are going to make Hal. Computers are powerful enough.' There was this AI bubble in the early '80s followed by an AI nuclear winter. So that was right at that moment and I got totally fooled by it and thought I was going to produce AI. That is what I wanted to do in college.

ROBERT GREENE

Then, I know that you went to, was it, did you go to RISD?

PAUL GRAHAM

Yeah. After Harvard.

ROBERT GREENE

After. You went to Harvard for what?

PAUL GRAHAM

Grad school. I went to grad school in computer science at Harvard.

ROBERT GREENE

Computer science at Harvard. Wow.

PAUL GRAHAM

Yeah. Well, everybody thought I was a computer science major at Cornell. I just wasn't. But I was always in that computer science building.

ROBERT GREENE

Did you go all the way at Harvard?

PAUL GRAHAM

Yeah. I got a Ph.D.

ROBERT GREENE

You got a Ph.D.

PAUL GRAHAM

Yeah.

ROBERT GREENE

So what made you then go into painting?

PAUL GRAHAM

Well, I didn't work. I didn't get far enough as an undergrad to realize it was kind of all a big fraud.

ROBERT GREENE

Yeah.

PAUL GRAHAM

There is this beginning part that is kind of encouraging. Have you ever heard of a program called SHRDLU? You might have seen it in a documentary at some point.

ROBERT GREENE

SHRDLU?

PAUL GRAHAM

The SHRDLU comes because it is sort of the QWERTY of Linotype machines. If the Linotype machine has a bug and it just drops a sequential series of text into your document, it will be the letters, S-H-R-D-L-U.

ROBERT GREENE

Oh. S-H . . .

PAUL GRAHAM

So it is sort of a joke. R-D-L-U. The guy who made SHRDLU is a guy called Terry Winograd, who is a professor of computer science at Berkeley and one of Larry and Sergey's advisors.

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

Okay. So there is this program, SHRDLU, and what you can tell it. It was Winograd's Ph.D. thesis at MIT.

ROBERT GREENE

Yeah.

PAUL GRAHAM

You can tell it, "Put the red block in the green box." And this robot arm would come and do it, because you can write a program that understands that constrained form of English and carries out the actions. The problem is you just run into this wall. It is not really English. What it is, is a subset of English that unambiguous.

ROBERT GREENE

Right.

PAUL GRAHAM

It is not the language we are speaking.
[laughs]

ROBERT GREENE

No.

PAUL GRAHAM

It just looks like it. But I didn't get far enough. I was still fooled by this. At the end of Cornell, I had my undergraduate thesis was basically I reverse engineered SHRDLU.

ROBERT GREENE

Uh-huh. Wow.

PAUL GRAHAM

I was really encouraged by how far I had gotten. Pretty quickly, once I got to grad school, I went to grad school to study artificial intelligence.

ROBERT GREENE

Oh.

PAUL GRAHAM

Yeah.

ROBERT GREENE

That's exciting.

PAUL GRAHAM

One of the reasons I went there was this professor, Bill Woods, who had done a lot of work on natural language stuff, which is what SHRDLU was doing. I wanted to do natural

language. I got to Harvard and I started working on this all the time instead of just as a side project, like as an undergrad and I realized pretty quickly that this stuff just did not work.

ROBERT GREENE

Uh-huh. That's interesting. There are still people nowadays who think it will work. Right?

PAUL GRAHAM

It may work. It may work. But the path to it will not be the approach that they were using then. It will be some emergent behavior from some machine that you don't even understand. No one is going to sit down and write the piece of code that represents logical reasoning. What someone is going to do is they are going to make something that is a fairly good simulation of planarian. And then it will gradually learn and get better. But no one is going to sit down and write the algorithm that is intelligence. That is what they thought they were doing in the 1980s, in

retrospect. It was so wrong. But I was a starry eyed undergraduate. I didn't know any better.

ROBERT GREENE

So you got into something completely different?

PAUL GRAHAM

Well, I got to Harvard, and I'm like, "Fuck. This stuff doesn't work. What am I going to do?" So, I thought, what can I salvage from the wreckage? [laughs] Of all this stuff that I know, and all the stuff that is going on in AI, what is good? You know what was good about it? Lisp. The programming language, the programming tools that they used in AI, and in retrospect I was right, because of all the legacies of all that work that people did in AI, their biggest effect has been in programming languages.

So I thought, all right, of all the stuff, what is actually, genuinely good? Programming languages. So I decided I would work on programming languages. But programming

languages, although kind of fun, are not as exciting as making Hal. [laughs]

PAUL GRAHAM

I mean, imagine. I really believed that was going to work.

ROBERT GREENE

Yeah.

PAUL GRAHAM

When I went to grad school, I really believed that if I worked hard enough, I would be able to make this machine that I could talk to and have a conversation.

ROBERT GREENE

Yes, right.

PAUL GRAHAM

Seems crazy. But I really, truly thought that.

ROBERT GREENE

Right.

PAUL GRAHAM

And a lot of other people did too.

ROBERT GREENE

Yeah.

PAUL GRAHAM

It wasn't just because I was young and stupid. There were a lot of people in the government who thought that enough to give universities millions of dollars to work on it.

ROBERT GREENE

Well . . .

PAUL GRAHAM

And something like that probably will happen. But it will take hundreds of years.

ROBERT GREENE

You think so?

PAUL GRAHAM

Yes.

ROBERT GREENE

Well, that is a whole another discussion. That is a very interesting discussion about language and human reasoning and how you get a computer to reason like a human. I've seen that debate, and there are people who believe it will never happen.

PAUL GRAHAM

Never say never in technology.

ROBERT GREENE

I know. I know.

PAUL GRAHAM

If you want to say never . . .

ROBERT GREENE

100 years.

PAUL GRAHAM

. . . in an impressive sounding way, no, say it will take arbitrarily long.

ROBERT GREENE

It will take arbitrarily long. But if we could just chart your course in life.

PAUL GRAHAM

Yeah, okay.

ROBERT GREENE

Would we say, because, for me, for instance, I was a writer when I was a kid.

PAUL GRAHAM

Yeah.

ROBERT GREENE

But then I went through a great wandering period until I found my way back to writing books.

PAUL GRAHAM

Oh, same here.

ROBERT GREENE

Yeah.

PAUL GRAHAM

I was a writer when I was a kid, too. In high school, what I thought I was going to do was I thought I was going to be a writer.

ROBERT GREENE

Oh, really?

PAUL GRAHAM

Yeah. But I had no concept of how one was a writer. So it was pretty demoralizing.

ROBERT GREENE

Oh. Well, maybe that is what you should have been. Well, you are a great . . .

PAUL GRAHAM

Well, that's what I am.

ROBERT GREENE

. . . writer.

PAUL GRAHAM

I know. I just don't do it for money.

ROBERT GREENE

Actually, because that is very impressive. Your writing is really quite exciting. But do you feel like you ended up where you were meant to go in life?

PAUL GRAHAM

I don't know. I still am trying to figure out what to do.

ROBERT GREENE

Oh, really?

PAUL GRAHAM

From day to day, I feel like I am sort of on a . . .

ROBERT GREENE

Like someone is . . .

PAUL GRAHAM

Like someone going down some rapids in a boat. And I have just been sort of tossed about.

ROBERT GREENE

Yeah.

PAUL GRAHAM

I am still making it up as I go. Really, honestly. Even Y Combinator itself.

ROBERT GREENE

Yeah. But that is probably why it is successful. But we'll get to that. But I guess, then you would answer this is still sort of a question mark. You never felt like there was a destiny that you were fulfilling?

PAUL GRAHAM

No.

ROBERT GREENE

Because a lot of people have talked about that. And a lot of people that I'm looking at had that from an early age. Like Napoleon is sort of the classic with his star and it is guiding him from when he was young. You don't fit that mold?

PAUL GRAHAM

Some of these things could be made up. If I were a politician, I would make up stories about how I was destined to lead the people.

ROBERT GREENE

Well, okay. But . . .

PAUL GRAHAM

Only in Napoleon's case.

ROBERT GREENE

Well, he certainly would be capable of making it up. [laughs] But, for me, I felt like I was going to end up a writer. So, the sense of self . . .

PAUL GRAHAM

Well, I thought that I was going to be a writer. I mean, that's what I do.

ROBERT GREENE

Well, you did become a writer.

PAUL GRAHAM

I know. I know. I just don't do it for money. But that's what I actually do.

ROBERT GREENE

Okay. I guess maybe I'm saying . . .

PAUL GRAHAM

Arguably, Van Gogh didn't paint for money either. He only sold two paintings in his whole lifetime.

ROBERT GREENE

Yeah. But, I mean, the sense that, that excitement you initially had with computers and the power that it represented, I am just trying to see if there is a link to where you are now. Maybe I can't.

PAUL GRAHAM

Well, I still like programming. I love programming. I know a lot of people who were studying programming when I was, and who don't do it anymore. I feel sorry for them.

ROBERT GREENE

You created Arc, essentially.

PAUL GRAHAM

Yeah. It's a new dialect of Lisp.

ROBERT GREENE

Yeah.

PAUL GRAHAM

And Hacker News is written in Arc. Hacker News. Hacker News now gets almost a million page views a day.

ROBERT GREENE

Okay. So you are the exception, then, that proves the rule.

PAUL GRAHAM

We'll see. Maybe you don't want me in this book. You can see for yourself.

ROBERT GREENE

No. No. That's not true. That's not true. It's totally fine, because you are open and you kind of go where life takes you, which is a whole other interesting way to do it.

PAUL GRAHAM

Well, you know, you can't have a destiny to do something, to do a career that didn't exist when you started.

ROBERT GREENE

Yeah. But here's the idea. The reason why I have it there, I'm not trying to prove something that maybe isn't real. But the sense of you are not going to master something unless there is a genuine love of . . .

PAUL GRAHAM

Well, that is certainly true.

ROBERT GREENE

Well, that love has to come from something deep within. Whether it is genetic, whether it is something from when you were two to three years old, it has to be really deeply rooted in you.

PAUL GRAHAM

Yeah.

ROBERT GREENE

That's what I am trying to get at.

PAUL GRAHAM

Well, you have got me as your guy for programming and entrepreneurship or something like that.

ROBERT GREENE

Yeah.

PAUL GRAHAM

And, actually, probably, it is writing.

ROBERT GREENE

Oh.

PAUL GRAHAM

More than anything else.

ROBERT GREENE

Oh. Okay.

PAUL GRAHAM

But I do love programming.

ROBERT GREENE

Well, you love programming, because you liked it when you were a kid and you saw those movies and the power and the sense of being able to control something and create these kind of Frankensteins. And then you liked the entrepreneur because you are unconventional and you don't like working for other people and you want to be, that kind of thing.

PAUL GRAHAM

You know, actually, what makes people . . . I asked Zuckerberg, actually, what question we could put on the Y Combinator application that would detect people like him. And he said, "When was the first time you realized things were broken and you wanted to fix them?"

I think people don't become entrepreneurs so much because they can't stand working for anyone. It is because they want to do something and the only way to do it is to do it themselves. A lot of them try to do whatever it was in some company that they work for. And the company won't do it, and they have to quit to do it. But they just want to make stuff.

ROBERT GREENE

Yeah.

PAUL GRAHAM

That's what, I mean, I like making stuff.

ROBERT GREENE

OK. Well, that's where we'll end up saying what it is.

PAUL GRAHAM

You just talk about everything and you'll sort it out later.

ROBERT GREENE

I'll sort it out later. So now I want to get into what I would consider your apprenticeship phase.

PAUL GRAHAM

In programming.

ROBERT GREENE

Whatever it is. Because you went through it. Otherwise you wouldn't be here today. So, to me, it seems like there is two phases—programming and then what ended up being the entrepreneurial thing with Viaweb leading to Y Combinator.

PAUL GRAHAM

Yeah.

ROBERT GREENE

It sounds like a lot of your apprenticeship phase, some of it would come at Harvard, where you learned about programming there. You didn't go out into the world and work for IBM or anything.

PAUL GRAHAM

No. I think, basically, all of my twenties, I didn't make much money. Either because I was in grad school or I was in art school or I was in neither, but just sort of making a little

money consulting. I spent my whole twenties just learning.

What I learned was all sorts of different stuff. I mean, if AI had worked, if my illusions going into grad school had been correct, then I would have been super energetic, super excited to work on it and would have maybe been one of the people who made Hal. [laughs] It would seem like I had been one of these people who had an early calling. [laughs]

ROBERT GREENE

I see. I see what you are saying.

PAUL GRAHAM

But I was fooled. [laughs]

ROBERT GREENE

Right.

PAUL GRAHAM

The bad side was all of my plans were lying me around like a smoking wreckage. The good part was I could then learn about anything I wanted. So, I was in grad school. It was kind of cool to hang out in grad school.

You had a some amount of prestige as if you had a job. People could say, "What do you do?" And you could say, "Oh, I'm a grad student at Harvard."

ROBERT GREENE

Right. That's good.

PAUL GRAHAM

Which is just as good as having a job. But you didn't really have to be in an office at all or have a boss or anything like that. So I just hung out and learned about all sorts of different things in grad school. That's what I did. I just hung out. Then, at the last minute, I coddled together this crappy dissertation about programming language just to get out and go to art school.

ROBERT GREENE

What was your first job? Not outside of school?

PAUL GRAHAM

I certainly didn't learn anything at that. Well, actually I learned a lot of lessons about how not to do a startup.

ROBERT GREENE

Exactly.

PAUL GRAHAM

My first and only job ever was, like, only normal job. Actually, I probably never had a normal job. But I used to do a bunch of random consulting in grad school. But I didn't actually have to go there.

ROBERT GREENE

Consulting? What is that ever mean?

PAUL GRAHAM

It means you write, it means freelance programming. That's what it really means.

ROBERT GREENE

Oh, okay.

PAUL GRAHAM

Someone needs a programmer and then they will pay you to do it. That's what it means.

ROBERT GREENE

But having to work with other people in, not in a setting of an office, but with 10 or 20 other people where you have a clash of egos . . .

PAUL GRAHAM

No. I mean, I did it for like one year.

ROBERT GREENE

Okay.

PAUL GRAHAM

I went to RISD and then the Accademia in Florence, straight out of grad school. Then, when I came back from the Academia, I was out of money. I had to work for a year to get some money to go back to RISD. I worked for just one year. I had this deal with this company called Interleaf, now deceased, that I would work for one year writing code for them. It was miserable.

ROBERT GREENE

It was a large company?

PAUL GRAHAM

Not that large. They thought of themselves as a startup. I think they had a few hundred people. Oddly enough, they got acquired about the same time Viaweb did for slightly less.

ROBERT GREENE

Oh. Wow.

PAUL GRAHAM

Yeah. I went to work there, and I don't think it was a particularly formative experience. It was just sort of . . .

ROBERT GREENE

It could be negative for you.

PAUL GRAHAM

It was. I learned a lot about how not to do a startup.

ROBERT GREENE

Okay.

PAUL GRAHAM

I learned a whole bunch of negative lessons about startups. Do not move to the suburbs. Do not have a sales guy in charge of a company. Do not let the original technical guy quit. Do not take too long between releases.

ROBERT GREENE

Valuable stuff.

PAUL GRAHAM

Be wary about selling things to the government.

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

I did have sort of a job. I had what was a lot like a startup after college. I started my own consulting firm in college and got a contract from the DOE.

ROBERT GREENE

Oh.

PAUL GRAHAM

To write software. As Paul Graham Associates.

ROBERT GREENE

Oh.

PAUL GRAHAM

That was sort of like a job. I mean, you couldn't really do a startup back then. Not right out of college. But that was as close as you could get.

ROBERT GREENE

Consulting.

PAUL GRAHAM

But I actually went out to Washington state and had an office.

ROBERT GREENE

Washington state?

PAUL GRAHAM

Yeah. There's a lot of DOE stuff. No, in Richland.

ROBERT GREENE

Wait, the state of Washington?

PAUL GRAHAM

Yeah. The state of Washington.

ROBERT GREENE

Oh, Richland.

PAUL GRAHAM

Richland. Hanford is one of the three big centers of the government nuclear industry.

ROBERT GREENE

Oh.

PAUL GRAHAM

There's Tennessee.

ROBERT GREENE

That I know about.

PAUL GRAHAM

And there is one in Los Alamos and one in Hanford.

ROBERT GREENE

Hanford, Washington?

PAUL GRAHAM

Yeah.

ROBERT GREENE

I didn't know that.

PAUL GRAHAM

Yeah. Well, Hanford, the town of Hanford doesn't exist anymore. Now it is just a big nuclear lab. Gigantic place. Hanford was where . . . they had to do three things in World War II. They had to refine uranium, which they did in Tennessee. They had to refine plutonium, which they did in Hanford, in Washington state. And they had to assemble the bombs, which they did in Los Alamos.

ROBERT GREENE

Right.

PAUL GRAHAM

Those are, to this day, the three big government nuclear sites. So, I actually, when I was an undergrad, I actually applied to get a government contract with my little one man company, Paul Graham Associates, writing software for the guys at Hanford.

ROBERT GREENE

And how was that? What did you learn from that?

PAUL GRAHAM

That probably made me into a libertarian.

ROBERT GREENE

[laughs]

PAUL GRAHAM

To see how the government did things. It was just shocking.

ROBERT GREENE

The waste?

PAUL GRAHAM

Yeah.

ROBERT GREENE

Yeah.

PAUL GRAHAM

Yeah. Really shocking.

ROBERT GREENE

Right.

PAUL GRAHAM

That made me just think, I want to stay as far away from the government as I possibly can for the rest of my life.

ROBERT GREENE

That's a good lesson.

PAUL GRAHAM

Yeah.

ROBERT GREENE

Well, if you had to think of those Renaissance artists. Alberti, who went through an apprenticeship.

PAUL GRAHAM

I think Alberti is your one counter-example. You want someone like Leonardo.

ROBERT GREENE

Okay. Leonardo, Verrocchio.

PAUL GRAHAM

Alberti was an intellectual.

ROBERT GREENE

He didn't go through an apprenticeship?

PAUL GRAHAM

If anyone didn't, he didn't.

ROBERT GREENE

All right.

PAUL GRAHAM

He was an intellectual and a writer. He sort of invented the job of architect.

ROBERT GREENE

Yeah.

PAUL GRAHAM

Meaning separate from builder.

ROBERT GREENE

Right.

PAUL GRAHAM

The guy who said, "Put that over there, builder."

ROBERT GREENE

Right.

PAUL GRAHAM

But Leonardo was a classic.

ROBERT GREENE

Verrocchio, because I concentrate a lot on that relationship.

PAUL GRAHAM

Yeah.

ROBERT GREENE

Is there anything in your life that we can point to? Because programming is just all self-taught. You are doing it over and over again.

PAUL GRAHAM

Almost everyone is self-taught. That's the way programming works.

ROBERT GREENE

In programming.

PAUL GRAHAM

Yeah. In general. In general, you will find few cases where people have this classic apprenticeship relationship in programming.

ROBERT GREENE

Well, the apprenticeship doesn't have to involve a mentor, someone instructing you.

But you have to be going through a process of learning.

PAUL GRAHAM

Yeah. Sure.

ROBERT GREENE

What you could do when you were 21 isn't what you could do when you were 35.

PAUL GRAHAM

Yeah. You learn by writing programs.

ROBERT GREENE

Yeah.

PAUL GRAHAM

Everyone learns by writing programs. By the time you get to college and you decide to become a computer science major, it is probably too late.

ROBERT GREENE

Right.

PAUL GRAHAM

I know of very few examples of people who didn't take up programming before college. But, mostly, you learned it in high school.

And there is no one around in high school, even now.

ROBERT GREENE

Right.

PAUL GRAHAM

There is no one around to tell high school students what to do. So, they find books.

ROBERT GREENE

That's a good thing, though, isn't it?

PAUL GRAHAM

Now, thanks to the Internet, there is online communities where they can learn stuff.

ROBERT GREENE

But learning things for yourself is a very good trait.

PAUL GRAHAM

You become your own apprentice. There is this quote, "Your twenties are always an apprenticeship. You just don't know what for."

ROBERT GREENE

Okay. Well, so it's true about your twenties. Some people are more directed than you and I, but I would say that.

PAUL GRAHAM

I don't know what my twenties were an apprenticeship for, actually.

ROBERT GREENE

Well, there has to be . . .

PAUL GRAHAM

I mean, I learned how to program. I know how to program.

ROBERT GREENE

I mean, all of the valuable things that you are today that lead to your success, Y Combinator, etc., things you have invented, there must have been a process that led to it. The things that you learned when you were in your twenties are who you are now.

PAUL GRAHAM

Yeah. I learned about programming from the Lisp community.

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

Which was pretty tight. I mean, nowadays, programming language communities are

often pretty tight. But the Lisp community was arguably the original programming language community. And I'll know if there was a Fortran community. So I learned about programming from the Lisp community and actually from Robert Morris, who I met pretty soon after arriving in grad school. Harvard was not a big place for hackers. The theory was what they prized.

ROBERT GREENE

Right.

PAUL GRAHAM

So people were often writing things on paper. But there were a few hackers who were sitting up late at night in a computer lab. Me and Robert were the two biggest ones. So, I learned a lot just from talking to Robert.

ROBERT GREENE

Oh, really?

PAUL GRAHAM

I don't know if he learned anything from me. It would be interesting if it was a one-way thing and I simply was Robert's apprentice.

That would be very embarrassing because he was a year younger than me. But it might be the case that I was Robert's apprentice. That would be very funny. But I am not too proud to admit it. You should ask Robert if he learned anything from me.

ROBERT GREENE

Well, you learned something from him. That's the important thing.

PAUL GRAHAM

Right. If you read about the Impressionists and how they were all in this one particular atelier. What was the guy's name? There was this one particular atelier. Atelier Suisse.

ROBERT GREENE

He was the teacher?

PAUL GRAHAM

Atelier Suisse was the least restrictive of the ateliers. It was basically the art student's league. You would just show up and pay your money and you could do whatever you wanted.

ROBERT GREENE

Right.

PAUL GRAHAM

So all of these ne'er do wells were at the Atelier Suisse. They all became friends with one another, and they came up with all of these ideas in conversation with one another. Ideally, if Robert did in fact learn anything from me, and it wasn't just one way, then it was like the Atelier Suisse. That was how I learned to program.

ROBERT GREENE

I am sure he learned something from you.

PAUL GRAHAM

Well, we'll see.

ROBERT GREENE

It was back and forth. Otherwise, you know.

PAUL GRAHAM

I don't know. I wouldn't presume it. It is quite possible he didn't learn anything from me. Robert is certainly smart enough to have not learned anything from me.

ROBERT GREENE

So what kinds of things did you learn from him? Or was it all just very technical? You wouldn't call him your mentor, because he is your age. I guess.

PAUL GRAHAM

Well, a mentor is someone who is more sophisticated than you, not older. He was certainly a lot more sophisticated.

ROBERT GREENE

Well, you know, that thing that you were saying where you look at someone from behind and see what they are doing and imitate it.

PAUL GRAHAM

Yeah.

ROBERT GREENE

It is that sort of thing. Where you look at how someone is doing something and then you know how to do it.

PAUL GRAHAM

I mean, if there was anyone like that, it was Robert.

ROBERT GREENE

Okay.

PAUL GRAHAM

I mean, his father was one of the guys who wrote UNIX.

ROBERT GREENE

Oh.

PAUL GRAHAM

The guys who wrote UNIX were all in one corridor at Bell Labs. His father, also called Robert Morris was one of those guys. So, Robert grew up in UNIX and grew up with a digital PDP-1 in his basement.

ROBERT GREENE

Right.

PAUL GRAHAM

He had a very different experience from everyone else using their TRS-80s in those days.

ROBERT GREENE

Oh, sure.

PAUL GRAHAM

So, at 17, he was the guy. Do you know what TCP/IP is? TCP/IP is what the Internet runs on.

ROBERT GREENE

Yeah.

PAUL GRAHAM

It is like the Lego of the Internet. IP stands for Internet Protocol.

ROBERT GREENE

Okay.

PAUL GRAHAM

Bell Labs is where UNIX is from. When Bell Labs added support to their own internal version of UNIX for TCP/IP, Robert, at age 17, was the one who wrote it.

ROBERT GREENE

Wow. What does he do now?

PAUL GRAHAM

He was the insider's insider. He is a professor at MIT.

ROBERT GREENE

Oh.

PAUL GRAHAM

And he is one of the founders of Y Combinator.

ROBERT GREENE

Oh.

PAUL GRAHAM

And was one of the founders of Viaweb with me.

ROBERT GREENE

Oh, that I know. He is still involved with Y Combinator?

PAUL GRAHAM

Oh, yeah. He was here, staying in that house two weeks ago.

ROBERT GREENE

Well, he must have seen something in you. He must have been drawn to you for some reason, because you ended up becoming a team.

ROBERT GREENE

Well, how about the fact that to do programming, you have to have incredible focus and concentration?

PAUL GRAHAM

Yeah.

ROBERT GREENE

Is that something that you developed in this period?

PAUL GRAHAM

It was genetic. George already has it.

ROBERT GREENE

Oh. God damn, you are ruining all of my ideas. [laughs]

PAUL GRAHAM

Sorry. Sorry.

ROBERT GREENE

What do you mean it's genetic? Come on. It is hard, when you had the same focus when you were 16 that you have years later when you came up with Viaweb?

PAUL GRAHAM

Yeah. Sure. I didn't know where to point it. I had this powerful gun and I was shooting around at random. Focus for a while on some girl, and be like the crazy boyfriend.

ROBERT GREENE

Right.

PAUL GRAHAM

And then focus for a while on something that I was bad at and be better than I should have been, like soccer or something like that.

ROBERT GREENE

Right.

PAUL GRAHAM

But you just have to learn where to point it.

ROBERT GREENE

So there is no, in this twenties period, we can't think of any kind of skills that you are sort of building up.

PAUL GRAHAM

Yeah, sure. Let's see. Well, I definitely did learn how to program. I definitely learned how to program. I wrote a book about Lisp in

my twenties that was based on my thesis. My thesis was a pretty lousy thesis, but it made a decent book.

This book called, ‘On Lisp’. I decided I was going to write a book. At age 22 or something like that, I thought wouldn’t it be cool if I wrote a book. So I wrote this book about Lisp and when I started writing the book, I still didn’t really understand Lisp. But in the course of writing the book, I was forced to understand it.

ROBERT GREENE

Oh.

PAUL GRAHAM

So, probably the single biggest thing that I did to learn was write that book.

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

I had to write exemplary code because all of the code in there was examples. So I learned how to write code so clean that . . . first of all, you can’t fit big programs in a book.

No.

ROBERT GREENE

PAUL GRAHAM

One of the things I wanted to do, which was hard then, is to put whole programs in the book. And Lisp is so elegant, so concise, that you can actually do that. You can write an entire program that is that small, it will fit on one page. But only if you are really careful and don’t have anything in inessential in it.

ROBERT GREENE

That kind of forced you to master Lisp in a way.

PAUL GRAHAM

Yeah. Really, really deeply.

ROBERT GREENE

That’s good.

PAUL GRAHAM

I really understood it. And to understand Lisp is, if you remember what I said about the history of programming, to understand Lisp is to understand modern programming, because that is what all programming now is

basically what would have been considered Lisp programming in the 1970s.

ROBERT GREENE

Oh.

PAUL GRAHAM

So writing that book, maybe. But writing that book was also . . .

ROBERT GREENE

It helped you become a writer, too. Or not?

PAUL GRAHAM

No, not really. But writing that book was something I did, it was almost the result of a conversation with Robert. I didn’t just sit down and write that book. I rewrote it over and over and over, and talked about everything with Robert as I was writing it.

ROBERT GREENE

Oh.

PAUL GRAHAM

A lot of the ideas in that book are half Robert’s, and it is impossible to tell where one begins and the next ends.

ROBERT GREENE

Okay.

PAUL GRAHAM

So that is sort of what I did in my twenties. I wrote this book and I spent a lot of time programming with Robert. You are helping me, actually . . .

ROBERT GREENE

[laughs]

PAUL GRAHAM

I never tried to figure this stuff out.

ROBERT GREENE

Yeah.

PAUL GRAHAM

I always felt like I was always waiting for some apprenticeship to happen, and it sort of was in a weird, backwards way.

ROBERT GREENE

Well, as you said in your quote, it happened anyway in your twenties. It was an apprenticeship, just what was it for?

PAUL GRAHAM

Yeah.

ROBERT GREENE

I guess it was for, how old were you when you decided to launch Viaweb?

PAUL GRAHAM

30. And Robert was 29.

ROBERT GREENE

There we go.

PAUL GRAHAM

Yeah.

ROBERT GREENE

So that is what it was all leading towards.

PAUL GRAHAM

Yeah.

ROBERT GREENE

I guess.

PAUL GRAHAM

I remember when I decided to make money.

ROBERT GREENE

All right. Let's hear about that, then.

PAUL GRAHAM

I went to art school, and then I went off to New York to be a painter and to be a starving artist and all that. I was sort of an unpaid

assistant in the studio of my grad school art teacher, Idelle Weber. I was stretching canvas with a staple gun.

ROBERT GREENE

Right.

PAUL GRAHAM

I was listening to some radio station that was talking about, they were just listening to it in the house. I hadn't chosen this. Or maybe it was the TV. But they were talking about this guy who managed some big fund for Vanguard and made vast amounts of money. The idea just occurred to me, "You know, I bet I could do that."

ROBERT GREENE

Do what?

PAUL GRAHAM

I could just make vast amounts of money. Because up until that point, I had been living hand to mouth. You have probably done this at times in your life, right? There's stuff you want to work on.

ROBERT GREENE

In New York, too, yes.

PAUL GRAHAM

Yeah. So you get a bit of money, and then you're okay. You have some money in your bank account, and you can work on the stuff you want. It gradually runs out and you're like, "Oh, my god. I've got to get more money." So then you shift into panic mode.

ROBERT GREENE

Right.

PAUL GRAHAM

Then you try and frantically work until you get more money. And then you build some up and then you can work on what you want again.

ROBERT GREENE

That's like the story of my twenties and thirties.

PAUL GRAHAM

Yeah. A lot of mine, too. So that is what it was like in New York.

ROBERT GREENE

Right.

PAUL GRAHAM

So I heard about this guy who was making tons of money managing some fund for Vanguard. And I thought, "I bet I could make lots of money. I should just try to make lots of money and then I won't have to do this."

ROBERT GREENE

Stretching canvas.

PAUL GRAHAM

Well, no, I wasn't getting paid for that. I just happened to be stretching canvases as I was hearing this. I was doing freelance programming, basically.

ROBERT GREENE

Oh, I see.

PAUL GRAHAM

Consulting. That's what I always did, except for that one bit at Interleaf.

ROBERT GREENE

That's pretty good. I think that is . . .

PAUL GRAHAM

You can make a lot of money programming.

If you want a day job where you can make tons of money that won't take up a lot of time, it has got to be the most efficient.

ROBERT GREENE

Well, I am figuring out why things like maybe "The 48 Laws of Power" are kind of irrelevant a little bit to your life. Because you really weren't having to deal with that.

PAUL GRAHAM

No.

ROBERT GREENE

And you were kind of avoiding it.

PAUL GRAHAM

No. Yes. Deliberately.

ROBERT GREENE

Which is very good. But that is not how, it is an unusual story. Most people have to suffer through that.

PAUL GRAHAM

Well, you should make another law actually, that's like, "If possible, avoid places where these laws are enforced." [laughs]

ROBERT GREENE

That would be the 49th. You're right. But, for a lot of people, you can't. I mean, how are you going to make that law for people who get into politics?

PAUL GRAHAM

Don't. Don't go into politics. Seriously. I think, more and more, you can avoid it.

ROBERT GREENE

Yes.

PAUL GRAHAM

It used to be, like in the mid-20th century, it was all about large organizations and economies of scale, and to participate in that you had to put up with politics.

ROBERT GREENE

But, even now. I don't want to get too on a tangent here, but you start off with Google and you've got this little small thing and now

you've turned into this mega monster. I don't know if you saw the article in the New York Times about how . . .

PAUL GRAHAM

Well, Larry and Sergey . . .

ROBERT GREENE

. . . bureaucratic it's becoming.

PAUL GRAHAM

Yeah. Yeah. But, that's the . . .

ROBERT GREENE

It's the way of the world. You can't avoid that.

PAUL GRAHAM

No. But for Larry and Sergey's experience, they are on the top. All the political crap is happening below them. They have to deal with it to some extent. They have to deal with Machiavellian people trying to charm them and stuff like that. But they don't have to deal with it the way a participant does.

It is someone who shows up at Google now that it is a big company who has to deal with politics. But someone who is starting a startup, they don't have to deal with politics

now. The startup grows up underneath them like a gopher hole and it's down there.

ROBERT GREENE

But I still maintain it would be essential to have this knowledge and hopefully not use it.

PAUL GRAHAM

Well, I'll tell you the truth. I was interested enough in that book to buy it. I saw it in the store and I read it and I thought, "Ugh. I don't want to know this stuff." Put it down.

ROBERT GREENE

I can understand that as I'm listening to you, but . . .

PAUL GRAHAM

It was like reading about some gruesome medical procedure that you hope will never be necessary to happen to you.

ROBERT GREENE

Well, and it didn't happen to you, which is good. But, what was I going to say? I can't remember. I don't know what I was going to say. I mean, a lot of people can't avoid it.

PAUL GRAHAM

Well, they think they can't avoid it. But they could if they really wanted it.

ROBERT GREENE

I know what I was going to say. Even now, with Y Combinator, with the success that you are having with the 20,000 applications that you are getting, you are dealing with people, some of whom might try and trick their way in or whatever.

PAUL GRAHAM

Oh, yeah.

ROBERT GREENE

You've got to develop a bullshit detector. You have to know how some people are charming. And in fact the latest thing that I read is you are not so interested in people's ideas. You are interested in what they've done before.

PAUL GRAHAM

Yeah.

ROBERT GREENE

Do you know what I'm talking about?

PAUL GRAHAM

Yeah.

ROBERT GREENE

So, it is almost like you are interested in their character.

PAUL GRAHAM

Yeah. Yes. Absolutely.

ROBERT GREENE

That is total 48 Laws of Power stuff right there.

PAUL GRAHAM

Yeah, but you know what?

ROBERT GREENE

You are getting in through the back door . . .

PAUL GRAHAM

You know what my solution is?

ROBERT GREENE

It's unavoidable.

PAUL GRAHAM

No, it's not. Here's my solution. I outsource that. Jessica has perfect pitch for character.

ROBERT GREENE

Okay.

PAUL GRAHAM

She is one of these weird people. She is almost an idiot savant for character. I can just ask her. But, she in particular has this like weird . . .

ROBERT GREENE

Okay.

PAUL GRAHAM

We call her at Y Combinator the social radar. So, I just ask her, "Is this person good or bad?"

ROBERT GREENE

Okay. But, if you didn't have her. You were smart enough to find a tool, Jessica, to use. It is still unavoidable.

PAUL GRAHAM

No. I didn't find her. I already knew her when we started Y Combinator.

ROBERT GREENE

Right. But you knew that she could fulfill this great function for you.

PAUL GRAHAM

I don't know if I knew that at the time, actually. Y Combinator started very much by accident. But, as we were doing it, it became clear that that's how it was going to work. It was really an experiment that worked. It could have been an experiment that failed.

ROBERT GREENE

Right.

PAUL GRAHAM

The reason it worked was because we happened to have all of the ingredients necessary.

ROBERT GREENE

Yeah.

PAUL GRAHAM

We didn't know at the time.

ROBERT GREENE

Okay. All right.

PAUL GRAHAM

A lot of things I did were experiments that worked.

ROBERT GREENE

Well, okay. I mean, I agree with you, that would be the ultimate thing is to never have to deal with the laws of power. But it would be . . .

PAUL GRAHAM

I should read the book so I know what I am talking about, because I really don't remember in detail what they were. I just remember it was a bunch of sneaky crap.

ROBERT GREENE

No. No. I'd say a third of it is sneaky crap.

PAUL GRAHAM

Okay.

ROBERT GREENE

Another third of it could go either way.

PAUL GRAHAM

[laughs]

ROBERT GREENE

And then the other third of it is totally . . .

PAUL GRAHAM

For actually getting things done.

ROBERT GREENE

Another part of it is common sense, noble wisdom.

PAUL GRAHAM

Yeah. I am very, very interested in how to get things done.

ROBERT GREENE

Okay. You might like this, then. It is more like that.

PAUL GRAHAM

Oh. The most interesting thing I've heard in 2010 was probably from Charlie Rose. Charlie Rose came to Silicon Valley and had lunch with a couple of people from Silicon Valley at Ron Conway's house. That guy has interviewed 20,000 people. Or, rather, he has done 20,000 interviews. There have been a lot of duplicates. He knows how the world works, probably more than anybody else.

ROBERT GREENE

I should be interviewing him.

PAUL GRAHAM

You should. Boy, if you want a master, you really should.

PAUL GRAHAM

But you know what he said?

ROBERT GREENE

What?

PAUL GRAHAM

He said, I don't know how this came up, but he said, "The way things get done in the world is because of two things -- relationships between people and focus." That is how shit happens.

ROBERT GREENE

That is exactly right. I have no disagreements with that.

PAUL GRAHAM

Yeah. And I realized after he said that, that that's what Y Combinator supplies. Focus followed by relationships.

ROBERT GREENE

But the relationships can't help but involve politicking.

PAUL GRAHAM

I don't think so. Like my and Robert's relationship was fabulously valuable. But I don't think there was a lot of politics. There really wasn't. If you have a bunch of peers who are working together, really, they can't be manipulating one another.

ROBERT GREENE

I don't know. That's how it originates. How Microsoft might have originated. But look at Microsoft now. That's like the great den of politicking the 48 Laws of Power.

PAUL GRAHAM

Oh, God, yes. I bet it is.

ROBERT GREENE

And it is happening at Google as we speak. It is just the way of the world.

PAUL GRAHAM

Well, it is like a decay.

ROBERT GREENE

[laughs]

PAUL GRAHAM

It is what happens when things are bad. When things go wrong. I should just read the book. I should find it, find where my copy is.

ROBERT GREENE

Well, I gave a talk, I was just at Yale. I gave a talk and it was exactly on this subject. The subject was the Machiavellian intelligence, and the idea that humans are actually wired for this kind of politicking.

PAUL GRAHAM

I believe you. I believe you. I read *The 48 Laws of Power*, and it is like having buttons pressed that I wish to suppress.

ROBERT GREENE

Yeah. I know, I know. And maybe if we evolved beyond it, that would be wonderful. But . . .

PAUL GRAHAM

Or how about if you just avoided situations. People have all kinds of bad impulses. I have heard fairly convincing arguments that men have this natural tendency towards infidelity.

ROBERT GREENE

Some of them.

PAUL GRAHAM

Or to murder people when you are angry or something like that. But the best thing of all is if you put yourself in a situation where these tendencies are not invoked. Because I find it depressing. I may be able to manipulate people, but I feel dirty afterwards.

ROBERT GREENE

Well, that's a good thing. That's fine. But, as I said, it would be useful to be able to know. Because I am a little bit more in your direction, honestly. It would be useful to know when people are doing it to you.

PAUL GRAHAM

Oh, yeah.

ROBERT GREENE

And upon occasion, use this when necessary.

PAUL GRAHAM

One of the things that I like about Y Combinator is it is more like a jellyfish than a vertebrate. It is sort of like a company in

the sense that there is all these large numbers of people all working on things to generate wealth and some amount of it filters to us. But it is not this top down brain telling the body what to do.

ROBERT GREENE

No.

PAUL GRAHAM

It is like some more primitive animal. Secretly, I am kind of hoping it is the replacement for the corporation. We'll see.

ROBERT GREENE

I am totally for that.

PAUL GRAHAM

Yeah.

ROBERT GREENE

I hate all that stuff. I hate the old way of doing things and the corporate mentality and advertising budgets and the whole scale that they have.

PAUL GRAHAM

Yeah.

ROBERT GREENE

And I think it is going away. But human nature won't change because of that.

PAUL GRAHAM

Human nature is still the same as it was, I mean, I don't believe that evolution has changed our tendency to murder one another and cheat on our wives and stuff like that.

ROBERT GREENE

Right.

PAUL GRAHAM

But I don't think people murder one another and cheat on their wives as much as they used to. Certainly they don't murder one another as much as they used to.

ROBERT GREENE

No. But that aggression has been channeled in other directions.

PAUL GRAHAM

Okay. But that's better. [laughs] That's better.

ROBERT GREENE

Yeah.

PAUL GRAHAM

Far better to kill people on shoot ‘em up games.

ROBERT GREENE

Well, the 48 Laws isn’t about shooting people, it’s about how aggression gets channeled in ways we don’t expect it to.

PAUL GRAHAM

You are saying it’s inevitable that I will have to worry about people doing this kind of thing to me?

ROBERT GREENE

No, I don’t think so.

PAUL GRAHAM

And if we were trying to create a Google, then, yeah, sure, I would have to worry about it. But I think I have to worry about it much less, because what happens is, we don’t manage people. The market hires and fires people. All we do is get these things started and they spread out.

ROBERT GREENE

I agree with you. I agree with you, and I am watching as I am hearing your whole story. I’m thinking, “God, this is somebody who has avoided all of these other things that other people have had to go through.”

PAUL GRAHAM

Because I can’t stand it.

ROBERT GREENE

I know. But the only thing I could say was that you found Jessica to deal with a little bit of the 48 Laws that have managed to filter their way into the Y Combinator realm.

PAUL GRAHAM

Yeah.

ROBERT GREENE

So, there you go. That’s a good thing.

PAUL GRAHAM

I think my ability to detect sneaks has atrophied because I can just ask her.

ROBERT GREENE

Because as you get bigger and more successful, it is inevitable that you are going

to get that kind of crap coming in, where people are going to try and fool you or they know now the formula that seems to work for getting accepted into Y Combinator.

PAUL GRAHAM

Oh, it’s already happened.

ROBERT GREENE

Okay.

PAUL GRAHAM

We have gotten fooled a bunch of times.

ROBERT GREENE

Okay, so you were alluding to Viaweb and you heard this thing on the radio, and you thought, “I can make a lot of money.”

PAUL GRAHAM

Why don’t I just make a ton of money and I won’t have to keep doing this consulting thing. So, we deliberately started Viaweb to make money.

ROBERT GREENE

You and Robert?

PAUL GRAHAM

Yeah.

ROBERT GREENE

Okay.

PAUL GRAHAM

So we decided we would start a startup and sell it and make lots of money.

ROBERT GREENE

And how did you come up with Viaweb? The idea for online . . .

PAUL GRAHAM

Because Netscape was just about to do its IPO then.

ROBERT GREENE

Yeah.

PAUL GRAHAM

And it was doing tons of PR.

ROBERT GREENE

Yeah.

PAUL GRAHAM

It had to make up some story about why a company doing software for this thing called the Internet would be valuable. So they were telling everybody that there would be a lot of commerce on the Internet and that's why they

should pay a lot for shares of Netscape. It was all this talk about Internet commerce. There was no actual Internet commerce going on. [laughs] Just a lot of talk about it.

ROBERT GREENE

How did you know that this would actually lead to something? How did you . . .

PAUL GRAHAM

We might have been wrong. We believed the PR just like everybody else did.

ROBERT GREENE

Oh.

PAUL GRAHAM

In fact, what happened was, we thought, "Oh. Merchants want to sell online?" We didn't know any merchants. We weren't merchants. We believed all this crap.

ROBERT GREENE

Well, it ended up being, maybe it was a vision. Maybe you were . . .

PAUL GRAHAM

Well, what happened was, we wrote all this software for selling online and we went to

some merchants to try and offer them the opportunity and they are like, "No. We don't want to." Nobody gave a shit. [laughs] We were so early.

ROBERT GREENE

You started by writing the actual software.

PAUL GRAHAM

Yeah.

ROBERT GREENE

That would be . . .

PAUL GRAHAM

For generating online stores.

ROBERT GREENE

It wasn't running via the Internet?

PAUL GRAHAM

Oh, yeah. We discovered the idea of web apps, which Viaweb was the first web app.

ROBERT GREENE

Right. I know.

PAUL GRAHAM

That's why it was called Viaweb.

ROBERT GREENE

You are the inventor of online . . .

PAUL GRAHAM

I remember the moment I thought of that. The reason we did it, actually, was because we hated writing Windows software so much.

ROBERT GREENE

Oh.

PAUL GRAHAM

I mean, that's inaccurate, actually. We hated Windows so much that we never learned how to write Windows software. We didn't even want to learn. In describing this, it is funny how much of what I have done has been to avoid unpleasant things.

ROBERT GREENE

[laughs]

PAUL GRAHAM

We were of two minds, because we wanted to start this startup to write software for generating online stores. But it seemed like what a software company was then, was a company that wrote software that ran on Windows.

ROBERT GREENE

Right.

PAUL GRAHAM

But we hated that. We were used to writing software that ran on UNIX, which is what all the web servers ran. So we wrote version one as just a regular app on UNIX machines. And we were thinking, "Oh God. The next step is to translate it and figure out how to write some fucking Windows app."

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

Which just seemed so miserable. If we had had to do that, we never would have continued with the startup, actually. But one morning, I just woke up with this idea of just letting the software run on the web server and not actually putting any software on the guy's computers. They would just use it through Netscape.

ROBERT GREENE

Do you know where this idea came from?

PAUL GRAHAM

Yeah. It came from X Windows. There was this program that everybody used back then in universities where you would be running Windows in the sense of a GUI, displaying stuff on a computer that you were using, but the process that was driving it all was running on some other computer on the local network. So what we were thinking was, we could write something that had that same kind of architecture except instead of local network it would be using the Internet. So we would be using some . . .

ROBERT GREENE

It was an analogy.

PAUL GRAHAM

Yeah.

ROBERT GREENE

It's a classic creative . . .

PAUL GRAHAM

Yeah. We would be using a web server as if it was an X server.

ROBERT GREENE

Okay.

PAUL GRAHAM

It would be showing stuff on your screen and we would be using the browser. The browser, essentially, is an X term. An X terminal.

ROBERT GREENE

Uh-huh.

PAUL GRAHAM

It was one of those things where . . .

ROBERT GREENE

Nobody had done that before? Nobody had thought of that?

PAUL GRAHAM

No.

ROBERT GREENE

Okay.

PAUL GRAHAM

We only thought about it because (a) we were ridiculously early because we believed all this Netscape PR. And (b) we did not know how to write Windows apps and did not want to learn. So we had a couple of

things driving us. It was one of these things where the browser was supposed to be for consuming stuff. It wasn't supposed to be for controlling an app. Links were supposed to be hyperlinks. But we thought, "Okay. We'll make this link that when you click on it, it can tell the server anything. It could run some software on the server. So we'll make an application that people use just like a desktop app except people will control it." Clicking links on a web page. Whoa. If you think back, that was kind of a wild idea.

ROBERT GREENE

Why hadn't anybody thought of that before?

PAUL GRAHAM

Well, it was a stupid idea. The way software was supposed to work was it was supposed to run on the desktop. It turns out there is all kinds of advantages of running software on servers. The greatest of which is that you can do continuous releases. You don't have to constantly deploy things to people's desktops.

ROBERT GREENE

But you didn't know this at the time.

PAUL GRAHAM

No. No. We only did it so that we could avoid writing desktop software. It turned out to have all these benefits. But, for us, the big benefit, the only benefit was that we wouldn't have to learn how to use . . . we didn't even know how to use Windows, let alone write software for it. I have never used Windows except when I have to borrow somebody else's computer. But I have never owned a Windows machine. It looks like I never will.

ROBERT GREENE

Neither have I.

PAUL GRAHAM

Really. Yeah. Interesting.

ROBERT GREENE

Well, what do you mean? I've had Macs since the very beginning.

PAUL GRAHAM

Yeah. Yeah. Well, I had Macs in the very beginning. Then, machines running, not

Linux, but FreeBSD, which is a lot like Linux. Then, Macs, now, since OS X have been UNIX underneath.

ROBERT GREENE

Oh.

PAUL GRAHAM

So all the developers now just use Macs. Not all, I mean, the Linux people will kill me. But most developers just use Macs because it has got a real UNIX machine underneath with just a Mac skin on top.

ROBERT GREENE

Right. But once you discovered this, because you hated and couldn't write on Windows, did it suddenly dawn on you that this could actually contain other advantages that you hadn't thought of?

PAUL GRAHAM

Well, when we first started doing it, we weren't sure it would even work. We thought, "Let's try and build this program that we control by clicking on links in web pages and see if it can even be done." In one or two

days we made the first version, and it was obvious that this whole concept of a web app would work.

ROBERT GREENE

Were you pretty excited when you discovered that?

PAUL GRAHAM

Yeah, actually, I was excited when I had the first idea. When I had the idea, I remember, it was one of these eureka moments. I was lying there.

ROBERT GREENE

Tell me about the eureka moments, because I love eureka moments. Did you wake up or were you looking at the app?

PAUL GRAHAM

Yeah. I was lying in bed.

ROBERT GREENE

Yeah.

PAUL GRAHAM

I was staying at Robert's apartment. But I didn't actually live there. I was just visiting. I lived in New York. I was staying in Robert's

apartment and I was lying on this bare mattress. It was hot. It was summer. Lying on this bare mattress just on the floor in the middle of a room. I was lying in bed in the morning when you are half awake except it was probably about noon.

I remember the way the thought came to me. It was like, "Can't you just run all the software on the server, just like you would with an X server? Couldn't you just use the browser like an X client? Could you do that?" And I am trying to imagine how you would click on links and how to run software on a server.

ROBERT GREENE

I wonder how the thought of the analogy of the X server and running it on the Internet came to you?

PAUL GRAHAM

That style of architecture was how things were done by default in the UNIX world.

ROBERT GREENE

Yeah.

PAUL GRAHAM

But I remember when I realized that you could. I realized basically the sentence, I don't remember the sentence, but it was something like, "You could control a program by clicking on links." And when I thought of that, I sat bolt upright in bed.

ROBERT GREENE

Wow.

PAUL GRAHAM

Like the letter L on this mattress lying on the floor. We're just sitting there, like, "Holy shit. We have to try this out. This could actually work."

ROBERT GREENE

So you told Robert. What did he say?

PAUL GRAHAM

He said, "Yeah. That might work. Let's try it."

ROBERT GREENE

He didn't get as excited as you were?

PAUL GRAHAM

He never gets as excited as I do. But he was pretty excited.

ROBERT GREENE

Right.

PAUL GRAHAM

And it was a pretty cool idea, to control a program by clicking on links.

ROBERT GREENE

Yeah.

PAUL GRAHAM

It was probably not necessary to do that level of computer stuff in order to make a successful online store builder. We just did it in a very boffin way, because we were good at programming and we didn't know shit about business. So we tried to turn it into a game where you won by being good at programming.

ROBERT GREENE

Probably that played to that barriers to entry thing that you are talking about. You did something so weird and unique and different.

PAUL GRAHAM

Not only were our competitors not able to build something like this, it took them a long time to even understand that it was a good idea.

ROBERT GREENE

Right.

PAUL GRAHAM

Our biggest competitor kept writing desktop software for a long time.

ROBERT GREENE

Right.

PAUL GRAHAM

They didn't even start building web based stuff until just before they went out of business.

ROBERT GREENE

How long did it take you then from the moment that you had that idea sitting bolt upright to actually interest that angel investor that ended up coming on?

PAUL GRAHAM

A long time. Well, there were different investors. The very first investor was Julian.

ROBERT GREENE

Yeah. That's who I mean.

PAUL GRAHAM

The husband of Idelle.

ROBERT GREENE

Oh, okay.

PAUL GRAHAM

Whose house I was stretching canvases in.

ROBERT GREENE

Oh, right. Right. Yeah.

PAUL GRAHAM

When I decided I would try and make a lot of money. He was a cool dude. He was retired then. But he had been president of *National Lampoon* magazine.

ROBERT GREENE

Wow.

PAUL GRAHAM

So he knew about business, but he was not a suit.

ROBERT GREENE

Right.

PAUL GRAHAM

He was also a lawyer. So he didn't give us \$10,000. What he did was he gave us his credit card number and said we could spend up to \$10,000.

ROBERT GREENE

Oh, that's a good idea.

PAUL GRAHAM

Yeah. So, essentially, he gave us \$10,000, and he got us all set up as a company, which, to hackers, seems like this completely incomprehensible thing.

ROBERT GREENE

To be incorporated.

PAUL GRAHAM

Dead stop obstacle. It's not that hard. To hackers, it seems so foreign. That was the model for Viaweb, actually. Viaweb is just the deal that we got with Julian systematized. For that, we gave him ten percent of the company for 10,000 bucks and setting us up.

ROBERT GREENE

He did pretty well, didn't he?

PAUL GRAHAM

Well, it feels like. What I was thinking to myself when I was starting Viaweb, I was thinking, "Julian got a good deal out of that." But, actually, so did we, because if it hadn't been for Julian, we never would have made it. That company never would have even happened.

ROBERT GREENE

Not bad for a little \$10,000 investment.

PAUL GRAHAM

But he didn't just. He gave us a lot of advice, he invested 10,000 back when we were . . .

ROBERT GREENE

He would be your mentor for Y Combinator.

PAUL GRAHAM

More like the model for Y Combinator.

ROBERT GREENE

A model. Whatever you want to call it.

PAUL GRAHAM

Although he did teach us a bit about business.

ROBERT GREENE

Yeah. Okay.

PAUL GRAHAM

If your whole book is going to be about formal apprenticeships, I am going to be the counter-example.

ROBERT GREENE

No. First of all, you're not. It is a way through everything here.

PAUL GRAHAM

I figured out everything in this very messy way with bits and pieces of advice from different sources.

ROBERT GREENE

Yeah. But that's a good thing. A lot of people do want to avoid the conventional way of doing things. Going to university and having to learn from other people and going into a large business. So, you are the model for that. What you ended up doing was you avoid all of the painful stuff. Your avoidance of the pain is an interesting strategy.

PAUL GRAHAM

Even in college, avoiding major requirements.

ROBERT GREENE

Okay.

PAUL GRAHAM

Getting into that thing where I could just do what I wanted.

ROBERT GREENE

Young people are going to be really excited by that, because a lot of young people really want to avoid that pain.

PAUL GRAHAM

Yeah.

ROBERT GREENE

Then your twenties are a very valuable apprenticeship.

PAUL GRAHAM

Not just pain, but bullshit. Avoiding bullshit.

ROBERT GREENE

Bullshit is pain.

PAUL GRAHAM

Bullshit is demoralizing. It makes you stupid. It is a particular sort of pain. There are

different kinds of pain. The kind of pain that you get from running, from being out of breath is different from the kind of pain you get from someone jabbing you with a nail.

ROBERT GREENE

I would disagree with you on this.

PAUL GRAHAM

Don't you think there is good pain and bad pain? I like good pain.

ROBERT GREENE

I do, too. I work out every day.

PAUL GRAHAM

Yeah, it feels wholesome.

ROBERT GREENE

I work very hard. Okay. But . . .

PAUL GRAHAM

Whereas dealing with someone who is sneaky just gets you down.

ROBERT GREENE

You know what? But it doesn't necessarily have to. What if it didn't get you down?

PAUL GRAHAM

That would be . . .

ROBERT GREENE

What if you treated it like a game?

PAUL GRAHAM

Ugh.

ROBERT GREENE

Like, "All right. I am not going to get involved. I am not going to become sneaky. But I am going to understand this person because it is inevitable, and I am going to be above them because I don't have their ugly instincts. But I am going to know how to deal with them."

PAUL GRAHAM

That is like saying that I can take up hanging out with . . .

ROBERT GREENE

Once you have gotten that, whenever a despot enters your life, and there will always be despots entering your life, you will know exactly how to deal with them.

PAUL GRAHAM

So far I have managed to avoid them.

ROBERT GREENE

But you are not going to avoid it your whole life.

PAUL GRAHAM

I made it to 46.

ROBERT GREENE

Unless you die tomorrow.

PAUL GRAHAM

I'm probably more than halfway through.

ROBERT GREENE

It is going to happen. I swear to you it is going to happen. You are going to call me up one day in ten years. . .

PAUL GRAHAM

No. No. I will ditch Y Combinator first.

ROBERT GREENE

[laughs] Well, that's when it will happen.

PAUL GRAHAM

Before I have to deal with that kind of stuff. Fine. All right. What were we talking about?

ROBERT GREENE

So, you are saying that you didn't have an apprenticeship, but you very much had a very strong apprenticeship.

PAUL GRAHAM

Okay. So I did.

ROBERT GREENE

But it was a meandering apprenticeship where you were finding your way.

PAUL GRAHAM

From different people and different sources.

ROBERT GREENE

Different people, different skills. Some of it is on your own. Some of it from Robert Morris. Some of it from Julian.

PAUL GRAHAM

Yeah.

ROBERT GREENE

A very rich apprenticeship and RISD and Florence.

PAUL GRAHAM

And writing that Lisp book.

ROBERT GREENE

Right. You lived and all of these things are part of the soil. So, you had a very rich apprenticeship.

PAUL GRAHAM

Diverse.

ROBERT GREENE

Rich.

PAUL GRAHAM

[laughs] Okay. So with Viaweb, let's see, where were we? We raised money. We got \$10,000 from Julian. Just basically, also, the other thing was, Julian gave us 10,000 bucks just because of who we were. That is also the way Y Combinator works. He didn't care what the idea was. He thought we were smart guys and maybe we would multiply his \$10,000 by a lot. As it turned out.

ROBERT GREENE

The same thing happened to me. I will tell you the story later about the guy who discovered me. I had my own Julian. He paid

me to live while I wrote the book, but only because he thought I could pull it off.

PAUL GRAHAM

Interesting.

ROBERT GREENE

So were you worried that someone was going to come and steal your thunder before you? Not steal, but get there before you?

PAUL GRAHAM

With Viaweb?

ROBERT GREENE

Yeah.

PAUL GRAHAM

Oh, yeah. We were terrified. We thought that what we were doing was so obvious that everybody else must be working on it. We were so wrong. It wasn't obvious. It was actually way ahead of its time. But it seemed obvious to us. We felt like we were super late. In fact, we were almost fatally early.

ROBERT GREENE

Oh, interesting. You just had to kind of learn on your own about how to put this together?

There was no other model out there for something like this.

PAUL GRAHAM

You mean the code?

ROBERT GREENE

The code and the idea of this kind of business.

PAUL GRAHAM

Yeah. We had to explain to people a lot what a web startup was. We didn't try and do any strategic explaining to anyone. We would just talk to individual potential customers. We would say, "You should have an online store." Actually, we didn't have to explain much to those guys, because they were so unsophisticated. They didn't even care or understand where the software was running. They just knew if they went to this URL and clicked on the button that they were supposed to click on, they ended up with an online store. A lot of them probably thought it was running on their desktop computer.

ROBERT GREENE

Oh.

PAUL GRAHAM

So we never really had to get into that.

ROBERT GREENE

Huh. Interesting.

PAUL GRAHAM

After we were bought by Yahoo, this guy who had been covering us in the trade press for years wrote an article about it and talked about how quick it was to download the software. [laughs] He still thought it ran on the desktop.

ROBERT GREENE

Oh. [laughs]

PAUL GRAHAM

It never had.

ROBERT GREENE

All that time. So he had been following you for years? What do you mean?

PAUL GRAHAM

When we got bought, we had been around for a while. It was three years later when we got bought.

ROBERT GREENE

I see. That formative time was just writing the code and perfecting it kind of thing?

PAUL GRAHAM

Yeah. We had to make a good website builder that ran on the server. The idea, we called it a server based app.

ROBERT GREENE

Right.

PAUL GRAHAM

The phrase web based app was actually invented by a guy at our PR firm.

ROBERT GREENE

Oh.

PAUL GRAHAM

Web based? The Web is the thing that connects the servers. It is really a misnomer to call something web based. But he wasn't

so fussy about that. It sounded cooler to say web based.

ROBERT GREENE

It does sound better. Did you make any kinds of mistakes when you look back on the whole thing?

PAUL GRAHAM

Oh, my god. Yeah. Sure.

ROBERT GREENE

Like what? I want to learn from the mistakes. You are saying great stories come from hearing about mistakes.

PAUL GRAHAM

We were very dubious about even starting the company. We were terrified about the responsibility that it would entail.

ROBERT GREENE

[laughs]

PAUL GRAHAM

Because if we had users. With a server, with a web based app, it is not like you have this piece of software that you ship to people and

that you can go out of business the next day and it keeps working.

ROBERT GREENE

You have to hear their complaints.

PAUL GRAHAM

Their stuff is running on your server.

ROBERT GREENE

Yeah.

PAUL GRAHAM

You have to keep the server up or no one can get to their online store. People don't have much of a sense of humor about that. So it was really kind of terrifying. It would have been frightening enough starting a company.

ROBERT GREENE

Yeah.

PAUL GRAHAM

But a web based company has a much closer relationship with its users than a traditional software company. So, it was double terrifying. Really, we were very, very ambivalent about even doing it. Then, we had to try and get users. I didn't know anything

about sales. So the way I would try and get users is basically call people up and tell them that they would be stupid if they didn't use our software to sell online. That was true, but it was not the way to convince people.

ROBERT GREENE

That is not the art of seduction.

PAUL GRAHAM

No. But I was the sales dude because Robert and Trevor were the only other guys working on it. And they would have been even worse.

ROBERT GREENE

Yeah. With what you said about Robert, I don't think he would be a good salesperson.

PAUL GRAHAM

Trevor, too. It is me and two Wozniacks, basically. I had to be the sales guy. I did it really badly. But some people went for it anyway, and we managed to get some users.

ROBERT GREENE

What were some of the things that you couldn't believe that you did? The mistakes,

the things that you learned that you now teach some of your Y Combinator students?

PAUL GRAHAM

Well, we didn't understand anything about investors. We couldn't tell good investors from bad investors. They all seemed pretty much the same to us. We were really naive about getting acquired. Basically, the day we launched, a giant company came along and offered to acquire us for \$3 million. Our big angel investor at that point, this was after Julian, we had already raised some more money. Our big angel investor was this metals trader from New York. This unbelievably fearsome guy, like you might expect a metals trader in New York to be. We thought, "Well, this guy is a professional negotiator." We'll just let him handle the negotiations.

We went down and we had this meeting in Julian's loft in New York. The guys from the big company came, and we were sitting there, too, at this long table. The guys from the big company said, "We'll give you \$3 million for

the startup.” And the metals trader said, “For \$1 million, we will sell you an option to buy it in a year for 20.” The guys from the big company were like, “What? This isn’t how M&A even works.”

ROBERT GREENE

How what works?

PAUL GRAHAM

M&A, mergers and acquisitions. They couldn’t even know what to make of this. It was like he had handed them some kind of puzzle.

ROBERT GREENE

Right.

PAUL GRAHAM

So they were like, “No, thank you.” You know what they said? They said, “Well, can you give us any recommendations for where to eat in New York?”

ROBERT GREENE

[laughs]

PAUL GRAHAM

By way of saying, “Okay, this conversation is over. Thanks for wasting our time.” I realized I was so slow. I realized the next day, “Gosh. They are probably not going to buy us.” I had more than a third of the company at that point. So if they had bought us for \$3 million, that would have been like \$1 million for me personally, and I had negative \$5,000 in assets. In the sense that I had basically zero plus I owed the government \$5,000 in taxes. I thought, “Shit. I just lost a million dollars. A million dollars. One million dollars.” So, I called up the guys at the big company and I said, “You still want to buy us?” They said, no, assholes. [laughs] Not in those exact words. They said no, very frostily. I’m like, “Fuck, I lost a million dollars. Oh, no.”

ROBERT GREENE

You would think if they were willing somebody else would be.

PAUL GRAHAM

Well, our first reaction was panic. “Oh, my god. We lost a million dollars.” After about a week of panic, we thought, “Well, if they wanted to buy us, someone else will buy us.” And you know what? That turned out to be wrong. It took a really long time for the next acquirer to appear, during which time we were just totally desperately trying to sell the company to anyone who wanted to buy it. Anyone who seemed like they might buy it.

ROBERT GREENE

You just wanted out?

PAUL GRAHAM

No. We didn’t want to fail. We didn’t want to get out. We felt like we had lost this million dollars and we wanted to get it back.

ROBERT GREENE

Oh.

PAUL GRAHAM

That’s what it was. We had it in our hands.

ROBERT GREENE

Right.

PAUL GRAHAM

It is like we had had a million dollars and then lost it. Aah. For someone who never had any money. I was trying to solve the money problem and that would have been solving it, by my standards, then. We botched this whole initial conversation. Then, the result of botching it overhung the company for the next two years.

ROBERT GREENE

Two years?

PAUL GRAHAM

Yeah. We went around trying to get bought by anybody. And it was really probably two years before we felt like, “You know, this is a good company. Someone is definitely going to buy it for something. We don’t need to be so panicked about getting bought. Someone is going to buy us. We will just stick to our knitting and do a good job.”

ROBERT GREENE

Yeah.

PAUL GRAHAM

Anyone in that situation now, I could tell them exactly how things would be. Exactly what the big . . .

ROBERT GREENE

What was the lesson then from this?

PAUL GRAHAM

Well, the lesson is deals fall through.

ROBERT GREENE

Yeah. And don’t panic.

PAUL GRAHAM

Just in general. Just assume that deals are going to fall through. What I tell startups now is treat deals like the side thing. You just work on the company. You know the Johnnie Walker ads that say, “Keep walking”? That’s what I tell people to do. The minute you stop and talk to them, then dealing with those guys is going to become the big priority, not working on the company, which just weakens your position. Because the only reason they want to talk to you in the first place is because

of the good work you were doing on the company.

So, just work on the company. Work on the company. Never stop and talk. You should make it so that it is as if you are just walking along, going wherever you were going.

ROBERT GREENE

But that is perfect strategy. That is something right out of *The 48 Laws of Power*.

PAUL GRAHAM

I’m sure. Okay. So, maybe part of it applies to startups. You should write a book about the part that applies to startups.

ROBERT GREENE

You already do a much better job than I would.

PAUL GRAHAM

Yeah. Well, what we tell people is keep going on whatever you were doing. And make them run alongside you trying to say, “Hey. Hey. Wait. I’ll give you this much money.” And you just keep looking forward and you say, “Sorry. Not enough. Not enough.”

ROBERT GREENE

Yeah. Total seduction.

PAUL GRAHAM

Yeah. Well, it is not . . .

ROBERT GREENE

When you turn your back on someone, they come running after you.

PAUL GRAHAM

No. But, I don't suggest people do it in order to be more seductive.

ROBERT GREENE

But that is the end result.

PAUL GRAHAM

It is the only path that actually wins at all.

ROBERT GREENE

Yeah.

PAUL GRAHAM

It is because a lot of the time, these guys aren't serious anyway. The way M&A works, it is these giant companies where one hand doesn't know what the other hand is doing. So some low level guy wants to buy you, opens up negotiations. You think the

company wants to buy me, and it doesn't.

Just this one guy does. So the deal gets to a certain point, and his boss says, "No, we don't want to do that." And you're like, "The deal didn't happen."

ROBERT GREENE

It is the same thing in Hollywood with film scripts. I know very well.

PAUL GRAHAM

Yeah. You know, actually, we constantly get requests from people who want to do documentaries. And we have learned, don't even talk to them. Because it is not going to get funded. These people come and talk to you about some documentary that might happen or not, and then they suck up all this time and the documentary never happens.

Documentaries just never happen.

ROBERT GREENE

Why do you want one?

PAUL GRAHAM

Oh, it would be sort of interesting. There is all kinds of stuff we do. It is kind of a shame that it is lost.

ROBERT GREENE

Well, you know what I would suggest more, or maybe it has already been done. Has *The New Yorker* ever profiled you?

PAUL GRAHAM

No.

ROBERT GREENE

Because that would be the way to go. That would be really interesting.

PAUL GRAHAM

Well, there are people who have written all sorts of articles about me.

ROBERT GREENE

Would you mind if I suggested it?

PAUL GRAHAM

No. Sure. I'll do whatever.

ROBERT GREENE

The guy who did a profile of me for the *New Yorker*, he does most of their business profiles.

PAUL GRAHAM

There have been a few people who have written all sorts of articles about me. But getting it on film, it is the kind of thing you have to see. To see these startups incite you.

ROBERT GREENE

It would be a very interesting documentary.

PAUL GRAHAM

Not me, even. It's them. I am just part of it.

ROBERT GREENE

The best way to go if you ever wanted advice on that would be to make the documentary yourself. To spend \$100,000, whatever, \$200,000 at the most.

PAUL GRAHAM

Yeah.

ROBERT GREENE

Do it yourself. Because you will like it a lot more. Hire somebody that you trust to do it and work with them. Then sell it.

PAUL GRAHAM

We don't have the time.

ROBERT GREENE

Well, don't worry about it. But, anyway, so negative lessons that you learned was not worrying about the investor.

PAUL GRAHAM

How to do sales. There was stuff that we were doing that we thought was a mistake that was actually right.

ROBERT GREENE

Like what?

PAUL GRAHAM

There was a bunch of things. Well, one was that the engineers were doing sales. That turned out to be really good. The recipe for disaster in a startup is for the company to get so much money early on that the engineers hire some sales guys to do sales and they are no longer talking to the customers. We did unintentionally what I now tell startups to do intentionally.

ROBERT GREENE

Which is?

PAUL GRAHAM

Which is to figure out the product in consultation with the users.

ROBERT GREENE

Right.

PAUL GRAHAM

Do the smallest thing first just to start the conversation and then say, "Okay. Users, do you like this?" And the users will say, "I kind of like it. But it would be better if it did such and such." Then you write such and such, you show it to the users and say, "Do you like it now?" And they say, "Oh, come to think of it, now that I see it doing such and such, what if it did such and such, too?" And you just rapidly iterate what you can do with server based software.

ROBERT GREENE

Well, these are all things that you ended up doing. These aren't negative lessons. So, with the investors, you moved on and two years later. It doesn't sound like you did anything really wrong. Maybe it was kind of by luck.

PAUL GRAHAM

No. We botched that whole application. You know, we were cowards. We ran that company like cowards, because we were so afraid not to get rich. Especially after that initial experience, it would have been better if we had had time. We were like a child star or something like that, who then spends the rest of his career trying to get it back instead of just doing good work.

ROBERT GREENE

Oh.

PAUL GRAHAM

So, we had a taste of almost success.

ROBERT GREENE

Yeah.

PAUL GRAHAM

And then we just were trying to get it back. Trying to get it back instead of working on the company.

ROBERT GREENE

Oh.

PAUL GRAHAM

We were spending all of our time thinking about someone buying us.

ROBERT GREENE

Oh.

PAUL GRAHAM

Instead of just thinking about writing amazing software and getting users.

ROBERT GREENE

I see.

PAUL GRAHAM

Another thing we did wrong is we spent way too much money. If I were doing that company again, it was the '90s. We weren't as bad, not nearly as bad as the other companies. We only raised a total of two and a half million. But we could have done it on \$300,000. But we thought what you are supposed to do is you are supposed to raise lots of money and hire lots of people. So we raised lots of money and hired lots of people.

ROBERT GREENE

I see. Okay.

PAUL GRAHAM

We spent too much money. We hired too many people. We should have just done it super cheap. We should have just instead of trying to blow up this company, raising tons of money and trying to sell it, we should have just done a good job. We should have just had a few programmers and do nothing but work on software and make users happy. And let success take care of itself instead of trying to force it. We were trying to force it.

ROBERT GREENE

But then it ended up happening anyway. \$50 million.

PAUL GRAHAM

But it could have been a lot bigger.

ROBERT GREENE

Oh, really?

PAUL GRAHAM

Yeah, sure. Think about how much effort it took away to be thinking all the time about getting bought.

ROBERT GREENE

Yeah. Right.

PAUL GRAHAM

We could have been in such a stronger position too if we just concentrated on getting users and spending as little money as possible.

ROBERT GREENE

I see. Okay.

PAUL GRAHAM

We definitely spent too much. And we spent a lot of our time worrying about the wrong things.

ROBERT GREENE

Which is something you very much stressed with Y Combinator about.

PAUL GRAHAM

Yeah. Learn from my mistakes, man. Do it cheap and focus on the essential things, because focus is the most important thing in a startup because there are very few guys and they have to get a lot done. And they have a lot of different things they could spend their time on, all of which are actually good. But

some are better than others. And you have got to just spend your time on the ones that are most important.

ROBERT GREENE

Law number 23 in *The 48 Laws*.

PAUL GRAHAM

Is it?

ROBERT GREENE

Concentrate your forces. Find that one and concentrate. Just hit it, hit it, hit it. You have to hit that sweet spot.

PAUL GRAHAM

Well, that was certainly true for ancient warfare.

ROBERT GREENE

Yeah.

PAUL GRAHAM

It was all about breaking through the enemy's ranks and then get them to flee.

ROBERT GREENE

It is very much a part of modern warfare. The whole concept of center of gravity.

PAUL GRAHAM

Yeah?

ROBERT GREENE

Vulnerability. Finding that one little spot in your enemy that is vulnerable and you hit them and then the whole thing collapses.

PAUL GRAHAM

Oh.

ROBERT GREENE

In this book, I talk about how terrorism found the one little vulnerability in America. And look at the huge cascading effect.

PAUL GRAHAM

9/11.

ROBERT GREENE

It is very much part of modern warfare. But I want to take a break, because we are kind of getting towards the halfway point.

PAUL GRAHAM

Okay. Do you want to come back tomorrow?

ROBERT GREENE

Well, I just want to ask you one question before I take a break.

PAUL GRAHAM

Sure.

ROBERT GREENE

It sounds like a theme that I am getting a little bit here is this. Well, we can continue after or we can continue tomorrow. Is a sort of serendipity. Having a bit of luck. Things just kind of fall into your lap a little bit.

PAUL GRAHAM

I know when luck is happening.

ROBERT GREENE

Well, that's what I want to get at.

PAUL GRAHAM

I know when things are promising.

ROBERT GREENE

Well, that's what I want to get at. It happens to everybody, but they don't recognize it.

PAUL GRAHAM

Yeah.

ROBERT GREENE

So, what were you going to say?

PAUL GRAHAM

Well, I know when an idea is sort of the right kind of wrong. The very best ideas are . . . it is funny. I was saying this to somebody else today. But the very best ideas are just on the right side of crazy.

ROBERT GREENE

Oh. I want to hear about this. That sounds interesting. Yeah.

PAUL GRAHAM

For example, microcomputers are a good example of this phenomenon. When people first started making microcomputers, using microprocessors, microprocessors were not even intended to be the CPUs of computers. They were intended to control traffic lights and vending machines and milling machines and stuff like that. They weren't supposed to be the central processors of computers. But they were just good enough that you could make this completely shitty computer. I mean really almost useless computer.

When these things first came out, everyone thought, "These computers are a joke. They are not even worthy of the name computer." But they were just good enough. For a certain number of people who had to do some kind of repetitive computation, it would have been an unbelievable amount of pressing enter on a calculator to get done, that was a little hole through a wall.

ROBERT GREENE

Right.

PAUL GRAHAM

To be able to have a computer dedicated on their desktop instead of using punch cards and taking them to run on a central computer. And, "Oh, there was a bug. Sorry. Try again the next day."

ROBERT GREENE

Right.

PAUL GRAHAM

So I have learned, I don't know whether it is nature or nurture, but I have learned

to recognize. I have sort of a nose for promising ideas.

ROBERT GREENE

Okay.

PAUL GRAHAM

That, actually, is the key. Y Combinator, I am pathologically well suited to doing Y Combinator.

ROBERT GREENE

Wow. The other thing you would be suited for, as I am hearing you talk, is you would be a great writer. You should write. It would be detective stories or whatever it was.

PAUL GRAHAM

Essays, actually. I should tell you about the whole essay thing.

ROBERT GREENE

I know. But I don't want to get on that.

PAUL GRAHAM

All right.

ROBERT GREENE

You are great for ideas.

PAUL GRAHAM

I can sort of judge ideas.

ROBERT GREENE

Yeah.

PAUL GRAHAM

A good typist can touch type or pianist knows where the keys are and he can just do stuff.

ROBERT GREENE

Well, we are going to get to that.

PAUL GRAHAM

I can munge. Do you know munge? It is this verb in the hacker world meaning to manipulate things. To munge things is to manipulate them. Because the real expert doesn't merely know how to do, deal with a computer program the way you are supposed to. They really know how to get inside and grab all its guts.

ROBERT GREENE

Munge?

PAUL GRAHAM

Yeah. Munge. It is almost onomatopoeic.

ROBERT GREENE

Yeah.

PAUL GRAHAM

But I am good at munging ideas. That is what I do at Y Combinator. I have to judge people's ideas. But I also, when I am talking to them, I say, "Oh. Have you ever considered taking this piece and rotating it over to the other side?" And they are like, [gasps] "My God." That happens all the time.

ROBERT GREENE

Well, what did you mean just on the other side of crazy?

PAUL GRAHAM

Well, the microcomputer seemed like a terrible idea.

ROBERT GREENE

Right.

PAUL GRAHAM

Because the technology was only just to the point where it made sense. So to most people it still seemed like it didn't make sense. That is what I mean by just on the right side of

crazy. It almost didn't work. Or like when we first started doing web based apps, it almost didn't work. You could control an application running on the server by clicking on links in the browser, just.

ROBERT GREENE

Why would this be a good strategy or a good way of doing?

PAUL GRAHAM

Because the world changes. So the things that start out just on the edge of crazy, as the world changes, they are smack in the middle of great. So if you see things moving, you are kind of leading the target. You are shooting where the target isn't, but you know it is going to move to where your bullet it. That's part of it.

ROBERT GREENE

But it is interesting. Because the way you described Viaweb, it almost happened by accident. But it seems like there maybe was something a little conscious.

PAUL GRAHAM

Well, we wanted to make money. That wasn't by accident. The part that seemed to happen by accident is writing web based apps, and the fact that we were kind of forced to do it because we didn't like Windows. But I think maybe we understood, because we knew so much about this architecture of running stuff on servers instead of clients, we probably understood that it was generally the right idea.

ROBERT GREENE

Yeah.

PAUL GRAHAM

So we had some instincts.

ROBERT GREENE

That's what I'm saying.

PAUL GRAHAM

That were the result of a lot of training.

ROBERT GREENE

Right.

PAUL GRAHAM

We realized, maybe we came up with the idea out of laziness. But we realized it was good out of experience.

ROBERT GREENE

Right.

PAUL GRAHAM

But I like crazy ideas.

ROBERT GREENE

Oh. But why?

PAUL GRAHAM

The best ideas are weird ideas. If you look historically, all of these ideas that are now established and prestigious, when people first started doing them, they seemed like this crap and everybody said, "Why are you spending your time on that?"

ROBERT GREENE

In science, particularly.

PAUL GRAHAM

Yes.

ROBERT GREENE

Nobody ever understands anything, an idea when it first comes up.

PAUL GRAHAM

Like physics. When Newton started doing it, it wasn't even called physics. It wasn't prestigious. He was studying these weird questions. And everybody said, "Why do you even care about that?"

ROBERT GREENE

Right.

PAUL GRAHAM

Physics is the result of Newton. Not something that he was doing. They call it physics now.

ROBERT GREENE

Right.

PAUL GRAHAM

So what you want to do is you want to find the things are like that now.

ROBERT GREENE

Or evolution.

PAUL GRAHAM

Yeah. Yeah. Evolutionary biology. Ideally, what you want to do is not study in some prestigious field but study something that a prestigious field will grow out of. That's the really big win.

ROBERT GREENE

Yeah.

PAUL GRAHAM

And the same with companies. You don't want to enter some kind of rich market.

ROBERT GREENE

No.

PAUL GRAHAM

You want to create something that people think is a joke, that they dismiss as a toy where nobody would be interested in it.

ROBERT GREENE

Very interesting. One of the people that I am interviewing, he is probably one of the greatest neuroscientists of our time. His name is V.S. Ramachandran.

PAUL GRAHAM

Uh-huh.

ROBERT GREENE

And he says his best ideas originate as jokes.

PAUL GRAHAM

Yeah.

ROBERT GREENE

He is talking to his students and he is joking and they kind of respond. Then he figures out that there is something really interesting there.

PAUL GRAHAM

That is totally true. We do too. When an idea makes us laugh . . .

ROBERT GREENE

[laughs]

PAUL GRAHAM

And we think, "My God. That would be so funny if that actually worked." Those are the best ideas.

ROBERT GREENE

Yeah.

PAUL GRAHAM

Y Combinator itself started out as this thing that was . . .

ROBERT GREENE

I know.

PAUL GRAHAM

It seemed like a joke.

ROBERT GREENE

Students asking you at Harvard, right?

PAUL GRAHAM

Yeah. No, the way we did it was a lot like microcomputers. Where we take people who are not supposed to be these impressive founders. Super young, totally inexperienced. Give them a paltry amount of money and everybody laughed at us. And then it turns out some of the companies we funded are actually some of the big companies in the Valley now.

ROBERT GREENE

I think it's very exciting. It is sort of the reason why I chose you. I hope this becomes

a model for business in the future. It would be very exciting.

PAUL GRAHAM

Are we recording already?

ROBERT GREENE

Yes, we are.

PAUL GRAHAM

Okay, good. Do you want to start? Let's go. I was thinking about what we were talking about yesterday, and I really feel like I didn't have any mentorship or apprenticeship or anything like that, not in the usual sense. I just did a bunch of different things, and I figured out how to do them, mostly by trial and error.

ROBERT GREENE

Yeah. I figure that everything occurs as sort of an organic process. So who you are today, whatever you are, came up organically, year by year, learning some things until you created Y Combinator. So there has to be an apprenticeship phase. But it's not the classic

working in a studio with someone, following in their footsteps.

PAUL GRAHAM

With a master.

ROBERT GREENE

With a master.

PAUL GRAHAM

Right. There was no real master honestly.

ROBERT GREENE

But that would be very interesting. I like people who don't quite fit my mold. I don't like things too pat or formulaic.

PAUL GRAHAM

Okay, good.

ROBERT GREENE

So, you're probably more what people are going to be like in 50, 80, 100 years from now. That's totally fine.

PAUL GRAHAM

Yeah. Do a bunch of different things.

ROBERT GREENE

And self-taught. That kind of thing.

PAUL GRAHAM

Programmers certainly are invariably self-taught for some reason. I don't know why. It's not the sort of thing you can watch someone do. So, you can learn painting by being Rubens's assistant, and you watch him paint, and he lets you paint some of the background or something like that. But with programming, it's much harder to watch someone work.

ROBERT GREENE

You just have to do it.

PAUL GRAHAM

Yeah. Or in a lab. You could be someone's lab assistant doing science or something like that.

ROBERT GREENE

For programmers, you say that doesn't work so well.

PAUL GRAHAM

Well, it would work for some kinds of science, but for programming, no.

ROBERT GREENE

Well, figure out how does one become a writer, just a writer?

PAUL GRAHAM

I think writers are mostly self-taught, too.

ROBERT GREENE

Writing classes are pretty bogus.

PAUL GRAHAM

Yeah.

ROBERT GREENE

The only thing they do is they make you write.

PAUL GRAHAM

Yeah. That's actually what computer science classes do.

ROBERT GREENE

They make you program.

PAUL GRAHAM

They make you program.

ROBERT GREENE

Well, there you go.

PAUL GRAHAM

But they do select useful problems. They select problems that stretch your brain in the right way if you are to solve them.

ROBERT GREENE

Well, did you have that?

PAUL GRAHAM

Yeah, probably. Like I said, you learn how to be a hacker in high school, and you're thinking a cheesy way. And then you go to college and you sort of clean up your act.

ROBERT GREENE

There might have been a few professors who gave you some interesting problems.

PAUL GRAHAM

Yeah. They teach you proper algorithms for doing things instead of whatever crappy techniques you were using before.

ROBERT GREENE

Well, it's interesting though that none of them stand out. Like you don't mention any of the professors at Harvard as a mentor, which is telling.

PAUL GRAHAM

No, not really.

ROBERT GREENE

The only person you really mention is Robert Morris, your colleague.

PAUL GRAHAM

Yeah.

ROBERT GREENE

So maybe things are going to be more egalitarian in the sense of it's more like people working together, figuring things out yourself, teaching yourself, but it's still an apprenticeship.

PAUL GRAHAM

Yeah. No, no one sticks out. Because in college, you would have some professor for one class, and then the semester was over and that was it. You might never have another class with him again.

ROBERT GREENE

Unless you cultivated a relationship. Like if you had found somebody that you

really liked, you would have cultivated a relationship.

PAUL GRAHAM

No, I never really did.

ROBERT GREENE

Yeah. Well, for my purposes, I believe very firmly that there is an apprenticeship phase for you. It's just not as straightforward as some other people.

PAUL GRAHAM

Well, there certainly is in the sense that, if you know how to do something, you must have learned how to do it somehow, right? So, certainly in learning. Already, specifically, what do you want to ask about?

ROBERT GREENE

Well, I wanted to get to Y Combinator, but the first thing, before then, I was just curious, because there's kind of, maybe a nine year period. What year did Viaweb get bought out, '96 or '98?

PAUL GRAHAM

'98. And then I had to work for Yahoo until '99.

ROBERT GREENE

So you worked for Yahoo for a year.

PAUL GRAHAM

Which was grim.

ROBERT GREENE

Anything stand out from that experience that kind of marked you?

PAUL GRAHAM

It was distressing how much Yahoo had already turned into a big company. Even though they only had 500 people when they bought us and maybe a bit over 1,000 a year later when I left, it felt very much like a big company.

ROBERT GREENE

What were you doing there?

PAUL GRAHAM

I was in charge of Yahoo! Store, which is what Viaweb became. So I was still doing the

same thing, but now I had to do it within this larger corporation.

ROBERT GREENE

So how long did you last, like a year?

PAUL GRAHAM

Yeah.

ROBERT GREENE

Okay. So, for the next six years or so, you were mostly writing?

PAUL GRAHAM

Well, I worked on spam filtering.

ROBERT GREENE

I know, the Bayesian.

PAUL GRAHAM

And I worked on Arc.

ROBERT GREENE

Which is very exciting.

PAUL GRAHAM

And I started writing essays.

ROBERT GREENE

Okay. So that's quite a bit. It's not like you weren't doing anything.

PAUL GRAHAM

No. Actually the big thing in there . . . well, Arc and spam filtering both took up a fair amount of effort. But the biggest thing was realizing . . . I feel like this is one of the bigger realizations I will ever have, realizing that there were all kinds of essays that would be good to write and had never been written before because of the restrictions on how essays could previously be published. If you think about it, it's hard to get yourself excited about writing an essay for no one else to read. I mean, you want to tell somebody. You could get excited about writing a story that no one else read maybe, because it would be sort of pleasing. But an essay is kind of a message.

And before the Internet, who got to publish essays? Famous people got to publish essays, and only about the things that they were famous for. Maybe in some extreme case, Linus Pauling would get to public essays about peace or something like that. But the magazines and newspapers would severely

restrict the possibility of writing essays. What that meant was there were certain essays that never would get written because no one had the credentials.

So that essay that I wrote about nerds in high school, how would that have ever gotten published before the Internet? The funny thing was it did get published in Wired, but only because it was already a big hit on the Web. But before, back in the days of print, you'd go to an editor with an idea. "I'm this guy you've never heard of, and I want to write an essay about what happens in high school." And the guy would say, "Well, no." So I realized that there was this whole swath of territory, virgin territory to just cut through.

ROBERT GREENE

Nobody was filling it.

PAUL GRAHAM

And no one had realized yet. I've used this metaphor for other things, but it's like when you have an animal in a cage, and you open the door of the cage. The animal

doesn't realize that the cage door is open. The animal is sitting there in the cage, and it could run out, but it doesn't know. No one had realized yet that you could now write all these essays that had never been written before. Huge numbers of essays.

ROBERT GREENE

Because people were blogging, but they were short things. Nobody really put a whole idea together.

PAUL GRAHAM

The thing about blog posts, as the name suggests, it's a log. A log means dated entry. So a blog post kind of implicitly doesn't take more than a day to write. Whereas an essay, you probably know, takes weeks to write sometimes. So no one had really started publishing a lot of essays on the Web, but you can. Write it and they will come, if it's any good. And if they don't, well, no one will come, so at least no one will know you suck. So that was like the big, exciting discovery.

PAUL GRAHAM

2001 I think. So, it was a PDF file. It wasn't even a webpage, and it got like tens of thousands of page views. So, I thought whoa. Holy cow. I should write some more of these. There's an audience there. So I wrote some more essays as HTML pages instead of . . . instead of PDFs. And gradually, the traffic grew and grew from that. And a few in, I realized, holy cow. The cage door is open. But I still feel . . . you know this is somewhat belied by what I actually do from day to day. But I still feel like the big, most urgent project is to write essays, and the Y Combinator is sort of a side project. Y Combinator grew out of the essays.

ROBERT GREENE

It did, because you gave a talk at Harvard.

PAUL GRAHAM

And because that was why we had anyone who would apply. Because there was large numbers of people who would visit my site. So I had the stream of people, and I just took an

application form and stuck it into the stream of people that was already going by. And they were the right people to start startups, it turned out. So Y Combinator could never have started without the essays.

ROBERT GREENE

So everything you do, you kind of put your own weird personal stamp on. Like you're going to cash in on what's happening with Netscape, but you do it in your own peculiar way with Lisp and with a web server, whatever you call it.

PAUL GRAHAM

Server based apps.

ROBERT GREENE

Server based apps, excuse me. Then the opening up of the Internet, when most people are writing blogs, you write essays. The startup venture capital, but you do a new model. You make everything . . .

PAUL GRAHAM

You know what's true in all these cases? It's because I didn't know how the right way to

do it. So for example, we wrote server based apps because we didn't know how to write desktop apps on Windows, and we didn't want to learn. And I wrote essays because I didn't understand about blogging. I had never done it, and I knew these guys did this thing called blogging, but I didn't really care about it.

ROBERT GREENE

You tend to always put these in the negative form.

PAUL GRAHAM

Okay. Well here's a positive way. I deliberately ignored these things because I knew they weren't interesting. You can do a lot by avoiding bad as opposed to seeking good.

ROBERT GREENE

Yeah. And it's a positive avoiding bad. It's a choice.

PAUL GRAHAM

I knew to avoid Windows, and so that sort of ended up choosing for me to write server

based apps. And I knew to avoid blogging, and that ended up causing me to write essays.

ROBERT GREENE

Exactly. If you would have blogged, you wouldn't have had Y Combinator.

PAUL GRAHAM

And also, I knew to avoid venture capital. I should tell you, when we did start doing Y Combinator, the distinctive thing about Y Combinator is the way we fund a whole bunch of startups at once. That's the really new thing about it, to do it in batch mode. Synchronous versus asynchronous. Do you know those terms?

ROBERT GREENE

Yeah. Well, I mean I know them, but you may have a different way of using them.

PAUL GRAHAM

In programming, they mean something specific.

ROBERT GREENE

Okay. Tell me in programming.

PAUL GRAHAM

Synchronous means to do things in a batch, all at once. There's a bunch of things that have to happen. So synchronously to make sandwiches, first you would cut all the slices of bread and then you would lay them all out. Then you would cut the cheese, as it were, and put it on the sandwiches. Asynchronously, you make a sandwich when you need one, and then you make another sandwich when you need one. So, it was very unusual to fund startups synchronously.

ROBERT GREENE

You sort of analogize something to the computer.

PAUL GRAHAM

Everything about Y Combinator is built like software. We approached it as if it was software.

PAUL GRAHAM

Okay. Well, what I was saying about was sort of out of ignorance. We didn't know anything about how to be investors. So, I gave this talk

at Harvard. The computer undergrads asked me to give them a talk, and I thought, What will I tell them about? I'll tell them about how to start a startup.

ROBERT GREENE

They invited you because of your . . .

PAUL GRAHAM

The essays. Yeah. And I thought, What could I tell them that would be really useful? Instead of a bunch of theoretical stuff about programming languages. So I told them how to start a startup, which back in 2005 was not very fashionable at that point, because it was still in the aftermath of the bubble. And that talk turned into Y Combinator, because in the course of the talk, I was telling them they should raise money from rich people, and best of all, rich people who made their own money from doing startups, because then they could give them advice along with the money. And then I'm standing up there as such a person. I notice they're all looking at me expectantly,

and I had these visions of them all sending me their horrible business plans in my e-mail.

ROBERT GREENE

You were rich at that point too, right?

PAUL GRAHAM

Yeah.

ROBERT GREENE

You had a lot from Yahoo and Viaweb.

PAUL GRAHAM

Right. So I was the person they were talking about. And I suddenly felt very much on the spot, and I literally said up there, "But not me." [laughs] Because I did not want them all pestering me.

ROBERT GREENE

You said that?

PAUL GRAHAM

Yes, I said that. But then afterwards, I went to dinner with some of them, and among the people in the audience were the founders of Reddit, who had come up from the University of Virginia on the train during Spring Break to see this talk, because one of the two of

them was a big Lisp aficionado, and that was how he knew me. So it sort of all tied together. So I went out to dinner and coffee afterwards with some of these guys, and I thought, you know, maybe actually they'd be able to start startups even though they're so young. Maybe they could do it.

So I thought, all right, all right. I'm finally going to start angel investing. All people who make money out of startups plan someday to start angel investing, because someone invested in their startup. And then they never get around to it, because it's a pain in the ass, and they don't know about how to do all of the paperwork and stuff. So I thought, gee, it's been seven years since we sold Viaweb and I still haven't done any angel investing. I should really get my shit together.

So I just went to the people who had been in Viaweb with us -- me and Robert and Trevor, the hackers who made Viaweb. And I said, "You guys want to do some angel

investing?" [laughs] At that point, when we started Y Combinator, it was just a bunch of us were going to pool our money and invest in startups. No more than just regular angel investing. And we recruited Jessica, who was my girlfriend at the time.

ROBERT GREENE

And the impetus behind this was just you wanted to do it?

PAUL GRAHAM

Well, I felt guilty that I hadn't invested in anybody else's startup, because people invested in mine.

ROBERT GREENE

So your idea wasn't as a way to make money. It was more like giving back, or kind of a mix of both?

PAUL GRAHAM

Well, it's more like a money neutral way to be good. If it would simply cost money and you were never going to get any back, then you would think twice about doing it. But you'd feel like you can do it, and if you

do it reasonably well, you should at least break even.

ROBERT GREENE

No models, nobody who could teach you.

PAUL GRAHAM

No mentors. [laughs]

ROBERT GREENE

No mentors, as usual. Which is actually really good.

PAUL GRAHAM

I'm the anti-apprentice.

ROBERT GREENE

No you're not. [laughs] You're the auto-apprentice.

PAUL GRAHAM

So the whole reason we got into doing startups synchronously, meaning a whole bunch at once, was to teach ourselves how to be investors. The first summer, the first time we did Y Combinator, it was a summer program for undergrads. In computer science, or probably in engineering generally, summer jobs are throwaway jobs. Google will hire

college students during the summer in the hopes of recruiting them when they graduate. Google does not expect them to actually get shit done during the summer. So it's kind of a throwaway for everyone involved.

So we figured, since everyone in college treats summer jobs as throwaways, we'll say, start a throwaway startup. And these guys could come and learn how to start a startup while we learn how to be investors on them. And so they would probably be shitty founders, and we would be shitty investors, but no one would blame either, because we each got what we deserved. [laughs] What ended up happening was that we were better investors than we thought, and the founders were better founders than we thought.

ROBERT GREENE

And how did you find these original founders, these original . . .

PAUL GRAHAM

They were people who visited my website. So what we did was we just said, we just

announced very soon after this talk . . . I gave the talk in early March, and we put out this announcement, like, halfway through March that we were going to fund a bunch of startups this summer just to see what happened. We figured we'd give them, like, \$15,000 apiece. We could fund 10 startups for \$150,000 and just see what happened. So we got a whole bunch of applications, read them all, interviewed people, and we ended up with eight startups that summer. And among them was Looped, which is still one of the most successful ones we've funded. Reddit, do you know Reddit?

ROBERT GREENE

I thought you said the people from Reddit already had come up and . . . oh, they hadn't yet started Reddit.

PAUL GRAHAM

Right. They were at the talk. They were undergrads at the time. They hadn't started Reddit. They were working on a completely different idea in fact. So the founders of

Reddit, Reddit was in this batch. The first startup that ever got acquired from Y Combinator, TextPayMe, which got acquired by Amazon, was in this batch. And the founders of Justin.tv were in this batch, although they were doing another startup.

ROBERT GREENE

I remember I read about them, yeah.

PAUL GRAHAM

They were doing a calendar that got crushed by Google Calendar actually.

ROBERT GREENE

So they pivoted.

PAUL GRAHAM

Yeah. No, they didn't actually. That was not a pivot. That one, they shut down the company, sold the assets, and started a new company. That was not a pivot. But all in this first batch that we considered to be a throwaway.

ROBERT GREENE

So what were you learning?

PAUL GRAHAM

We were learning (a) how to be investors. One of the most interesting things I learned was what about Viaweb was significant? Because I knew that we had done certain things in Viaweb and that it had worked. But I didn't know which of those things were necessary to working. I just knew we did this, and it ended up working. So I learned how to understand Viaweb a lot better. Which parts of our experience were atypical and which parts were typical, now that I had more data points.

ROBERT GREENE

Just thinking about it or reflecting?

PAUL GRAHAM

No, observing other startups do the same things.

ROBERT GREENE

So it's like a little laboratory for you.

PAUL GRAHAM

Yeah, yeah. The only reason we funded a whole bunch of startups at once was so that

we could learn how to be investors. We were not expecting that to be how Y Combinator worked. We were just going to do this initially, just as sort of a kickoff thing. But it worked so fabulously well. A couple weeks in, we could tell we were onto something.

ROBERT GREENE

How could you tell?

PAUL GRAHAM

Because the startups were doing so well.

ROBERT GREENE

But your role wasn't just supplying money.

PAUL GRAHAM

No, no. We advised them a lot.

ROBERT GREENE

Which is not really what angels necessarily do.

PAUL GRAHAM

Ideally it is, actually. Good angels do advice startups a lot. In fact, one of the things startups will do when they're real hot deals and they can pick between investors, is they'll pick only the ones that can help with some

specific thing that they need. Like the guy has expert in money transfer or virality or something like that. So very early on, we realized accidentally, partly because we were trying to fund a whole bunch of startups at once to learn how to do it, and partly because we approached everything like programmers instead of investors, because we only knew how to program and didn't know how to invest. We realized that what we were doing was we were applying mass production techniques to venture funding.

And so time after time . . . this talk about making. Here's an interesting metaphorical use of making. Time after time in history, there's been some case where there was some kind of thing that was made one at a time, unreliably and expensively. And then someone figured out how to systematize it and just pound them out and get better results too with massive gains in efficiency. We realized very early on in Y Combinator that, unbeknownst to us, that's what we had

been doing. So we decided, okay, let's keep doing that. And so we kept funding startups in batches, even though Y Combinator stopped being a summer program. We deliberately sought out ways to apply mass production techniques.

ROBERT GREENE

How so? Explain that a little bit.

PAUL GRAHAM

Well, scaling for example. Funding more and more startups each year. Almost all investment firms fund about the same number of startups from year to year, but we decided we were going to grow, because that's what you do when you've got a mass production technique. Initially it's not running so well, but with something like a technique like that, if it's not growing, it's dying. So every batch, we've had more and more startups...

ROBERT GREENE

Where does that concept come from, the idea that you have to keep growing?

PAUL GRAHAM

That's what you do. Whenever you're building . . . as an engineer, if you're working on making some process efficient or better, you're always continuing to work on it. You never make it better and then stop. It's always an ongoing process....I'll tell you what appealed to us about Y Combinator. People often ask why we did Y Combinator. Was it to get money or to help people or something like that? And actually, neither of those were the main reason.

ROBERT GREENE

Okay. Now we're getting somewhere.

PAUL GRAHAM

The main reason was because it's a clever hack. It was just like Robert's worm. Why did he want to do the worm? Because it would be such a cool thing. Imagine if you could write this piece of software that would spread out all over the Internet and just quietly live on all these computers, and no one would know

it was there. But it would be this living, like a fungus or something.

Well, wouldn't it be a cool thing if you could cause . . . imagine how much less effect Larry and Sergey would have had on the world if, instead of starting Google, they had graduated from Stanford and gotten jobs at Microsoft Research or something working on operating systems. They would've had very little effect on the world. At a startup, a given person, if they're ambitious enough, can have much more effect on the world than if they are insulated within some giant company. So basically, Y Combinator is a hack to change the shape of the world's economy.

ROBERT GREENE

That's what I'm hearing.

PAUL GRAHAM

That's why we're doing it. And so the reason we're scaling is because we want to make the hack work. We want to have thousands of startups all over the place doing all kinds of exciting things.

ROBERT GREENE

Was this part of the original idea?

PAUL GRAHAM

Very early on, yes. Yes. Very early on. What happened was we started doing Y Combinator as a side thing, and then we started to think about it and we got into it. We started thinking about it as an interesting, clever hack. Very early on. So that's why we want to scale. To make the hack big.

ROBERT GREENE

Why do you consider it a hack?

PAUL GRAHAM

To programmers, a hack means both . . . I wrote a whole essay about this actually, so I'm basically just telling you what I said in this essay. But a hack has two meanings, and they're actually related. A hack means when you do something particularly clever. And it also means when you do something in a sort of cheesy, stuck together with duct tape kind of way. And what those both have in common is that they're kind of breaking

the rules. There's a reason programmers are so unwieldy. It rewards breaking the rules. So, Y Combinator is sort of breaking the economic rules.

ROBERT GREENE

This is the ultimate hack.

PAUL GRAHAM

Maybe not the ultimate hack, but it's certainly a big one.

ROBERT GREENE

So these are your clones, your cells, your guerilla warfare cells that you're spreading out virally, like his worm, throughout the world.

PAUL GRAHAM

They're not virally, because these startups don't cause other startups to exist.

ROBERT GREENE

Not virally. No. But they could have a viral effect ideologically.

PAUL GRAHAM

Yeah, that's true. That's true. It's very important actually. You're right. I'm wrong.

It's true, because the main thing that causes people to start startups is seeing other people start startup. Mark Zuckerberg. Even that movie, I haven't seen that movie, but whether it's accurate or not, it's going to cause a lot more people to start startups, because it seems like an understandable thing. It's just like the reason I never thought of becoming a painter or even a programmer in high school was because there weren't any around. It was something that other people did in theory somewhere else. So if starting a startup becomes something real to people, they're much more likely to do it.

ROBERT GREENE

Now is this simply people . . . are you giving them more than just a startup? Are you giving them, not an ideology, but a way of looking at the world, an ethos, something that reflects your own ideas?

PAUL GRAHAM

Not consciously. But in a startup, you're sort of in a small sinking boat in a storm, and you

really have to focus. So we tell people how to make a startup not die. We tell them exactly what to do. And inevitably, that reflects some kind of view of the world. That it's all about pragmatism, a certain pragmatism, a certain number of reasons to [inaudible 36:58] are okay. You don't have to be a complete goody two shoes.

ROBERT GREENE

So they are pragmatic . . .

PAUL GRAHAM

And above all, speed.

ROBERT GREENE

Speed.

PAUL GRAHAM

Speed, actually speed and empathy. Empathy with the users and speed in reacting to their needs. You want to be like a highly reactive chemical. And so the user has certain needs that have a certain shape, and you can never predict in advance what they are. So what you do is you make something that looks roughly the right shape, and you push it

against the user, and some parts don't fit. You shave off the bits that don't fit, and eventually, after a bunch of iterations, you have a mold. And then it just fits everybody, because users aren't that different from one another.

ROBERT GREENE

What I'm getting at, just intuitively, is you're kind of taking programming, how programming works, and it's kind of infecting how you do everything.

PAUL GRAHAM

Yeah. Well, it's a very fruitful source of metaphors. The kinds of stuff that you have to do in programming, it just happened with science. You can use the kind of techniques that you use in science also in cooking. You can do experiments, and if you have theories about things, you can measure them.

ROBERT GREENE

But programming is a new thing. Was there anything like it before that we could . . . because it's almost like you learn as you go along, you build it as you go along. It's almost

a little improve, almost like jazz or something. You do something . . . What other metaphor can we see, because it's more like hacking than programming, is really what we're talking about.

PAUL GRAHAM

Well, it's like clock making where you can make a dial of a certain size by snapping your fingers, as opposed to having to cast it and grind it and stuff like that. So, when the medium becomes much more flexible, you can take a more seat of the pants approach to it. But you've got to have the same standards for the result. You can't be slack.

ROBERT GREENE

Do you agree it's sort of like a new way of thinking?

PAUL GRAHAM

A lot of it's new, yeah.

ROBERT GREENE

And it's going to have a profound effect on culture?

PAUL GRAHAM

I mean, like Galileo. Galileo was very much a hacker. A hacker does not figure out things based on principles. He sort of tries shit out and sees what happens.

ROBERT GREENE

He was one of the first to really do that.

PAUL GRAHAM

Right. And there's another side of trying shit out. If you're going to work by trying shit out, you have to be particularly good at noticing when you have something promising.

ROBERT GREENE

Do you have any heuristics on that?

PAUL GRAHAM

Well, I remember you asked about this, and I said, "It's knowing that an idea has the right kind of wrongness."

ROBERT GREENE

Right kind of . . .

PAUL GRAHAM

Wrongness.

ROBERT GREENE

Wrongness?

PAUL GRAHAM

Right. It seems kind of weird, and yet correct.

ROBERT GREENE

Like we were saying, almost like a joke.

PAUL GRAHAM

Yeah. Yeah, yeah, yeah. And that's why hackers are very often irreverent.

PAUL GRAHAM

We ask explicitly on the application form for Y Combinator, what awkward way are people forced to do something now because what you're planning to build doesn't exist yet? Like, people are using a steak knife to butter their bread, because you haven't invented the butter knife yet.

ROBERT GREENE

I find this very exciting, because part of my book on warfare and my whole idea of whenever you want to tackle something or you want to change something, you have to do it indirectly. So if you had a goal where

you wanted to change how capitalism or corporate America is functioning, and you preached and you talked about what needs to be done, and you had think tanks. It doesn't do anything. But literally going in there and creating people from the ground up, like little moles springing up, spreading this idea is absolutely the perfect strategy.

PAUL GRAHAM

I'm not trying to spread ideas though, I'm really not.

ROBERT GREENE

But you are.

PAUL GRAHAM

I know, but I'm not trying to. Not even secretly. Really, I'm not. I'm just trying to change the shape of the economy, and that will tend to . . .

ROBERT GREENE

How come that's not an idea?

PAUL GRAHAM

Well, I was trying to get people to do different things. I don't care what they believe. But,

of course, they have to believe certain things if they're going to make their startups work. It's to make the startups work I want them to believe these things. Not the other way around.

ROBERT GREENE

Yeah. But changing the course of history or capitalism as it is, like the way the serfs went to town, is an idea.

PAUL GRAHAM

But, but, but. I believe that . . .

ROBERT GREENE

Because changing how material culture works and how people do this is the most profound effect of all.

PAUL GRAHAM

Sure, but I believe the serfs . . . I believe startups are going to happen anyway. All I'm doing is accelerating the process. This is inevitable.

ROBERT GREENE

Okay. That's true.

PAUL GRAHAM

You know how back in those days, sometimes forward thinking rules would deliberately establish a town and say, "Come all ye serfs." It's sort of like that, but it was going to happen anyway. All we're doing is speeding it up by a few years.

ROBERT GREENE

Okay. So, in dealing with this now for four or five years, it's been five years.

PAUL GRAHAM

Five and a half.

ROBERT GREENE

Five and a half.

PAUL GRAHAM

It'll be six this March.

ROBERT GREENE

Would you say that you've gained -- this is really from the next section, but I might as well talk about it now -- gained the kind of feel for what kind of person is going to work?

PAUL GRAHAM

Yeah, yeah.

ROBERT GREENE

I'm very interested in that.

PAUL GRAHAM

I feel like we have so much . . . actually another thing that we deliberately did with Y Combinator and the reason we wanted to scale it so much was because when you fund startups, you learn from them. Nothing teaches you more than actually funding them. Pretty early on, we realized that we were learning about startups at a much faster rate than ordinary investors do. So for example, we have now funded, with this last batch, 250 startups. A typical venture capitalist, a VC partner, will fund two startups per year. So he'll fund like 60, 70 in his entire career. And we're already up to 250.

So I have so much data about startups. My god, I can tell you everything about every little edge case, about different relationships between the founders, and when it's okay for them to not quite their jobs and when it is, whether it's okay for them to be dating or

married or gay, whatever. I know so much.

And in fact, we often will fund a startup not because we think they're the most likely to generate a return, but because we want to see what happens with that kind of startup. So for example, this new batch, we're funding the first startup we've ever funded from southern Europe. We've funded a lot of startups . . .

ROBERT GREENE

This is the Spain thing you were talking about.

PAUL GRAHAM

Yeah, there's one from Spain in this new batch. And the main reason we're funding them is to see what happens with a startup from Spain. Don't tell them that.

ROBERT GREENE

And why?

PAUL GRAHAM

Because we want to get data. We want to get more data about what works.

ROBERT GREENE

So you're going to have them here, and then you're going to send them off back to southern Spain.

PAUL GRAHAM

They can go wherever they want. If they can manage to arrange the visa thing so they can stay here, they should definitely stay here.

ROBERT GREENE

But then what are you going to learn about southern Spain? You're going to learn what kind of people they are?

PAUL GRAHAM

I'm going to learn what happens with a startup from Spain. It's weird, this startup. It's not just like they're from Spain. They just did it themselves without any encouragement. In Seville, it's not even Barcelona. There's no startups. And these guys just decided they were going to do it. So we'll see what happens, but I know we're going to learn a lot, because they're so different from anybody else we've funded.

ROBERT GREENE

Interesting. So you choose different cultures, people from different backgrounds.

PAUL GRAHAM

Yeah. We fund super young people. We funded someone in this batch who's 17.

ROBERT GREENE

You're like a mad scientist with this great laboratory with human beings.

PAUL GRAHAM

But I don't get to make any of the stuff. I'm just like their faculty advisor. I want to be the guy who makes the stuff. I don't want to be the guy who advises other people.

ROBERT GREENE

But you're making stuff. I want to get back to that. Part of what I want to do in the book is change the notion of what it means to make something. Anything you do, you are literally in the end making something even if you're a pawn in some corporation or whatever. It's just not a physical object necessarily.

PAUL GRAHAM

I can tell. Y Combinator is itself a thing, so I'm sort of making Y Combinator. But Y Combinator is worth about two or three good essays as a thing.

ROBERT GREENE

What do you mean?

PAUL GRAHAM

I mean, the startups I'm not making. They're making, and I'm just helping them. The only thing I'm making is Y Combinator itself, and Y Combinator is just one company.

Like Viaweb for example. Is it something anybody would care about in 100 years? It would rank lower than any of my essays, even the ones that are most dated, and yet it's three years of work, because it's mostly doing mundane crap.

ROBERT GREENE

Here's the difference to me, because I see it differently. You take a writer like Machiavelli who was a low level diplomat who never really had much power, and then he gets

thrown out of Florence when the Medicis return, and he's exiled to the countryside.

PAUL GRAHAM

Like Dante.

ROBERT GREENE

Like Dante. And he writes "The Prince" and nobody's interested in "The Prince." So he writes other books, and he has a fair amount of success. By the end of his life, he's allowed to come back to Florence and a few people know about him. He dies, but his books, particularly "The Prince" but some of the others, become perhaps the most influential political essays ever written in the history of mankind. The number of leaders, statesmen, dictators, presidents who were influenced by "The Prince" is enormous. This one man simply writing essays. What did he produce? He didn't really produce anything except a book. Although I guess you're saying that a book is a book.

PAUL GRAHAM

Oh no. I'm saying essays matter a lot. When I say Y Combinator only counts as a few essays worth of value, I'm saying essays are valuable, and Y Combinator isn't.

ROBERT GREENE

Because they last? You mean because Y Combinator . . .

PAUL GRAHAM

Yes. Yeah.

ROBERT GREENE

It does last in that it has a kind of a domino effect within the culture.

PAUL GRAHAM

But my gut feel is that that doesn't matter as much. I could be wrong, but my gut feel is that somebody in 100 years could conceivably be reading some essay I wrote. But in 100 years, no one will have heard of Y Combinator. In 100 years, only a few people will have heard of Google.

ROBERT GREENE

[laughs]

PAUL GRAHAM

It's true.

ROBERT GREENE

Books are one way of . . . maybe people aren't going to be reading.

PAUL GRAHAM

They'll be reading. They won't necessarily be reading codices, but they'll be reading.

ROBERT GREENE

Okay. I'm reading a lot about Thomas Edison for this new book, because I'm kind of intrigued by him.

PAUL GRAHAM

Yeah. He was the Larry and Sergey of his time. And now all anybody remembers about him is his name and something about light bulbs.

ROBERT GREENE

Okay. But what was his great . . . maybe one of his greatest ideas was a business model, which the research institute, the research park, which ended up having an enormous impact on the 20th century.

PAUL GRAHAM

Yeah, I know.

ROBERT GREENE

And that was just an idea. It wasn't a book or anything he made.

PAUL GRAHAM

I could be wrong.

ROBERT GREENE

You could be right. I'm playing devil's advocate.

PAUL GRAHAM

I could be wrong that having an effect doesn't matter so much as producing a particular thing that people will care about in 100 years. I could be completely wrong, but it's my . . .

ROBERT GREENE

But then why keep scaling it up? It's going to consume your time and you're not going to . . .

PAUL GRAHAM

I can't stop. I can't stop.

ROBERT GREENE

Okay. Well I think it's an amazing, fascinating thing. I would settle into this for a while.

PAUL GRAHAM

No.

ROBERT GREENE

Okay.

PAUL GRAHAM

I've got to find ways to not have Y Combinator suck up so much of my time. That's why we're getting more partners.

ROBERT GREENE

Okay. All right. You'll figure that out. Okay. So, the one thing that . . . did I bring this up yesterday? You said somewhere that you're not really so interested in people's ideas. You're more interested in what they've done before, but almost as a test of their character.

PAUL GRAHAM

Yes. It's the people you care about. Absolutely.

ROBERT GREENE

Can you explain a little bit about that?

PAUL GRAHAM

Well, the idea is going to change. That's why I don't care about the idea. The Reddit, when they came to Y Combinator, their original plan was to let people order fast food on their cell phone. And we said, "That's a terrible idea. You need to do something else."

ROBERT GREENE

But how do you see whether someone is the right material, even if their idea is kind of . . .

PAUL GRAHAM

That's the hard part. That's the hard part. One is to talk to them about their idea, and if their idea is bad and they are blindly wedded to it, that's a bad sign. Whereas if the idea is bad and you talk to them, and they say, "Hmm, yeah, there's a weakness there. Maybe we should be such and such." You just start talking to them and see if they respond like Galileo would. See if they have the sort of quick, pragmatic, flexible yet determined. The metaphor I always use is like a running back. You don't want to be determined in the

sense that you just plow forward. You want to sort of jump to the side and twist around. You want to be flexible and determined at the same time.

ROBERT GREENE

Flexible and determined.

PAUL GRAHAM

Yes. Those two qualities.

ROBERT GREENE

Naive and skeptical. But flexible and determined is a good one.

PAUL GRAHAM

Naive and skeptical is also . . .

ROBERT GREENE

You've used that one somewhere.

PAUL GRAHAM

[laughs] It does also sound good too.

ROBERT GREENE

So, you're kind of judging them a little bit as you're testing them and seeing how they respond.

PAUL GRAHAM

It helps if you're a startup founder. I think it would be much harder to do something like Y Combinator if you were not yourself a startup founder. Because when we started out, you know what our trick was? We looked for people who were like us. [laughs] It's pretty easy to tell whether someone feels like they're like you and you feel comfortable with them or not. Later, we sort of branched out into startup founders that were not like us but also good. [laughs]

ROBERT GREENE

Okay. Because there are probably not as many yous as there are . . . you wouldn't be able to mass produce.

PAUL GRAHAM

If any of these people do show up at 5:00, you will see a lot of . . .

ROBERT GREENE

Little Paul Grahams.

PAUL GRAHAM

Not because I mass produce them. Because there actually are a lot of people like me, and they're the kind of people who end up being good at startups.

ROBERT GREENE

Okay. Have you've gotten better at this as far as judging people from these tests and their character?

PAUL GRAHAM

Yeah. One of the most interesting things we've learned is how bad college admissions officers are. They themselves have never been able to measure their own results. Imagine if colleges accepted people and then within six months, they got feedback about whether they chose well or badly. Wouldn't that be interesting? Well that's what happens to us. We fund people. We picked people to fund a week ago, and probably about the beginning of February, I will be able to tell you, "Boy, I'm so glad we picked these guys. These guys

were a complete mistake, totally blew it.”

I'll know.

ROBERT GREENE

And you've made some mistakes.

PAUL GRAHAM

Oh, god yes.

ROBERT GREENE

What would you say your percentage rate is?

PAUL GRAHAM

We're hoping that a third of the startups that we fund succeed.

ROBERT GREENE

So two-thirds fail in some way.

PAUL GRAHAM

Fail in some way? How about like fail completely. When startups fail, it's like zero.

ROBERT GREENE

What are the things that you've learned from the failures?

PAUL GRAHAM

Well, one thing I was saying is it doesn't matter much where people went to college.

ROBERT GREENE

Oh, okay. Really? That's interesting.

PAUL GRAHAM

Yeah. We've learned. And if you think about it . . .

ROBERT GREENE

Like what you mean, people who have gone to Harvard and Yale and Princeton.

PAUL GRAHAM

Right. Right. There's a large percentage, basically I would say off the top of my head, at some prestigious university, half the people there are actually smart, and half of them just shouldn't be there.

ROBERT GREENE

They're like W.

PAUL GRAHAM

Yes. Yes. And it still happens. Courtesy of prep school and Stanley Kaplan. You can buy your way into an elite university. And we know better than the admissions officers know how good they're doing because we get all these people, and we can measure them.

ROBERT GREENE

Yeah. So earlier on maybe you might have been charmed or seduced by where they went to school. Then you learned that had nothing to do, that's not a good barometer of anything.

PAUL GRAHAM

No. Where they went to school is not a good predictor. And also, intelligence is not as important as determination.

ROBERT GREENE

A huge part of this book.

PAUL GRAHAM

Yes. Determination is everything. If you think about it, if you think about people you know yourself. Imagine you have some guy who is 100 in both intelligence and determination. He's going to take over the world. Now imagine if you start throwing away intelligence. You can throw away quite a lot of intelligence as long as he has 100% determination.

ROBERT GREENE

Because he can always find the right people who have the intelligence and get them to do what he . . . fill in the gaps.

PAUL GRAHAM

Or work in some business that doesn't require that much intelligence. He could become the king of taxis or garbage trucks or something like that.

ROBERT GREENE

Determination is more important.

PAUL GRAHAM

Whereas if you have the same guy who has 100 of each and you start throwing away determination, very quickly you get the sort of perpetual grad student who's very smart but never achieves anything.

ROBERT GREENE

The example I use of, among others, is there's Darwin and there's Galton, his cousin. And Galton had an unbelievable IQ, like 180, 190, something like that. They have managed to figure out what Darwin's IQ would be,

because they didn't have IQ tests back then.

It would be about 160, 155. So he was very smart, but nowhere near his cousin, and look where they both went. Because Darwin was this insanely persistent, painstaking man who spent eight years studying barnacles just because he knew that he didn't have a solid enough background on biology.

PAUL GRAHAM

Incidentally, I don't believe in IQ at all. I think it reminds me . . .

ROBERT GREENE

It's a silly thing.

PAUL GRAHAM

It reminds me . . . the people who study people's IQs do not themselves have IQs like Darwin. So it's like people a foot and a half tall trying to measure the respective heights of basketball players. How can they tell the difference from down there between someone who's seven foot one and seven foot two? I think that's nonsense. I believe Galton was much smarter, in some ways, very smart.

ROBERT GREENE

He had very interesting ideas. He couldn't stick to any idea. He had 80,000 different interesting things, but he never stuck to one like Darwin.

PAUL GRAHAM

That is the big thing that we beat on people to do during YC, to find the right thing to focus on and just focus on it. Beware of all the snares of side projects.

ROBERT GREENE

That's great. Well, so it's determination.

What about fearlessness, which is a big theme of *The 50th Law*?²

PAUL GRAHAM

People can learn fearlessness. We've seen that many a time. You get these people, their fearlessness has not been called upon, because they've grown up in a sheltered life in the suburbs and going to school. And some of these people, you could toss them into the Navy SEALs and they'd turn into monsters,

and other people would wimp out and could never deal with it.

ROBERT GREENE

You can definitely develop it. Definitely.

PAUL GRAHAM

Maybe it's latent, or maybe it can be learned. But whatever, it's not something we can necessarily observe. When we see it, we love it.

ROBERT GREENE

Can you observe a bit of daring or not risk taking, but maybe nonconformist. They don't . . .

PAUL GRAHAM

Right. Nonconformism. As long as people aren't complete wimps. The phrase I use is tissue turgor. Do you know what that means?

ROBERT GREENE

Tissue what?

PAUL GRAHAM

Tissue turgor.

ROBERT GREENE

Turgor?

PAUL GRAHAM

Yeah. Turgor means solidity. And one of the tests that doctors use . . .

ROBERT GREENE

Turgor?

PAUL GRAHAM

Yeah. T-U-R-G-O-R.

ROBERT GREENE

I've never heard of that.

PAUL GRAHAM

It's a doctor, a medical term. Because when you're really sick, if a doctor pushes your flesh, it doesn't bounce back very well. You can push in and it leaves a dent. So, tissue turgor means some amount of resistance. You're talking to the guy, and you feel like he won't just say yes to whatever you say.

ROBERT GREENE

But he's not stubborn.

PAUL GRAHAM

Right. What you want is you don't want someone, no matter what you say, you don't want someone who says yes, yes, yes, and

you don't want someone who says no, no, no. [laughs] It's got to be the right answer in each case.

ROBERT GREENE

That's very funny.

PAUL GRAHAM

And we know, actually, when someone is saying yes, yes, yes. Because in the course of the interviews, we toss around a lot of ideas. I firmly believe that if you're not having a lot of bad ideas, you're being too conservative. So we toss around a lot of ideas with people about what they could do, and if they say yes to all of them, we know. A few seconds later, we think, "That was a stupid idea. Never mind." But they've already said yes. That means they're wimpy.

ROBERT GREENE

Do you ever get people who are clever and they tailor how they talk to you knowing what they think you're going to want?

PAUL GRAHAM

Yes. Yeah, yeah.

ROBERT GREENE

They fool you.

PAUL GRAHAM

There's knowledge out there. There's a lot of people who have written about Y Combinator interviews, and they ask the . . .

ROBERT GREENE

So you've got to keep upping your strategies.

PAUL GRAHAM

Well, you know what we do actually, we remember these people who fooled us. And suppose that someone who fooled us was called John Smith. When we're interviewing someone in the future, we'll say, "This guy is a John Smith. I know it. Remember when he said such and such?"

ROBERT GREENE

You can feel it? You can tell?

PAUL GRAHAM

Jessica can, and I'm pretty good at it.

ROBERT GREENE

Ah, Jessica. That's good.

PAUL GRAHAM

We have now interviewed . . . we've funded 250 startups, and so each startup has two and a half people. We've probably interviewed three times as many as we've funded. So 750 startups times two and a half people. It's well nigh 2,000 people. So Jessica has sat there on the table and watched 2,000 people's responses, and then observed the results with the ones that we've funded.

ROBERT GREENE

This would be a great book, what you guys together could do, because it's about results. You've seen . . .

PAUL GRAHAM

I don't think we'll ever write it. You can if you want, but we don't have time.

ROBERT GREENE

It's interesting, because the neuroscientist that I interviewed, he does everything very low tech. He's against getting a \$400,000 device to study. He uses mirrors and things that he can buy. He says he goes to Rite Aid

and gets it. He gets 95% of his answers by interviewing people. Because he says when you talk to people, and you spend like an hour discussing all of the signs that you need to come out from what they say, you just have to know how to read them. So it sounds like a lot of what you're doing is the talking part, the interviewing.

PAUL GRAHAM

Oh yeah. Did you know how we decide to fund people?

ROBERT GREENE

People don't do that much anymore.

PAUL GRAHAM

One of the most fascinating things that we have done with scale is figured out how short a time you can interview someone in order to decide whether to fund them or not. We decide in 10 minutes. Interviews are 10 minutes long.

ROBERT GREENE

Yeah, I read that somewhere.

PAUL GRAHAM

And it's just enough. The limit is probably actually around eight minutes. But we can tell where the limit is based on when our opinion of them changes. Like, after . . .

ROBERT GREENE

Do they know it's going to be 10 minutes?

PAUL GRAHAM

Yes, yes. It's a written schedule. They have an interview that's a particular time, and everybody knows interviews are 10 minutes. So they get ushered in. What they always say is they get ushered in, and they feel like they've basically been thrown into a dryer. And then after what feels like 10 seconds, someone comes along and says, Okay, time's up," and takes them out.

ROBERT GREENE

What if they freeze up or they're not good talkers?

PAUL GRAHAM

We're pretty good at getting them to unfreeze. We can extract the ideas out of their head if they're incapable of expelling them.

ROBERT GREENE

You have to adapt as well.

PAUL GRAHAM

We have to. We have 10 minutes. We have to make up our minds. We have to be efficient.

ROBERT GREENE

What about the fact . . . do you notice in dealing with . . .

PAUL GRAHAM

That's probably why they find it so confusing and exhausting, because it's not like a normal conversation. What it is is 10 minutes of . . . we pull the ideas out of their heads.

PAUL GRAHAM

Everything about Y Combinator is designed to frighten them into focusing basically.

ROBERT GREENE

Frighten them. How do you frighten them?

PAUL GRAHAM

At the end, you present to investors. At the end is demo day. And it's not a fake boogie man. It's real. This is going to mass produce your reputation in the Valley. Every investor in the Valley comes to demo day. And lots of investors from outside the Valley, too. So if you get up there and look like an idiot, all these famous important people are going to remember that you're an idiot.

ROBERT GREENE

Yeah, but a lot of kids nowadays, because I've seen it when I was at Yale or elsewhere, they have a mentality where . . . well, a lot of people our age did, too. Where they put it off. They wait, "In the last two weeks, I'll figure it all out." They're not making the most of every moment.

PAUL GRAHAM

Somehow that doesn't seem to happen. Partly because we have this . . . demo day is not just this stick in the mud in the future. Up till demo day, we talk to these guys ongoing. And

they have to keep talking to us and saying, “What have you done in the last week? What are you going to do next week?”

ROBERT GREENE

You’re applying the pressure, but maybe when they get out in the real world and they don’t have it anymore, they kind of fall apart.

PAUL GRAHAM

It does sometimes seem to happen, but I feel like those ones were doomed anyway. We think of ourselves as like the catapult in an aircraft carrier. We get you to enough velocity to stay airborne. And then after that, if you’re not aerodynamically suited, you’re going to lose a lot and plunge into the sea.

ROBERT GREENE

That’s a good metaphor.

PAUL GRAHAM

And I feel like those are inevitable. I’m not sure though.

ROBERT GREENE

I think you’re right.

PAUL GRAHAM

The only way we could spend more time on them is if we made Y Combinator longer, but then we couldn’t fund as many startups. So we would be taking attention away from somebody else we might have funded but wouldn’t be able to if we spend longer on each one that we fund. So I feel like three months is optimal.

ROBERT GREENE

It is. It’s evolution. They have to make it on their own at some point.

PAUL GRAHAM

Yeah.

ROBERT GREENE

And if they die, they die.

PAUL GRAHAM

The great thing about this is we never have to be the bad guys. We never have to fire anybody. The market fires them. They build this thing. Users don’t like it.

ROBERT GREENE

That’s how the world should work anyway.

PAUL GRAHAM

Yeah, I know. It’s funny, everybody in the middle of the 20th century thought that the way the future was going to be was giant organizations. All science fiction books, in the future, everybody was part of some giant organization and had their jumpsuit with their rank on it. And it turned out that giant organizations were just an artifact of medium quality speed of communications. If you have really slow communications, you can’t have large organization at all. They’d just fall apart. If you have really fast communications, you can do everything in small groups. They just cooperate with one another. But if you have medium fast communications, then it pays to have big groups. So, people didn’t realize. They saw this trend starting in the Industrial Revolution with bigger and bigger organizations, but it peaked in 1970 something.

ROBERT GREENE

I wonder if there was anybody who saw something else happening before it . . .

PAUL GRAHAM

Well, you know who saw it first? Silicon Valley saw it first. This was the first place small was cool. Silicon Valley and Boston, where the first startups were.

ROBERT GREENE

Before that, I'm wondering if going into the 19th century, are people in that . . . I guess it would have to be before corporations and large . . .

PAUL GRAHAM

It always seemed it was all about economy as a scale. That was the cool thing. Doing things on a big scale. Big was good.

ROBERT GREENE

You know what I would say it came from? In my just thinking out loud. Warfare, where they discovered that large armies were a disadvantage, and to break it up and fight

in guerilla warfare was the future. And you know who came up with that pretty much?

PAUL GRAHAM

Who?

ROBERT GREENE

Who invented modern guerilla warfare. T.E. Lawrence from Lawrence of Arabia. In his book, he kind of creates the idea for why guerilla warfare will work in the future and why small is better in the military sense. So maybe some people are ahead of that.

PAUL GRAHAM

Well, the reason startups worked in Silicon Valley was not because anybody had any theories about organizational behavior. It was just what worked. They started these companies, and they never needed it to be big in order to get things done, because they had tools that had a lot of leverage.

ROBERT GREENE

What are we talking about? What kind of companies?

PAUL GRAHAM

Well the first startup . . . Silicon Valley happened because of Shockley who was one of the three guys who got the Nobel Prize for inventing the transistor. He started his own company. Back then, there was no such thing as venture funding.

ROBERT GREENE

Are you talking about the '60s?

PAUL GRAHAM

1956 maybe. It's interesting that startups and blitz both happened at the same time practically, the late '50s. So Shockley came out here and started Shockley Semiconductor. And what happened was he was a very, very difficult person. So he recruited eight brilliant people to come and work for Shockley Semiconductor. Shockley Semiconductor was not a separate company. It was a subsidiary of a big company. That was how you got a startup funded in those days. And those guys, the eight people who came to work for him, who included Gordon Moore who founded

Intel and Eugene Kleiner, the founder of Kleiner Perkins, and a bunch of other very famous people.

The traitorous eight, they were called, because after a year of working for Shockley, they said they couldn't take it anymore, and they all wanted to quit. But they liked the lifestyle out here so much that they wanted to find some company that would hire them all so they wouldn't have to leave and break up the team. And what ended up happening was they came across an investment banking firm who put together a deal for them to start their own company, also a subsidiary of Fairchild Instrument.

So those eight went off and started Fairchild Semiconductor, and that set off everything. If you look at the family tree of Silicon Valley, it was Shockley Semiconductor, Fairchild, and then bang. Everything off of that. And they never had to be big, because they were

working with tools where they had a lot of leverage.

ROBERT GREENE

That's very interesting. Has anybody ever written about this?

PAUL GRAHAM

A lot of books. There's this very famous book by a French guy about the history of Silicon Valley. It's the best book on the subject. People have written a lot of books on the history of Silicon Valley.

ROBERT GREENE

Well, moving beyond Y Combinator, do you see anything, like, what the next idea of yours will be? We've come upon basically Viaweb.

PAUL GRAHAM

No.

ROBERT GREENE

Spam filter. Essays. Y Combinator.

PAUL GRAHAM

All of these things happened by accident.

ROBERT GREENE

It just happened.

PAUL GRAHAM

Yeah. It'll happen because . . .

ROBERT GREENE

There's nothing brewing in you right now.

PAUL GRAHAM

No. Well, there's a hundred things brewing, but most of these things will amount to nothing. I'm going to have to somehow not be spending so much time on Y Combinator for anything new to ever happen. As long as I'm very busy with something else, how can I ever start a new thing?

ROBERT GREENE

You'll find a way to detach yourself slowly.

PAUL GRAHAM

Yeah, we'll see. We'll see. I never know what. I never plan ahead.

ROBERT GREENE

That's good.

PAUL GRAHAM

I hate it, because the worst problem in my life has been people asking me, "What do you do?" I never know what to say. I usually

say I'm a programmer, since what they really mean is, "How do you make money?"

ROBERT GREENE

That actually is true. When I came up with my list of people, I had a hard time saying what you do. Like I came up with neuroscientist, architect, jazz musician. What do I call him? And I say programming genius/entrepreneur. Or programming and entrepreneurial genius is what I did.

PAUL GRAHAM

I wouldn't say genius. I would say . . . let's see. I never know what to call myself, so if I don't know, you probably can't think of anything good either.

ROBERT GREENE

Yeah. But that's probably okay that we can't categorize.

PAUL GRAHAM

How about just investor? That's what I do at Y Combinator.

ROBERT GREENE

No, because you're also . . . you're programming. You've created things that had a profound impact.

PAUL GRAHAM

Hacker News.

ROBERT GREENE

Huh?

PAUL GRAHAM

Hacker News. Hacker News.

ROBERT GREENE

But Viaweb. The spam filter. Hacker News. I wanted to just talk briefly about the spam filter, of course which I know nothing about. I read it. I know more about statistics and not about content, which is very interesting. Is there anything we can generalize about where you got this from, your approach . . .

PAUL GRAHAM

Yes, yes, yes. Doing the simplest possible thing. A lot of people talk about this. It's not some idea of mine. But what we always tell people within startups is build the simplest

possible version one. Do not make up some elaborate plan. You've probably heard the quote about how battle plans never survive contact with the enemy. Well, same with startups or just with technology in general. So don't make an elaborate plan. What you should do is build the simplest possible thing, and then try it out, and then see what happens and see what you need to fix.

We did this with Y Combinator itself, and we did it with the first version of Viaweb. And that's what I did with the spam filter. I just thought, "All right. What is the simplest possible algorithm you can make?" The simplest possible algorithm you can make is don't even look at sentences. Just look at each word that occurs. Just grind it up into a bunch of little words, and then look at the words that occur in spam e-mails and the words that occur in non-spam e-mails, and just do the simplest possible statistical calculation. Seriously, it's like 50 lines of code or something.

ROBERT GREENE

Why didn't anybody think of that? When did you come up with this?

PAUL GRAHAM

Partly, it was timing. It was because it was when spam was just becoming a problem.

ROBERT GREENE

'01? Somewhere around then?

PAUL GRAHAM

Yeah. I don't remember. Whenever it was. I did that just the moment when the number of spams was becoming a real problem. And so before that . . . your natural inclination when you just get a few spams . . . I know, because I did this myself. I had this handmade old fashioned spam filter that just had certain phrases in it. So if it ever said, "If you wish to unsubscribe," or something like that, like all spams do, you can just add this line to some filter, and typing in one phrase is less work than writing a program, even 50 lines. So, the least possible amount of work is just typing in a phrase, and any e-mail that you

see in the future that has that phrase, you just throw it away.

ROBERT GREENE

Yeah, but as you say, the spammers up their game, and they figure out a way around it.

PAUL GRAHAM

Eventually, you realize, shit, I've now written down 500 phrases. It would have been simpler just to write the 50-line program. So that's why nobody did it. Everybody had this . . . the easy approach accumulated.

ROBERT GREENE

Why didn't they switch and think of it differently like you did? That's a sign of . . .

PAUL GRAHAM

Because I was approaching the problem anew, as an outsider. I didn't know anything about spam filtering, so I tried what seemed like the most obvious thing.

ROBERT GREENE

Interesting. It's pretty effective on Gmail.

PAUL GRAHAM

Yeah, but they don't necessarily just use the kind of algorithms that I developed. Google knows everything. They know about what routers this stuff is coming through. They know everything. They also get everybody else's e-mail, so they know if somebody sends out 1,000 copies of an e-mail, they know, because they get 500 of them.

ROBERT GREENE

So it's a mix of what you did and some other.

PAUL GRAHAM

Who knows what Google is even doing. Believe me, I would never for a second take credit for anything they do.

ROBERT GREENE

Because I never get spam on it. It's pretty phenomenal.

PAUL GRAHAM

If Gmail had already existed when I wrote that stuff about . . . I would never have needed to write that stuff about spam filtering. It was because it was before Gmail.

That was one of those things, if somebody else, any reasonably thoughtful person who had approached the problem would have done the same thing.

ROBERT GREENE

I see. Eventually.

PAUL GRAHAM

Yeah.

ROBERT GREENE

Okay. All right, I wanted to get to some heuristics that I culled in reading your material. The first one, I don't really know how to explain, but it's a thing that people in science talk about as far as reframing a problem or a question. And I seem to feel that you do that a lot, but I don't know exactly how to explain it. So, for instance, your whole essay on money and wealth was a different way of reframing the whole question of wealth itself. Or there was just something you mentioned now and I forgot what it was already. But it seems to be a pattern that you use all of the time.

PAUL GRAHAM

Yeah, yeah, sure. Maybe that's one of the tricks for recognizing when you've got a good idea. Remember we were saying it's when it seems funny or has the right kind of wrongness? Maybe it's when you realize the way you've done has reframed the problem in a way that will allow it. Before the problem had this shape, and the frame was misaligned with it, and you figured out how to make it snap on, and you're going to be able to shoot forward. Maybe it's something like that.

ROBERT GREENE

Is it something that you've kind of consciously applied that we could talk about, or is it a way of thinking? Is it something that programmers have to do, because they're trying something over and over and over again, and then they have to try on something else?

PAUL GRAHAM

It might be. It might be. Or it might be something that, if you're good at it, then you end up liking programming and being good

at it. I don't know. I've never consciously tried to do anything. I'll tell you, I have this almost idiot savant like ability to come up with metaphors just endlessly, on demand. And that might be a very similar thing. Because it's about noticing that two ideas have the same shape. That's what a metaphor really is.

ROBERT GREENE

Give me an example of that and how that works.

PAUL GRAHAM

That was one. [laughs] Ideas don't have shapes.

ROBERT GREENE

Okay. What for programming or for business where you actually came up with it?

PAUL GRAHAM

Well, the thing we were just talking about, about how you do a very quick version one. With software, that's the thing that you want to do, and also with businesses, what you want to do is get something out there so that you can start talking to customers. And battle

plans, them not surviving encounter with the enemy, like the enemy is the customer. The customer in a business is the physical world if you're studying the physical sciences, is the enemy if you're studying trying to have a war. It's all the same shape idea.

ROBERT GREENE

Well, also, how about the idea where you never quite follow where other people have gone. You choose the area where no one has gone before.

PAUL GRAHAM

Not deliberately. Not deliberately. It's just I do a whole bunch of things. If you do a whole bunch of things and you're ignorant but energetic, then you will end up reinventing some things.

ROBERT GREENE

The metaphor I use . . . I don't know if it's a metaphor. But you're talking about Google where people like Netscape tried to take on Microsoft sort of in a direct kind of warfare,

and they got crushed. Instead, Google did the search engine, but they didn't . . .

PAUL GRAHAM

They transcended Microsoft. That's what they did. They didn't attack them. They transcended them.

ROBERT GREENE

Yes, but it wasn't necessarily a conscious strategy. They just were excited by search, and then it turned into this other thing.

PAUL GRAHAM

Yeah, yeah. The way we think of Y Combinator, and in fact the way we try and focus now that everybody and their mother is trying to have meetings with us and do things with us. The phrase we use is coral reef.

ROBERT GREENE

Coral reef?

PAUL GRAHAM

Coral reef, because there's only two things that matter that have made Y Combinator any good, which is picking startups and then helping them once you pick them. Everything

just comes from that, and it's very low level. Picking the startups is talking to some individual 20-year-old and thinking, "Is this guy going to do it or not?" And then helping them is boring shit. There's too much text on your page. No one knows what to click on. That image is lousy. It's all a bunch of mundane shit, but just like with a coral reef, you have these little animals making their little houses. And if you do enough of it, you end up producing this whole atoll.

ROBERT GREENE

That's a good metaphor.

PAUL GRAHAM

Right. So we say, "Don't worry about anything. Just pick the startups, and help the startups you pick, and everything else will take care of itself." And scale.

ROBERT GREENE

Well, you also talk about how nothing really is inherently boring. It's how you kind of look at it.

PAUL GRAHAM

Some things are boring.

ROBERT GREENE

They are.

PAUL GRAHAM

Some things are more boring than others.

ROBERT GREENE

Well, the idea of online business development software could be boring, but you approached it from a way that was very exciting.

PAUL GRAHAM

It was comparatively interesting. We did some interesting engineering stuff in Viaweb, but it was still mostly schleps. I would not encourage founders to have any illusions about that.

ROBERT GREENE

Okay. What about, you talked a little bit about simplicity and how simplicity in design is always the better approach, and that people always want to make things more elaborate than they need to be. They mistake that for . . .

PAUL GRAHAM

Sophistication.

ROBERT GREENE

Sophistication. Is there some kind of generalization we can make about that, about simplicity? Is there something from nature? Why is it a superior heuristic for solving problems or creating a business or for creating a painting?

PAUL GRAHAM

I think because it's easier to keep under control. When you have profusion of ornament or a side project or whatever, you can't tell how well you're doing. Whereas if you're just working on one thing and it sucks, you can see if it sucks. You've got to be able to tell if you're doing badly.

ROBERT GREENE

I see.

PAUL GRAHAM

And it's the same in a startup as in an essay. We tell people, "Take one thing, and that's what you're going to focus on, and you're

not allowed to think that you're doing well, because there's 1,001 different things that you sort of did this week. All that matters is how well you do on this one thing." And then they can know if they're sucking or not. Ambitious people really hate to suck. So all you have to do is show them that they are sucking, and they will frantically avoid it.

ROBERT GREENE

Yes. But even like in design, we can abstract and say that . . .

PAUL GRAHAM

It's the same in design. You can tell if your building sucks. If you have to keep it simple, then you know you're not fooling anyone, including yourself, with the ornament.

ROBERT GREENE

Okay. Then there's the one about thinking 100 years ahead. So sort of trying to create something perhaps timeless, classic, that can last.

PAUL GRAHAM

Well, this is also definitely true for startups. We tell people . . . a lot of times we spend our time talking about new ideas for people. People will say, “Our startup isn’t working. We have to come up with a new idea.” Blank slate. New idea for a startup. On the spot, like in 10 minutes. And one of the heuristics that we teach people is to think about how, when you look at movies, even from 20 years ago, like before cell phone for example. You look at them, and you think, “Jesus Christ, how did people stand living without cell phones?” And you know 20 years from now, people will be looking at present technology and think, “How did people stand life without blank?” All you’ve got to do is figure out what blank is, and you have a recipe for riches.

ROBERT GREENE

But what if you’re too far ahead of your time and you can’t . . .

PAUL GRAHAM

It’s too hard to think too far ahead of your time. It really is. You don’t have to worry about that anyway. But 20 years is about the right time.

ROBERT GREENE

You were trying to think about as far as computer languages, what will be the language people are using 100 years from now? That’s a little different.

PAUL GRAHAM

Yes. It’s a little different. It’s not specifically 100. It’s just 100 is far enough that whatever are the limitations of present day computer hardware will no longer factor into the picture.

ROBERT GREENE

Oh, that’s what it’s about. Okay.

PAUL GRAHAM

Yeah. So it could be 1,000. Except who knows. In 1,000, maybe . . .

ROBERT GREENE

It’ll be how times 10.

PAUL GRAHAM

Maybe in 1,000 years . . .

ROBERT GREENE

There won’t be any humans.

PAUL GRAHAM

Right. There are going to be 400 humans or 400 billion humans.

ROBERT GREENE

Primates will be taking over. So, it’s just a way . . . so why think . . .

PAUL GRAHAM

I wouldn’t advise startups to think 100 years in the future. 100 years is specifically for . . . it would be different amounts into the future for different things. For writing an essay, you could think more than 100 years into the future. Whereas a startup, 10 years is about the right time. For painting, too, I think it would be good to think hundreds of years in the future. Because if you look at the history of painting, there have been bad fashions that persisted for more than a century.

ROBERT GREENE

Yeah. That's a very interesting process to go through which I engage in all the time. I don't necessarily know if it works or not.

PAUL GRAHAM

Well, one trick you can use is to think what people would have thought of this thing a few hundred years ago. You don't know what things are going to be like in the future, but you know roughly what they were like in the past. So have you written something that people 200 years ago would have liked?

ROBERT GREENE

It's the same . . .

PAUL GRAHAM

Because they wouldn't have understood any of the inside jokes.

ROBERT GREENE

Right. Well, I believe that's how I try and write actually. I make it as timeless as I possibly can.

PAUL GRAHAM

That's good. What I saw so far seemed pretty undated.

ROBERT GREENE

But there are things that are dated in there definitely. You can't help but being a product of your time.

PAUL GRAHAM

But you can help writing about it.

ROBERT GREENE

The concept of craftsmanship, which happens to be a big theme in the book, you seem very interested in as well, and you've mentioned it in this book. Is this something that you use at all as far as your knowledge about tools and the idea of thinking very deeply about making something well?

PAUL GRAHAM

You mean the startups specifically?

ROBERT GREENE

Yeah.

PAUL GRAHAM

Well, we encourage, because the kind of founders we pick are mostly programmers, we tell these people that they should, just like in an army, if you had an army with heavy wagons or something like that, you would not want to do battle on swampy ground. So we encourage the founders to do battle on ground that's suited to them. And since they're hackers, what that means is if they have a choice of two paths, and one path is going to actually rely on hacking skills and one not, rely on the one that relies on hacking skills, as opposed to doing deals or something like that.

ROBERT GREENE

And how does that play into the idea of craftsmanship?

PAUL GRAHAM

Well, win by craftsmanship. That's what I'm saying. Hacking skills means craftsmanship as opposed to, like, political skills. Larry and Sergey, my god, with Google, they've totally

done that. Google is like a big science project. They just went off into territory where you have to be smart to win, and because they were smart, they won.

ROBERT GREENE

That's very exciting. They do have their limitations when they tried to do their own Facebook version, which they don't understand very well.

PAUL GRAHAM

According to Paul Buchheit, who is one of the few people in the world who has worked closely for both Larry and Sergey and Mark Zuckerberg, and can therefore compare them, he says that they're very different, and that Zuckerberg is like a poker player. It's all about strategy. And Larry and Sergey are basically like scientists.

ROBERT GREENE

That would be fascinating. I read in the New York Times that now there are people leaving Google to go to Facebook.

PAUL GRAHAM

Yeah. Facebook has the most pull at the moment.

ROBERT GREENE

Interesting, isn't it?

PAUL GRAHAM

Well, it's because people like working for things that have a big effect on the world, and Facebook has so many users. It's not necessarily just about the money. Hackers like having an effect.

ROBERT GREENE

What about the idea of people being too specialized these days? So you, for instance, you have quite a varied background. You studied philosophy at some point?

PAUL GRAHAM

Yeah.

ROBERT GREENE

You studied philosophy, painting, you were a hacker, you studied computer engineering, you stretched canvas. You then programmed Viaweb and you were an

entrepreneur. Because of that, you have all these associations where all your metaphors can come from. You can pick something from painting that applies to engineering. You have philosophy books. Don't you think that's an interesting model, perhaps where we're headed towards in the future anyway, where people need to be . . .

PAUL GRAHAM

I could see something like that happening, because the old model with large organizations, the old model was that right after college, you would join some organization and then work your way up the ladder. Now, maybe what people will do is they'll do gigs. That will be the word. They'll work somewhere doing something, and then they'll go do something else. Actually, if the rate of evolution of technology speeded up, that would also tend to increase that tendency, and of course it is. So you've got organizations becoming fragmented and

things happening faster. Both of those things will tend to cause people to do this more, yes.

ROBERT GREENE

And that could be our version of the Renaissance man or woman.

PAUL GRAHAM

I don't know. I don't know, man. I feel like if I wrote a biography, a good title for it would be "Do Not Try This at Home", because it's all been a bunch of accidents, and often it's very stressful.

ROBERT GREENE

I would disagree with you.

PAUL GRAHAM

Seat of the pants, on the fly, making things up.

ROBERT GREENE

I would say, "Do Do This at Home." You're not going to be exactly what you did, but . . .

PAUL GRAHAM

It did not feel good a lot of the time, and it doesn't feel good now.

ROBERT GREENE

It doesn't feel good now?

PAUL GRAHAM

No. No, no. This sounds completely obnoxious, but last month or something like that, I was on the cover of Forbes.

ROBERT GREENE

You were? I didn't see that.

PAUL GRAHAM

Yeah.

ROBERT GREENE

Oh, congratulations.

Paul: I feel like I still have not figured out what my career is supposed to be. I just did all these things in the meantime while I was trying to figure out what I was supposed to do. But if I died now, as well as because dying would bum me out. But if I died now, it would really bum me out, because I figure I never really got started. You know, I never started.

ROBERT GREENE

You're a late bloomer.

PAUL GRAHAM

Yeah. But I've got to figure this out. I've got to figure what to do. It's probably writing, and I've got to figure out how I can spend more time writing and less time on Y Combinator.

ROBERT GREENE

You have so many great ideas. Talking to you right now, you've got three or four . . .

PAUL GRAHAM

Well, I do write.

ROBERT GREENE

I know, but books.

PAUL GRAHAM

Oh, well, who cares if it's books or essays on the Web?

ROBERT GREENE

Well, then, if you're doing that, then why are you upset?

PAUL GRAHAM

Well, I'm not doing it enough. I'm spending all my time on Y Combinator. And I think the amount of energy that could have

produced some good essays has gone into telling a bunch of people to change the wording on the front page of their website.

ROBERT GREENE

Okay. Essays, but what about a book?

PAUL GRAHAM

This is just a book of essays from my website.

ROBERT GREENE

I know, but that would be a different challenge. A book is different from essays. I'm not saying it's better, but . . .

PAUL GRAHAM

No, this is just a bunch of . . . you mean write a separate book.

ROBERT GREENE

Yeah. A book with a concept that ties it all together, like about wealth or technology or . . .

PAUL GRAHAM

I like writing essays.

ROBERT GREENE

I find that naturally I break things up into groups anyway as well, so I understand that.

PAUL GRAHAM

I like writing essays. Believe me, if I just wrote all the essays . . . remember that whole idea, which to me is the really big idea, realizing the cage door is open, and there's all these essays you could write that have never been written because of the constraints of publishing them before? If I just cut a swath through all of that, it's like Durer. Before Durer, engraving was a despised medium for making these cheap little devotional images. Someone would thumbtack up their little Madonna and pray to it. And he said, "I'm going to see how far I can push this."

Actually, same with Shakespeare and plays. It was just this lowly thing, almost like burlesque for a few lords and a bunch of rabble in the pit. The lords were slumming going to the play. It's an important thing to remember. In those days, to go to a play was slumming. And they always took these . . . or jazz. People would take these despised media, and as soon as they realized there was all these new things

they could do, they would do almost all of them. One guy. And I would like to do that for essays.

ROBERT GREENE

I think that's great.

PAUL GRAHAM

And somehow, it's like this side project to invest in a bunch of startups has ended up taking over my life. And that's what everyone knows me for.

ROBERT GREENE

Well, but you're what, 45?

PAUL GRAHAM

Six.

ROBERT GREENE

46. You've got plenty of time.

PAUL GRAHAM

Yeah, that's what I've been telling myself ever since I was 15. I've got plenty of time.

ROBERT GREENE

Well, you don't have plenty of time. Since I turned 50, I don't feel like . . .

PAUL GRAHAM

You're over 50?

ROBERT GREENE

Yeah. I feel like the devil is on my heels, and I've got to get things done.

PAUL GRAHAM

Me too. As Robert Morris, who very rarely says things, but he said the funniest thing about this. "Time's winged chariot is crawling up my tailpipe."

ROBERT GREENE

Wow. That's his own creation?

PAUL GRAHAM

Yeah.

ROBERT GREENE

Time's winged chariot is crawling up my tailpipe.

PAUL GRAHAM

Crawling up my tailpipe is fighter pilot talk. He and I both read a lot of books about . . .

ROBERT GREENE

Fighter pilots?

PAUL GRAHAM

Yeah. About planes. Look.

ROBERT GREENE

Look where?

PAUL GRAHAM

In the Spitfire over there.

ROBERT GREENE

Are you interested in John Boyd?

PAUL GRAHAM

Yeah. I have Boyd's book around here somewhere.

ROBERT GREENE

Because that's a lot of the war book. I'm really into Boyd.

PAUL GRAHAM

Yeah, I have Boyd's book.

ROBERT GREENE

And the OODA Loop and all that stuff. He's I think the greatest.

PAUL GRAHAM

You know where it is? It's up the hill. I have another house up in the top of the mountains.

ROBERT GREENE

Okay. Maybe the power book is there as well.

PAUL GRAHAM

Maybe. No, I think because it was in Cambridge, and so it must be packed in a box.

ROBERT GREENE

Well, fighter pilot strategy is amazing. I'm really fascinated by it.

PAUL GRAHAM

Yeah, and boy is the heat on for those guys, right?

ROBERT GREENE

Yeah. So, we've covered the Renaissance man. I wanted to ask you . . . we already covered your vision of the future. You see people being entrepreneurs, startups, working for themselves, not for a large corporation anymore. Is that pretty much where you see things going?

PAUL GRAHAM

Well, it's one thing that's going to happen in the future I think.

ROBERT GREENE

What do you think of other . . .

PAUL GRAHAM

I don't know. I don't think much about it.

ROBERT GREENE

You don't?

PAUL GRAHAM

No. I have the future handed to me every six months, so I don't sit around predicting it.

ROBERT GREENE

But if you read all these things about medieval technology, because I read a lot of history, doesn't it often make you wonder what is the history that we're writing right now?

PAUL GRAHAM

Well, I know what's going to happen. I know that everybody has always been surprised by the future, which is one reason I know not to try to predict it. So, there will be some things about the future that are strikingly similar to now. And you'll think, "God. That hasn't changed at all. I can't believe that." And

other things will be completely different, and you'll never know what they are. So someone will discover something, and you can never tell what it will be. You won't even know what field it will be in. It will be in some field that doesn't even have a name now. But someone will discover something remarkable. Like, what was in retrospect the Computer Age was supposed to be the Space Age. And space turned out to be a completely side story. But it was supposed to be the Space Age.

ROBERT GREENE

Right. Although, the Space Age did really create the Computer Age.

PAUL GRAHAM

Partly. It's true. Silicon Valley was very much influenced by missiles. Not sending people into space and not high orbits, but a great deal of the semiconductor industry was basically paid for by, not government subsidies, but government contracts for circuits that could withstand horrible G

forces. That was one of the big forces driving the development of integrated circuits.

ROBERT GREENE

But what about computers and NASA?

PAUL GRAHAM

Yeah. Somewhat. Although if you think about it, IBM was into business machines.

ROBERT GREENE

That's true.

PAUL GRAHAM

It's largely for business, but a lot of the infrastructure for making wafer fabs and stuff like that got kind of paid for by defense contracts. But not because the government was trying to subsidize anything. Just because the government had this really hard problem that needed solving, and they were willing to pay a lot to get it solved. Incidentally, if the government wanted to stimulate industry, that would be the best way to do it.

ROBERT GREENE

Do what?

PAUL GRAHAM

To pick a really hard problem. Instead of saying, “We want to stimulate such and such industry. This senator wants that industry stimulated. This senator . . .” Just say, “We need somebody to make a microprocessor chip that can work 20 times faster than current microprocessor chips, and we will pay you a billion dollars if you do it.” That would be the best possible thing they could do.

ROBERT GREENE

That specific?

PAUL GRAHAM

Yeah, because that’s what drove it in the Cold War. That specific, because it becomes like a science problem.

ROBERT GREENE

The new thing for me would be, instead of space, would be green technology.

PAUL GRAHAM

It almost doesn’t matter what it is, so long as it’s hard.

ROBERT GREENE

That’s pretty hard.

PAUL GRAHAM

Yeah. Make a solar cell. We’ll pay you a billion dollars if you make a solar cell that has 50% efficiency.

ROBERT GREENE

I’m going to talk to them about that.

PAUL GRAHAM

If you talk to some government people. That’s the way it has worked in the past. The more it becomes like science problem, and the less it’s like politics, the better it works. If you make it like politics, it often has the reverse effect.

ROBERT GREENE

I agree. Finishing the thing on heuristics, are there any tricks you have for when you’re blocked or for thinking that you do personally? Like take long walks. I know you take walks.

PAUL GRAHAM

Yeah.

ROBERT GREENE

You’re probably thinking when you’re walking. Do you have any other things that you rely on?

PAUL GRAHAM

I read books about completely unrelated things.

ROBERT GREENE

Like what?

PAUL GRAHAM

Well, “E” for example is what I’m reading about now.

ROBERT GREENE

And how does that refresh you?

PAUL GRAHAM

Like right now, my brain is burned out actually, because we just went through a huge amount of work for Y Combinator, picking the new group. We had to read all these applications, then we had a whole week of interviews all day long. We interviewed 21 startups a day for a whole week. At the end of which, our brains are just cottage cheese. And

so really, I came out of this a few days ago, and I couldn't even remember what projects I had been interested in before. [laughs] Blank slate. I knew there were various things I was interested in working on, but I couldn't even remember. So, I am in this phase now and using these heuristics. [laughs]

ROBERT GREENE

What are you doing?

PAUL GRAHAM

I go running. I just read whatever books are interesting. I decided I'm going to focus on math in December. I'm going to focus on math and running. So what I'm going to do is I'm going to go back and understand . . . there's all this stuff you learn in school in math that you memorize and then you forget.

ROBERT GREENE

You mean like hard math. You're getting into . . . not about great mathematicians.

PAUL GRAHAM

No, actual math. No, not hard math. Not like group theory and shit like that that people

study in graduate school. I'm talking like freshman year in college math, but really understanding it. Because no one understands it when they do it in freshman year. They just memorize all the shit to get through the exams, and then they forget it all.

ROBERT GREENE

That's a good idea.

PAUL GRAHAM

And that's what I did, too. So what I want to do in December is understand a bunch of math stuff.

ROBERT GREENE

Well, this is an interesting point, because I bring that up, and it's a debate in neuroscience, whether it's true or not. So for instance, I studied Greek and Latin in college. I was a double major.

PAUL GRAHAM

Oh really? Okay. That's why you asked if I studied classics.

ROBERT GREENE

Yeah. I see all the Loeb there. And the most irrelevant subject you could ever imagine. What could be more irrelevant than two dead language. Because it appeared . . .

PAUL GRAHAM

Well, they wouldn't be so interesting except for the things that are written in them.

ROBERT GREENE

Okay. But you could read them in English. And I decided that today, where I am now, it actually played a hugely important role. Basically, it disciplined my mind. It made me think analytically. You have to read a sentence, and it would take you sometimes an hour to figure out what it could possibly mean. So you would have that kind of aha moment over and over and over again. You knew how to be patient and let it come to you. All sorts of analytical skills that I believe I now apply to other things. It had a huge impact. I can't prove it. But I believe that the brain is . . .

PAUL GRAHAM

It's sort of like doing yoga for the brain.

ROBERT GREENE

Yeah.

PAUL GRAHAM

Studying things like that. You don't actually get anywhere when you do yoga. You stand in one place and bend yourself in various shapes. But it makes you more flexible, so when you go out and do walk around, you can walk better.

ROBERT GREENE

Yeah. That's a good analogy. I see you do create metaphors a lot. So, learning math or reading about fighter pilots or whatever, getting the mind exercise, it's like jogging. Do you believe that?

PAUL GRAHAM

Yeah. I do jogging, too. So, the good thing about walking is you can do it for longer, or I can do it for longer than I can run. So I could go for a walk for like six hours.

ROBERT GREENE

And you can think when you walk. It's hard to think when you run.

PAUL GRAHAM

Well, no, I think when I run.

ROBERT GREENE

You do?

PAUL GRAHAM

Yeah. I have the best ideas when I run.

ROBERT GREENE

Really?

PAUL GRAHAM

Yeah, because the thing about running is you're sort of stimulated and your blood is flowing, but you're not looking at anything. You cannot possibly . . . you're not typing, you're not reading. You can't do anything except think. And yet you're very much awake. It's a way to force yourself to be undistracted. The shower is like that, too. You're in the shower. You can't have anything in there with you, at least with current technology. But you're sort of awake because

you've got all this water flowing all over you.

So things like that.

ROBERT GREENE

So do you believe in this idea of generally exercising the mind?

PAUL GRAHAM

Yeah. Oh, yeah, yeah, yeah. That's how you've got to get out of a rut.

ROBERT GREENE

I don't want to put words in your mouth.

PAUL GRAHAM

No. Because what happens is humans have this natural . . . getting into a rut is sort of the bad half of this very good human tendency which is the ability to focus. Effective humans know how to just ignore extraneous stuff and just focus, focus, focus. But then eventually it kind of gets stale, and that focusing . . . then you describe it not as focusing, but being in a rut. So then you need to stop and wash your brain out and look around and do something different. I often am at a loss to decide what

to do, and what I usually do is decide to do whatever would be the most fun.

ROBERT GREENE

Like math?

PAUL GRAHAM

Yes. Are you kidding? Because it has the aspect of a practical joke. It's something you're not supposed to do. You're not, at age 46, supposed to actually learn all that crap you were supposed to learn freshman year of college.

ROBERT GREENE

It's the kind of thing I would do, but I know most people wouldn't think of it. I took up my Latin again.

PAUL GRAHAM

Yeah. It's sort of naughty in an amusing way.

ROBERT GREENE

The most irrelevant, irritating thing you can do, but . . .

PAUL GRAHAM

And it's clear, actually, very few people have done this. Because I went looking for books

about this, and there do not appear to be a lot of books for people who actually want to understand math. There's two kinds of books. There's textbooks for the people in college who are having to do it to get grades. And then there's like "Algebra for Dummies."

ROBERT GREENE

Yeah. Exactly. How many people want to do this? Very few. Very exciting. Okay, well, we're nearing the end here. I have the idea that I call the inside out, which is kind of the last chapter in the book. The idea is that when you get to know something really well and you master it, you gain a knowledge that's different from the knowledge that you would have had before. It's actually qualitatively different. And the knowledge is what you've studied becomes internalized, and you have a feel for it, and ideas come to you quickly. You can't explain where they come from.

So it's like if you played chess for 20 years and you became a grand master, the board is no

longer the board that it was 20 years ago. It's literally a part of you. And they know people who are grand masters have a feel for patterns that go far beyond what other people . . .

PAUL GRAHAM

Actually, one of the most fascinating things I read in this connection was this research where they showed that highly trained pianists can play sequences of notes faster than the signals could be going back and forth to their brain. So, they're obviously sending chunks of notes to their hands.

ROBERT GREENE

Yes. It cannot be explained.

PAUL GRAHAM

Well, it can be explained. It just means they're not playing one note at a time. They're playing notes in chunks.

ROBERT GREENE

Yes. Yeah.

PAUL GRAHAM

They don't send their hand a command like play this note. They send their hand a command like play this entire bar.

ROBERT GREENE

Right. Well, that's why I mentioned Glen Gould, because he's my favorite pianist. Not only could he play incredibly fast, in a way no one could, but with a level of expression that was just unbelievable. So it's almost like piano was part of his body is I guess what I'm explaining.

PAUL GRAHAM

Yeah. Actually, when you get really into painting, the same thing happens. You just look at the world, and your hands are moving. It's not even going through your brain really, or at least not that you know about.

ROBERT GREENE

Do you know the story about Renoir, the impressionist Renoir?

PAUL GRAHAM

Which one?

ROBERT GREENE

Well, he got terrible arthritis, so the last 10, 15 years of his life, he couldn't . . .

PAUL GRAHAM

His hands were like this.

ROBERT GREENE

So he used his elbow, and he painted, and he got so good at it, nobody could tell the difference, because . . .

PAUL GRAHAM

I did not know that. Interesting.

ROBERT GREENE

So literally, the painting didn't necessarily need to be part of his hand. It was part of his brain, and he could . . . of course it took some practice to get there, but once he got a little bit of that technique down, it was the same.

PAUL GRAHAM

I'm sure you could paint with your foot if you tried.

ROBERT GREENE

Once you got proficient.

PAUL GRAHAM

Yeah. Once you knew how to get the sort of feedback loop going so you know what command to send to your foot to make what mark on a canvas.

ROBERT GREENE

Well, do you have any kind of experience with that or any sort of . . .

PAUL GRAHAM

With what are we talking about? I forgot what we were even talking about.

ROBERT GREENE

I'm stretching your limits. We're nearing the end.

PAUL GRAHAM

No, no, no. I just can't remember what we were talking about.

ROBERT GREENE

The idea of inside out. The thing becomes . . . you have an intuitive connection to it, and what you're studying is internalized. And it's a different level of knowledge.

PAUL GRAHAM

Oh, that has happened to me in multiple things.

ROBERT GREENE

Okay. We'll talk about that.

PAUL GRAHAM

It's happened to me in programming for example. When I first started writing code, you have to think to yourself, "Okay. What is my program going to do?" You have to think about each thing. Whereas now, I know if I need to write a piece of code to solve a particular problem, I can kind of start typing before I'm even thinking about it.

ROBERT GREENE

And how does that happen?

PAUL GRAHAM

Well, I know that I'm going to have to write a function of a certain shape. I just know it's going to have to be some recursive function. And so I start typing the recursive part before I even know what is going to happen in the recursive step. Like when you're walking

down a list or something like that, I know it's going to be that general shape of problem, so I just start typing a recursive function. Then I figure out whether I'm supposed to add one or divide by two or whatever it is in the repeated step.

ROBERT GREENE

And do you even wonder where that comes from?

PAUL GRAHAM

Practice. Yeah. Experience for sure. Just having written a lot of code.

ROBERT GREENE

You know, they have the thing about the 10,000 hours. I'm sure you've read about that in *Outliers*.

PAUL GRAHAM

Yeah.

ROBERT GREENE

How many hours of programming did that take? Would it be something like 10,000 hours?

PAUL GRAHAM

Oh, my gosh. I don't know.

ROBERT GREENE

It's hard to say, I know.

PAUL GRAHAM

It's hard for me to calculate how much time I must have spent programming. 10,000 hours is . . .

ROBERT GREENE

It often can be broken down into time units. So they'll show people who are really brilliant.

PAUL GRAHAM

1,000 hours a year for 10 years.

ROBERT GREENE

Do like 10 years.

PAUL GRAHAM

Three hours a day for 10 years. I've been programming since I was 14 or something like that. So 30 years. So I would have only had to do one hour a day.

ROBERT GREENE

Yeah, but you reached that point well before now. Or no?

PAUL GRAHAM

I don't know. I don't know if I've spent 10,000 hours programming. I mean, probably about that.

ROBERT GREENE

Have you felt it with anything else besides programming? Like do you get it with Y Combinator?

PAUL GRAHAM

Oh, yeah. Yeah, yeah.

ROBERT GREENE

Like how?

PAUL GRAHAM

Well, when you know things are going well or badly with a startup, after you have as much data as we have, you can just sense things are going good with these guys. This is going to be a promising one. Even when the startup is completely fucked up, you can sense, these guys are going to be okay. And then there's

these other guys where it looks like everything is going great, but you get this smell.

ROBERT GREENE

And what is that smell?

PAUL GRAHAM

Well, it's the smell of impending failure.

ROBERT GREENE

But where does it come from? How would you . . . do you ever try and think about it?

PAUL GRAHAM

Well, it all comes down to the people. So, if you get the feeling like, these people are fundamentally feckless, and maybe things seem to be going well now, but they must be lying to you. Or they're really good at going through the motions, but as soon as they hit something that's hard, they're going to flake. It's ultimately the people.

ROBERT GREENE

So you've gained a real feel for people's character.

PAUL GRAHAM

I've gotten really good at judging potential startup founders. It has funny effects actually, because I can't turn it off. So whenever I'm talking to anyone, I'm judging them.

ROBERT GREENE

Would I be a good startup founder?

PAUL GRAHAM

Well, you're not a programmer.

ROBERT GREENE

Yeah. Okay.

PAUL GRAHAM

You certainly wouldn't be a bad one. You're not like an accountant. Clearly you can deal with freakiness and unexpected circumstances.

ROBERT GREENE

But I'm not a programmer, so that probably wouldn't qualify me.

PAUL GRAHAM

Well, you'd have to get a co-founder who's a programmer. You need to have a co-

founder. It's very hard to do a startup as a single founder.

ROBERT GREENE

I have no need to feel like I would be good. I was just curious.

PAUL GRAHAM

Well, no. What I was going to say is because I can't turn this off, when I'm talking to someone like Zuckerberg, my startup detector in my head is shrieking. It's like read 1,000 on a scale of 1 to 10. It's like "Founder! Founder! Founder!" [laughs]

ROBERT GREENE

When you talk to him specifically?

PAUL GRAHAM

Yeah. Or someone like that.

ROBERT GREENE

What is it that you're reading? What are the signs? We don't want to publicize these too much. I don't want to give away your trade secrets.

PAUL GRAHAM

Well, I'm not even sure what they are. Extraordinary forcefulness. Like, you talk to this guy, and you realize you would not want to be between him and something he wanted.

ROBERT GREENE

Right. Okay.

PAUL GRAHAM

Larry Page doesn't give that off. Larry Page still seems like a very . . . he still seems like he would be a great startup founder, but he doesn't seem so terrifying. Maybe it's because he's learned to hide it or something. But I think he's just a different sort of person.

ROBERT GREENE

Well, but he wasn't alone, so maybe it's like a yin . . . maybe they complemented each other.

PAUL GRAHAM

No, no, no.

ROBERT GREENE

Brin maybe was the more . . .

PAUL GRAHAM

No. No, I don't think so. I mean, they are extremely determined. I just mean Zuckerberg is in a class by himself.

ROBERT GREENE

Maybe they channeled their determination into something more scientific. All that . . .

PAUL GRAHAM

They were determined to get the right answer, whereas Zuckerberg is determined to win.

ROBERT GREENE

Yeah. But it's curious, because Google won by going their own way.

PAUL GRAHAM

Because they found a territory where they could fight their opponents on swampy ground, or whatever is the equivalent. They deliberately chose an area where they could win by getting the right answer.

ROBERT GREENE

At some point, if you ever want to look at them, I wrote some blog essays. Because I'm

like you, I can't write blog posts. My posts turn into essays about these kinds of things. Google and warfare. I took that metaphor and went pretty far with it. I compare them to Napoleon and how he fought wars. So another concept in this idea that I'm talking about in this mastery phase is having a deep knowledge. This book seemed to be about having deep knowledge about the times that we live in.

PAUL GRAHAM

Which book? This book.

ROBERT GREENE

This book. Yeah.

PAUL GRAHAM

Unintentionally perhaps.

ROBERT GREENE

Well, okay. Maybe that's true. In the sense of this is the Computer Age. What does it mean? This is where we're headed.

PAUL GRAHAM

What this book really is, is just a collection of all of the more popular essays I'd written up

to this point. And I had to think about what they were about. But I didn't sit down and try to write a book about anything. I just tried to think about, if I had to describe them, how would I describe them? This whole big ideas thing, everybody misunderstood that. I wasn't claiming that I had big ideas. I was claiming this was about the big ideas of the present.

ROBERT GREENE

That wasn't playing off the title.

PAUL GRAHAM

Like what are the big ideas now?

ROBERT GREENE

I think this is more like the importance of knowing your times very well is very essential.

PAUL GRAHAM

Yes. I do believe that. I try and do it. I try and study a lot of history so that I know . . . remember how I said that what's going to happen in the future is some things will change a lot and other things won't change at all? And we'll have no idea which are going to be which.

ROBERT GREENE

Right.

PAUL GRAHAM

Well, if you study history, then you know what has stuck around and what has changed. And so, you see people assuming that something is going to last forever. And you know times in the past, people were assuming something that was going to last forever, it was going to disappear five years in the future. So you think, "Well, probably not actually."

ROBERT GREENE

Right. So you think that's an important part of being an entrepreneur or a startup.

PAUL GRAHAM

You know, I would never recommend it, but it has been immensely useful for me, so maybe I should. I mean, I read history just because I'm interested. I don't consider history to be . . . a lot of this stuff I'm saying, I wrote in some essay earlier. But I don't consider history to be a field. It's just all the stuff that's

happened so far. You have to call it a field so people who study what happened in the past can get a job teaching blank. But it doesn't seem to me that it's a subject.

ROBERT GREENE

What is it?

PAUL GRAHAM

It's something that everybody should know.

ROBERT GREENE

Why should everybody know it?

PAUL GRAHAM

Because it's all the previous data about what happened, about what worked. It's all the experimental data about what works and what doesn't. That's what history is. How can you get anything done without knowing experimental data about what worked and what didn't in the past?

ROBERT GREENE

And also you see patterns and trends.

PAUL GRAHAM

Yep. So, for someone who studied a lot of history, it's easy to believe that large

organizations were just this temporary blip. Because someone who has no sense of history, like people who know nothing about history, all of the past is basically the same. Everything from about 1900 in the past was, like, ladies in castles, and people were riding around on horses and knights or something. [laughs] It's actually very different in different places in different times. But if you know far enough back, you know historically the large organization is such a short-lived thing. It's still written in pencil really. It's still on trial. It's still at a trial acceptance phase.

ROBERT GREENE

The way I described it is . . .

PAUL GRAHAM

It was an experiment that didn't work out.
[laughs]

ROBERT GREENE

Well, centralized power goes back thousands of years. But as people become more and more, the large structure doesn't take care of you and you have to fend for yourself . . .

ROBERT GREENE

It's kind of fascinating from a macro level. One other little subset of this last section of the book is that in following this process, it's like something in nature. You're kind of following nature itself, because nature follows an organic process. Things grow in a particular way, and you're thinking becomes more lifelike in following this. So, the idea in the book is the importance of following a process, just like how anything organic grows until it reaches a higher state, like the plant turns into a flower. You can't predict the flower from the plant, but then it happens.

PAUL GRAHAM

It seems reasonable. I mean, I know that there are certain ways of operating that work and certain ways that don't. And trying to force things is a bad plan. Always, it's all about going along with things and then, when you notice . . . you sort of flounder around promisingly. And then out of the results of the floundering, notice the gem and seize upon it.

Do more of that. That's sort of both what I've done and what I tell startups to do.

ROBERT GREENE

That's right. Because you say that startups, the ones that are more organic and slow, as opposed to the fast ones that get picked up by the . . .

PAUL GRAHAM

Well, you remember the mold metaphor?

That users have certain needs, and the needs have a certain predetermined shape.

You can't just take something the wrong shape, spend a ton of money on marketing, and make it stick. You're going to lose. So you have to evolve into the right shape, and you can never predict what it's going to be in advance.

ROBERT GREENE

I guess something I was trying to get at earlier. The old model, to me, in capitalism was kind of creating false needs and finding a way to market them, and put a lot of money in them. Big corporations were good at it,

and putting a lot of money into your kind of crap product, but gaining a little bit of difference through . . .

ROBERT GREENE

Okay. I'm turning this off. By the way, I thought this was really good. ♦

TEMPLE GRANDIN

TEMPLE GRANDIN

Okay. I'm Temple Grandin. I am Professor of Animal Science at Colorado State University. We are the Rams. We're not the Buffaloes. But if you really know your buffaloes, people thatw raise them say they should be called bison and not buffaloes.

ROBERT GREENE

Why's that?

TEMPLE GRANDIN

I don't know, but that's just . . .

ROBERT GREENE

There's a difference between bison and buffalo?

TEMPLE GRANDIN

No, they're the same animal, but you not in the bison know if you call them buffaloes.

ROBERT GREENE

Oh, okay. I had no idea about this.

TEMPLE GRANDIN

That's why I try to call them bison. They are the same thing.

ROBERT GREENE

Okay. So you're Professor of Animal Science. Is that your official title?

TEMPLE GRANDIN

Yeah, that's my official title.

ROBERT GREENE

Okay.

TEMPLE GRANDIN

I thought instead of doing testing 1, 2, 3, I'd just give my name and my official title.

ROBERT GREENE

That's a good way to do it. Okay. Very good.

TEMPLE GRANDIN

You'll learn some things if you've taken media training.

ROBERT GREENE

I've taken media training.

TEMPLE GRANDIN

That was one of the things they taught you to do.

ROBERT GREENE

Oh, really?

TEMPLE GRANDIN

Yeah. Don't say testing 1, 2, 3. Give your name and your title.

ROBERT GREENE

Oh, oh.

TEMPLE GRANDIN

Then they'll have your correct name and title.

ROBERT GREENE

Oh, I'll have to remember that.

TEMPLE GRANDIN

Yeah.

ROBERT GREENE

I never thought of that. Okay. All right. So the first thing we're going to do is . . .

TEMPLE GRANDIN

How long do you plan to have this? I'm trying to figure out how elaborate you want to get.

ROBERT GREENE

Well, I don't know how long. In the past, the longest interview I've done was five hours and the shortest was three.

TEMPLE GRANDIN

Okay. All right. That's what I was kind of figuring like at least the whole morning and maybe a little bit of the afternoon.

ROBERT GREENE

If we move well and if you're tired, we'll take longer. If I'm not doing well, we can do it in three hours, but maybe a little more. It depends.

TEMPLE GRANDIN

All right. Okay.

ROBERT GREENE

I'll do the best I can.

TEMPLE GRANDIN

And then you have to make sure you change your memory card or whatever.

ROBERT GREENE

No, no, no. This is all . . .

TEMPLE GRANDIN

How much can you record on that recorder without stopping?

ROBERT GREENE

Well, I erase everything on it each time, so it's blank and it can take up like 20 hours.

TEMPLE GRANDIN

That little thing can take 20 hours?
That's amazing.

ROBERT GREENE

Yeah. Then as soon as it's done, I go upstairs and email it to the guy who sends it out to be transcribed. So then I can erase it. It's in cyberspace.

TEMPLE GRANDIN

Well, then you'd better make sure it's in cyberspace and transcribed before you erase it.

ROBERT GREENE

I put it on the computer on the hard drive. Yeah, that's right. I don't erase it until I get the paper in front of me.

TEMPLE GRANDIN

Until you get the paper in front of you?

ROBERT GREENE

Yes, I have them in paper. I can't stand it on my computer screen. I mark it all up.

TEMPLE GRANDIN

Well, that's what I do with things too.

ROBERT GREENE

And everything I do is on paper.

TEMPLE GRANDIN

I want put notes all over everything.

ROBERT GREENE

Yeah, that's my method too.

TEMPLE GRANDIN

That's what I do. Like I get journal articles, I want them in paper because I want to mark them up, write notes in the margin.

ROBERT GREENE

That's why I don't understand the whole Kindle thing, those books on a computer that people are creating.

TEMPLE GRANDIN

I don't know. The thing with the Kindle thing is there are certain books, if you read the latest Stephen King novel on a plane,

I'm not going to take notes on it and I'm not going to save it. That's perfect for that.

ROBERT GREENE

That's fine. But a normal book that you'd take notes on, what are you going to do with a Kindle. You can't . . .

TEMPLE GRANDIN

Well, the other thing is, if books that you really want to keep, what's going to happen when the formats change?

ROBERT GREENE

Yeah.

TEMPLE GRANDIN

You know, books I really care about I'm going to want in a hard copy because the format of reading a book on paper never changes.

ROBERT GREENE

I know.

TEMPLE GRANDIN

What happens when Kindle is obsolete in 10 years, 20 years.

ROBERT GREENE

Also it's nice to have objects in a book case, in a book shelf. It's kind of pleasing to have something in your hand.

TEMPLE GRANDIN

Yeah, I like marking them up.

ROBERT GREENE

Me too.

TEMPLE GRANDIN

That's the other thing.

ROBERT GREENE

I've marked you book up quite a bit.

Okay. So the first thing is I wanted to focus on your early years. Not a lot of questions about that, but I was sort of intrigued how you described the inner chaos of when you're two or three years old and your family was perhaps considering hospitalization, and it seemed that at some point you sort of pulled yourself out with, it sounded like there was a speech therapist.

TEMPLE GRANDIN

Oh, I had a lot of very good early teaching.

ROBERT GREENE

Okay.

TEMPLE GRANDIN

Okay. Let's just explain a little bit about what autism is. I think you need to have this background.

ROBERT GREENE

Okay, sure.

TEMPLE GRANDIN

Autism's a developmental disorder. It varies from a child that will never have speech, they'll be very handicapped, maybe have epilepsy and other very serious problems. At the other end of the spectrum, you've got half of Silicon Valley, you've got Einstein, you've got Mozart, you've got Jay Gould, and a bunch of people that you're going to write about in your book.

ROBERT GREENE

Jay Gould the . . .

TEMPLE GRANDIN

That would be the pianist. I may have mixed up again.

ROBERT GREENE

Glenn Gould?

TEMPLE GRANDIN

Glenn Gould.

ROBERT GREENE

Uh-huh. He was probably Asperger's.

TEMPLE GRANDIN

Asperg, definitely.

ROBERT GREENE

Definitely.

TEMPLE GRANDIN

You see, that's the thing, I think with a lot of these abnormalities in the brain a little bit of the trait gives an advantage. Get too much of the trait you get a handicap. I've been reading a recent paper right now on creative people, especially verbal creativity, and getting a little bit on the schizophrenia spectrum. Then you get too much of that then the thoughts get totally disjointed.

ROBERT GREENE

Yes.

TEMPLE GRANDIN

That's why these abnormalities still exist, because in their mild forms they have advantages. When I was two and a half, I had all the classical autism symptoms. I had no speech. I would just sit and rock, no eye contact, no social back and forth, and fortunately I got into very good early intervention speech therapy. My mother hired a nanny when I was three, and she just played constant turn taking games with me and my sister, because you can't let these little autistic kids just sit in a corner rocking and stimming. Why do they do all that repetitive behavior? Loud sounds hurt my ears. If I just sat there and I did rocking and stimming, I could shut out the world. What you've got to do is you've got to get these kids in a quiet place and you've got to get their brain connected to the world.

Now, if you look at the brain research. Okay, let's just summarize the brain research really succinctly. In your brain, you have two types

of brain matter. You've got the gray matter.

That's sort of like your processors, and it's in the outer periphery of the cortex. The different parts of the cortex are specialized, like offices in an office building that have very specialized functions like speech, motor, visual memory, a whole bunch of things like that. Then the white matter, which is the other half of your brain, in the middle part, that connects all the offices together. That's your interoffice communication.

Then up here in the frontal cortex, that's the brain's chief executive officer. That's why in neuroscience research it's called executive function. The frontal cortex is all association. It's association to everything else.

In autism, it's like those suits up there in the executive suite, they're lucky to get one dialup. But down in creative land, underneath, below language, you may have extra circuits for visual thinking, extra circuits for mathematics , and one of the big abnormalities in autism is the

disconnect between different parts of the brain, especially the frontal cortex. In other words, you disconnect some of the social circuits you're going to get geek circuits. and I tell people all the time that these recording devices where you put 20 hours on something the size of a cigarette package, it takes the geek brain to devise that kind of little recording device.

ROBERT GREENE

That's right.

TEMPLE GRANDIN

I've always said it wasn't the social people who designed the first stone spear, because they would have been too busy yakking around the campfire to be figuring out how to chip the first stone spear.

ROBERT GREENE

That's probably true.

TEMPLE GRANDIN

So I was definitely a full-blown autistic kid, and I had early intervention. All Asperger's

is, is just milder autism where there's no speech delay.

ROBERT GREENE

Yeah, and you had the speech delay.

TEMPLE GRANDIN

I definitely had the speech delay. Very definitely and I was not fully fluent until age four. I've been in some experimental brain scan research, and my speech output circuit only has about 25% capacity.

ROBERT GREENE

Is that right?

TEMPLE GRANDIN

And there's another DTI imaging that was done. It looked as though I've got a big visual circuit that's bigger than the control.

ROBERT GREENE

But sometimes I wonder how much has that developed over your life, because it's not used as much and the other part is . . .

TEMPLE GRANDIN

Well, what they're finding with this new kind of imaging that tracks the big white matter

tracks is that these are giant, big axons that go across the brain. They're like interstate highways. What you have to do to make up for the deficit is you might go around on the side streets somehow.

ROBERT GREENE

Right.

TEMPLE GRANDIN

You can't put that freeway that didn't grow back in.

ROBERT GREENE

Right, okay.

TEMPLE GRANDIN

You have to use the side streets.

ROBERT GREENE

Well, the question is . . . I've noticed throughout your life, and related in the book, that you have a very strong survival instinct. You sort of always find your way to the thing that's going to work for you. I'm wondering was there any sense early on in your life where there was any kind of willpower or any sort of idea that you were struggling to get

out of this, or it was pretty much up to other people to . . .

TEMPLE GRANDIN

Well, mother was always pushing me to do new things. I've seen a lot of people on the autism spectrum much milder than me, people that ought to be out at Google or some company like that, working for them, and they're not teaching them how to shop, how to have table manners, just how to do some of the most basic things. Mother kind of knew when to push and she knew when to back off. There's not enough teaching of just basic social rules. I mean, we'd go out to Granny's for a fancy Sunday dinner, I was expected to behave. There was some expectations for stuff like that.

ROBERT GREENE

You're talk about making sure that there are consequences for your behavior, which is something a lot of people don't know about anymore.

An important idea in the book is about skills, and I'm making the claim that human beings are designed, our brains are designed for actual operating things and learning spatial skills.

TEMPLE GRANDIN

I totally agree with that.

ROBERT GREENE

Okay.

TEMPLE GRANDIN

And let's talk about that. I've some interesting observations. When I was a little kid, my art ability was always encouraged.

ROBERT GREENE

Your which?

TEMPLE GRANDIN

My art ability.

ROBERT GREENE

Yes, I remember that.

TEMPLE GRANDIN

My art ability was always, always, always encouraged, and when I made a beautiful clay horse when I was in third or fourth

grade, I was really praised. You've got to develop talent. I have an employment book for autism called "Developing Talents." You've got to build up on the area of strength and then direct it into something that can become a job. I agree with you about the hands on. I grew up in school with a lot of hands-on stuff, art and sewing. Girls were taught sewing in the '50s, and I loved sewing, hated cooking, loved sewing. I was one of the first girls to take woodworking.

But all these hands-on things I think they teach practical problem solving, and I noticed something really weird, when the design industry switched from doing all the drafting by hand to computers. What I observed is when the older draftsmen switched to the computers, they were fine. But when you got a young 22 year old kid that's been hired right out of computer school by one of the meat companies, they made weird mistakes on drawings, weird perceptual mistakes on drawings. Like they don't know where the

center of a circle is. They don't realize that a 25 foot long gate can't possibly work. They're not seeing. They're drawing. They started making a new kind of mistake I had never seen before. Every time I saw these mistakes, I'd get a hold of the draftsman and I'd talk to him about the job, but then I always had a few questions in there like, "Have you ever drawn by hand?" "No." "Have you ever built anything?" "No." You see you don't understand where the center of a circle is unless you've taken a compass and spun it.

ROBERT GREENE

That's very true. The architect I interviewed, he does all his drawings by hand. That woman I mentioned who does the prosthetic hands, she does everything by hand. The hand and the brain, an enormous amount of the brain is involved in that connection.

TEMPLE GRANDIN

I've always said the mouse is not connected to the brain the same way the hand is.

ROBERT GREENE

Yes. We get a much closer feel for what is real by using the hand.

TEMPLE GRANDIN

Well, there's a very interesting Oliver Sacks piece about an adult that got cataract surgery. So now for the first time he was seeing, and he didn't understand even how to use vision until he touched something. He didn't realize that this black and white thing that he saw was his dog – it was either his cat or his dog or his pet – until he touched it.

ROBERT GREENE

That's interesting.

TEMPLE GRANDIN

To understand the seeing of spot, he'd have to touch it.

ROBERT GREENE

Is that in this book? Is that in there?

TEMPLE GRANDIN

No. it's not in that book. It's in one of the later. Wait a minute, let me look. I'm trying to remember which . . . but it was very, very

interesting. A case of the color blind painter, no it's not that one.

ROBERT GREENE

It might be one of his newer books. This one is relatively old.

TEMPLE GRANDIN

Yeah, you see, it's not in the latest one. It's not in the one with the yellow and the orange cover, it's not that one. "The Mind's Eye," it's not that one. I originally read it as a New Yorker article, that's one of the reasons why I don't . . .

ROBERT GREENE

I can look it up. Don't worry about it. I'll Google Oliver Sacks and cataracts.

TEMPLE GRANDIN

Yeah, but the guy had cataracts and I remember reading it. See, I read a lot of his things as a New Yorker article first. The thing that interested me about that is he didn't know what to do with seeing until he felt it, and then he eventually lost the sight again

and he really didn't care. He just couldn't really figure out what to do with sight.

ROBERT GREENE

That's interesting.

TEMPLE GRANDIN

And when he did understand what to do with it, it was through touching things.

ROBERT GREENE

Just as an aside though, the man that I have for the boxing person, he found this person who is now the greatest boxer of our era, and this is a little Filipino man. This Filipino man came to America to find a trainer, and he went to 15 people and none of them would take him on because he was too small. They didn't think he was any good. This one trainer, he actually gets in there and feels your punches. He uses mitts. He trains directly with mitts, and he felt the power.

TEMPLE GRANDIN

But you see what he's doing, he's feeling the pattern. He's feeling it. I've talked to people with some of the animation companies. I

remember reading an article about animators and that they want someone who's an artist first and then they can learn the computer.

ROBERT GREENE

That's right.

TEMPLE GRANDIN

And I've actually talked to some of the animation companies. They say sometimes they've got to get them off of the computers and get them back on a drawing board. Then Mark, who does my drafting now on my design stuff, I had him draw by hand first for an entire year before he got anywhere near a computer. He's had computer instructors say to him, "Well, how do you draw such nice CAD drawings?" Well, he draws his CAD drawings to look like his hand drawings.

ROBERT GREENE

That's very true.

TEMPLE GRANDIN

He draws absolutely beautiful CAD, and I saw some drawings a CAD instructor

had drawn and they weren't as good as Mark's drawings.

ROBERT GREENE

Yeah. So one would say then ideas of this sort built a kind of confidence in your own abilities as well, when you're able to learn a basic skill and use your hands in that way. If you're someone, as a lot of young people are, you're very insecure, you're not sure about yourself socially, being able to actually accomplish something . . .

TEMPLE GRANDIN

Well, the way I sold my jobs originally, since everybody thought I was really weird, was I showed my drawings. I would whip out one of my big two foot by three foot drawings. People would go, "Oh, you did that?" Then I got respect. There's a scene in the HBO movie where there's a drawing on a conference room table. That is actually one of my real drawings. It's on that conference room table. That is how I sold things. I showed people my work.

ROBERT GREENE

But even as a child though because you made those kites and these were airplanes.

TEMPLE GRANDIN

Yeah, I was really into kites. In fact, I figured out how to make a bird kite that I could fly behind my trike. I found that I could make it fly at a steeper angle if I bent the tip ends of the wings up just like the way jet liners have those winglets today. When I look at those winglets that are on a jet liner, the ratio of the winglet to the wing area is the same as on my kite. I mean, obviously, I haven't gone out to the airport and measured it, but just looking at it, it's the same ratio.

I did a lot of experimentation with the kites. I made the bird kites out 12 inch by 18 inch heavy art paper that was textured for water colors, and the only tape we had in the house was half-inch adhesive tape out of the medicine cabinet or Scotch tape, and I did a lot of stiffening of the wings with layers of adhesive tape too, to get it just right. I did

a lot of experimentation, and a lot of them didn't work until I got . . .

ROBERT GREENE

Do you still have any of them around?

TEMPLE GRANDIN

No, I don't, and I've often thought about whether I could actually duplicate those designs. But I do remember the materials perfectly. It was 18 inch by 12 inch "Hammett's. I don't even know if this art store even still exists.

ROBERT GREENE

They do.

TEMPLE GRANDIN

Hammett's Art Store.

ROBERT GREENE

Oh, no. I don't know.

TEMPLE GRANDIN

Hammett's watercolor paper was kind of stiff. It wasn't the real smooth card stock. I'd use half-inch adhesive tape. I'd use a little bit of Scotch tape to attach the tail, crepe paper for the tail, just regular party crepe paper.

ROBERT GREENE

That was pretty elaborate.

TEMPLE GRANDIN

So basically it was half-inch adhesive tape, some Scotch tape, art paper, scissors, some thread. I used thread to fly it with.

ROBERT GREENE

Wow.

TEMPLE GRANDIN

Just regular sewing thread. It was like a wing span of about like that.

ROBERT GREENE

This would be on the back of your bicycle or your tricycle.

TEMPLE GRANDIN

Yeah, on my trike. I actually flew it behind my trike. That was before I knew how to ride a bike.

ROBERT GREENE

Well, do you think that learning these kinds of skills like the sewing and the making things, was this like a foundation for later in life?

TEMPLE GRANDIN

Yes, because I think it teaches problem solving skills. I can remember wrecking some sewing projects because I got to going too fast on them. I didn't take my time to measure things right. But you have to figure out how to put the garment together. It takes problem solving skills. I think woodworking and sewing are exactly the same skills, except one you've got a stiff material and the other you've got a soft material and they both are about equally hard, but you learn practical problem solving skills. You also learn things don't always come out the way you want. Like you get a fabric you think might be really nice, but it didn't look the way you thought it would.

But I'm concerned today that so many young people today are totally divorced from the world of practical things, because I'm finding in a lot of policy stuff people are getting so abstract that they can't think anymore about

how's that policy actually going to implement on the ground.

ROBERT GREENE

Well, also, if you're sewing and you have an idea and it doesn't come out the way you thought, but you may well . . .

TEMPLE GRANDIN

Or maybe you can make it some other way.

ROBERT GREENE

I've got to do it again and I've got to make it right. You have to keep practicing.

TEMPLE GRANDIN

Yeah, that's right.

ROBERT GREENE

What I'm going to talk about is like just the two, it seems like, key mentors early in your life. The first, it seemed like your mother played a very large role in helping you. She's not alive is . . .

TEMPLE GRANDIN

Oh, she still is, yeah.

ROBERT GREENE

Your mother's still alive?

TEMPLE GRANDIN

Yep. She's 83. She'll be 84 soon.

ROBERT GREENE

Is she really proud of what you've done?

TEMPLE GRANDIN

Oh, yeah.

ROBERT GREENE

Anyway, it sounds like she had a major, major influence on you. Can you just explain a little bit of what her . . .

TEMPLE GRANDIN

Well, there was expectations for behavior.

Things like having table manners, that was just expected. Today kids are getting praised for just being on time for school. I wasn't praised for being on time for school. That was just being expected. Now she wasn't able to make me study when I wasn't interested in studying. That was my science teacher.

ROBERT GREENE

Yeah, we're going to get to Mr. Carlock in a minute.

TEMPLE GRANDIN

But I'm seeing too many geeky, nerdy kids today that end up on Social Security and playing video games because they're not being taught just basic stuff like being on time, how to go to a store and buy stuff, basic table manners, and eating like an absolute slob.

ROBERT GREENE

So she gave you direction and . . .

TEMPLE GRANDIN

Well, what she did is when I made social mistakes, she didn't scream at me. If I took my fork and I whirled it around like that during dinner, she'd say, "Put it back on your plate." If I wanted to eat something with my hands that wasn't appropriate, she'd say, "Well, use the spoon or the fork."

I remember one time when I was at school, we had chocolate ice cream for dessert and I leaned over and I went [slurps] like a dog, and they just said, "You're not a dog," and they took it away. I never forgot that.

Robert : So she was sort of a very kind, gentle, but not letting you just run wild.

TEMPLE GRANDIN

No. No, I wasn't allowed to just run wild. And then she did realize that some of those big, noisy crowds and things was just too much for me to stand, because I had a lot of sensory problems. Sensory problems are not just in autism. They're in a lot of other disorders too. Hearing sensitivity, some people have problems with fluorescent lights. Fortunately, I do not have that problem, but there are some where that's a real serious problem.

ROBERT GREENE

And then of course there was, I guess, Mr. Carlock, who in some ways really was the first person to direct you towards science.

TEMPLE GRANDIN

To get kids interested, you've got to show them interesting things. When I was in high school, we had an experimental psychology class, and I got introduced to the distorted room illusion, and in the HBO movie that

actually showed the actual Bell Labs film that I saw in high school, the one showing that trapezoidal window in the distorted room. I got fascinated by that. Well, instead of just telling me how to build it, they said, "All right. I want you to figure out how to build it." And I did. They showed in the movie exactly the way I built it. But you've got to show kids interesting things.

ROBERT GREENE

You built the trapezoidal room?

TEMPLE GRANDIN

Yes, I did. If you looked at the HBO movie.

ROBERT GREENE

Yeah, yeah, yeah.

TEMPLE GRANDIN

Yes, I built the trapezoidal room, and what they showed in the movie is exactly how I build it, the same size and everything.

ROBERT GREENE

Wow.

TEMPLE GRANDIN

With two plastic horses in it. I did the trapezoidal room. I also figured out the trapezoidal window, how to make it work. The thing that makes me happy is the stage hands had a lot of trouble building it, and they had the drawings.

ROBERT GREENE

How did you manage it then?

TEMPLE GRANDIN

Well, I was very frustrated trying to figure it out, and then I got one hint. I was allowed to look at a picture of it in a book, for like five seconds, that just showed that the front of the room was shaped like a trapezoid. You couldn't see how the back of it was. I was allowed to look at that for five seconds.

ROBERT GREENE

This was Mr. Carlock that allowed you to do that?

TEMPLE GRANDIN

Yeah. You see, there was another science teacher that also taught. I can't remember if

it was Mr. Carlock that showed me that or if somebody else had the book. But I wasn't allowed to read the book. I was allowed to look at an illustration in this book for like five seconds, but it was still hard to figure out because all I could see . . .

ROBERT GREENE

Very hard.

TEMPLE GRANDIN

You see, the trapezoid window I actually figured out all by myself without any hints. I figured out how to make the trapezoidal window work. That's where the window rotates, but it looks like it's oscillating. I had an old electric clock motor I used to turn it. That was easy to figure out, but exactly how to make the window and how to shade the window . . .

ROBERT GREENE

How old were you when this . . .

TEMPLE GRANDIN

This would have been, I'm going to guess, 16, 17, something like that.

ROBERT GREENE

This was a real exercise in problem solving there.

TEMPLE GRANDIN

Yeah, and they didn't want me to just . . . they weren't just going to give me the answer of how to do it.

ROBERT GREENE

Yeah. So he taught you how to use libraries and research?

TEMPLE GRANDIN

Oh, yeah. That Carlock taught me how to use libraries.

ROBERT GREENE

That's important.

TEMPLE GRANDIN

I learned that real scientists didn't use Encyclopedia Britannica, or today you don't use Wikipedia as a primary source.

ROBERT GREENE

No.

TEMPLE GRANDIN

I remember going on a trip with Mr. Carlock to a university library and looking up journal articles in psychology because I got very, very interested in why my squeeze machine relaxed me. He said, “Well, you are going to have to study science if you want to figure that out.” So I looked up a lot of articles on a thing called sensory interaction, where stimuli applied to one sense either degrades or enhances another sense, and there was a whole field of literature on it. But, you see, back then there were no copying machines. There were no copying machines, and I remember going down and we’d get these big books out, the psychological abstracts. I’d look up abstracts. You couldn’t Xerox the abstracts, so I had to hand write every abstract that I was interested in onto an index card, and then I stored those in recipe boxes.

ROBERT GREENE

This is very important because it really helps you remember things as well. It’s more like engraving it in your memory.

TEMPLE GRANDIN

Well, that’s right, and I had recipe boxes full of abstracts. Then if you got hold of the journal article, then I would write some things down, what were the important things that I learned in the journal article. Then I can remember when the first copiers came out, and as soon as that happened . . .

ROBERT GREENE

Was that in the ‘60s or . . .

TEMPLE GRANDIN

Well, you see, I was in college from ‘66 to ‘70. The first year in the library we did not have copiers. Then I can remember when we got a copier that students were allowed to use. Then what I did is I Xeroxed articles and I put them in three-ring binders. I actually have some of my very first articles that I looked up. But the Xerox machine

that, to me, was the most fabulous thing ever invented, because doing it in pre-copiers, talk about a pain.

ROBERT GREENE

Did something click the moment you were really immersing yourself science, in just science itself?

TEMPLE GRANDIN

Well, of course, when I got on the thing with the distorted room illusion, yeah, I got instantly fixated on that. But you see, you can take the kid’s fixation and broaden that out. Like, okay, I was fixated on my squeeze machine, and then Mr. Carlock said, “Well, if you want to find out why pressure relaxes you, you’re going to have to learn how to do the scientific literature.” Of course, the motivation of that fixation motivated me. What you want to do with fixations is broaden them out. The kid likes trains, let’s read about trains. Let’s do math with trains.

ROBERT GREENE

Right.

TEMPLE GRANDIN

Let's broaden that out. Let's use the motivation of that fixation to direct it into something of value.

ROBERT GREENE

One of the key ideas that I have in the book, in this section of it, is this idea of what I'm calling your natural inclination. The idea is that, to me, the most important role that genetics plays in what I'm talking about is that each person is born completely unique, scientifically, a unique set of DNA. As they move through life, unique experiences . . .

TEMPLE GRANDIN

I remember an old MRI picture, this was the very earliest MRI of the corpus callosum of two pairs identical twins. It showed the corpus callosum, and it was very early. There was a pair on the top and a pair on the bottom, and there were four images, all very similar, but they weren't exactly the same.

ROBERT GREENE

No, it's impossible.

TEMPLE GRANDIN

They were not exactly the same, but they were highly similar. I remember that slide made an impression on me, and I used to use that slide for a long time and say, "Well, even identical twins have 10% of anatomical brain structure that's variable."

ROBERT GREENE

Exactly.

TEMPLE GRANDIN

They're similar. Looking at twins reared apart studies, you don't tend to get one that's totally athletic and one that's totally uncoordinated. They will tend to both, maybe, like athletics. As long as they were in an environment that's what they call good enough, that gave reasonable access to a chance to do sports, let's say, or a chance to do art, or whatever.

ROBERT GREENE

Right. So the idea is that every person has a kind of an inclination, something that clicks

with them. Then for the book, "Frames of Mind" by Howard Gardner . . .

TEMPLE GRANDIN

I'm familiar with that, yeah.

ROBERT GREENE

It's similar to this. People could have music, spatial, mechanical. It's there and it's also . . .

TEMPLE GRANDIN

And there's a kind of a political correctness trend in the education system to say that everybody's the same, and that's wrong. My inclination definitely was toward the visual, and then I loved experimenting with all these kites and then I also made parachutes out of silk scarves. I worked on all these little kind of spacer things made out of coat hangers and adhesive tape.

ROBERT GREENE

Spacer things?

TEMPLE GRANDIN

Well, if you make a parachute out of a scarf and you just tie a weight on the end of four strings and you throw it up in the air, the

strings tangle. So what I wanted to do was to make a parachute that I could throw up in the air like this where the strings would not tangle.

ROBERT GREENE

I see.

TEMPLE GRANDIN

So it would fully open. So what I did is I took two pieces of coat hanger wire about six inches long, bent them so that they had a eyelet on the end to tie the strings to and then made a cross about four inches long with eyelets on it. Then I'd fasten them together with adhesive tape. So now the strings were attached to four eyelets that were maybe three or four inches apart.

ROBERT GREENE

Very clever. When was this?

TEMPLE GRANDIN

Oh, this was elementary school. It was definitely elementary school. Then when I was in high school, there was a drawing, I think, in Popular Mechanics for making

a boomerang, and I made the boomerang out of birch plywood and I really perfected it. I would throw that thing, and it actually did come back. It worked better than any boomerang you can buy in Australia. It really did work. Then we moved houses that . . .

ROBERT GREENE

You've got to be careful with those.

TEMPLE GRANDIN

Well, I don't have it anymore. It cracked into a tree, and you had to have a really big field to do it in.

ROBERT GREENE

I know. I broke a window once with a boomerang when I was about 11.

TEMPLE GRANDIN

The boomerang I did as a teenager, but all the parachute stuff I was probably 5th grade.

ROBERT GREENE

But what interests me is that you sort of found your way to the absolute sort of perfect career for yourself. You kind of created it for yourself. Would say so?

TEMPLE GRANDIN

Well, of course, one of the things that got me fixated on the cattle chute stuff is I was all real hung up on the squeeze machine thing, and I wanted to learn how that worked. But then as I started watching the cattle chute out in the feed yards, I got more and more interested in the cattle and what people were doing things to cattle that were bade and were not nice.

ROBERT GREENE

Wait, hold on.

TEMPLE GRANDIN

I think the computer has to talk to them. I don't know why a computer has to talk.

ROBERT GREENE

All right, I'm sorry. So the cattle, go ahead.

TEMPLE GRANDIN

Well, you see, you can have something that starts out a fixation. You get just an interest in one thing and then it broadens out into an interest for something else. Then I started getting more and more interested in the

cattle. Then the very first work I did with the cattle, I noticed the cattle would stop and refuse to go through a chute, this is the vaccinating chute out at a big feed yard, when there was a shadow, a chain hanging down, a rope across the chute, a hose laying on the ground, just all kinds of little things.

But I was one of the first people to notice that cattle notice little things that we don't tend to notice, shadows and reflections. They would tend to head towards the light, but they wouldn't go into blinding light. I was of course really fixated on this, and I'd go over the library and try to find everything I could find. We had copiers there, and we'd get articles through interlibrary loan. I found that cattle baulked at this stuff, and everybody thought that was really weird.

Then I managed to find an article written by a guy named Ron Kilgour in New Zealand where he had made some similar observations with sheep. Now, we couldn't

communicate. You've got to remember this was the early '70s. People didn't just call up people in other countries. So Ron Kilgour and I never communicated, but he and I independently had come up with some of the same conclusions. I go, "Well, that's really good. I'm really not crazy. This is really real because Ron Kilgour has made similar observations in sheep, that they were afraid of little things like seeing people up ahead, shadows, bright spots." But the thing is, this is visual detail, and it just seemed obvious to me to look at visual detail that the cattle were seeing, and to other people that just wasn't obvious.

But, of course, I didn't know at the time that I was a visual thinker and other people are not visual thinkers. I didn't know that, I thought everybody was a visual thinker. I didn't know that the way I thought was different.

ROBERT GREENE

What I'm trying to get at is it seemed like something inside of you was sort of pushing

you slowly, slowly into this direction, that it was almost like you had an instinct towards something that would suit you.

TEMPLE GRANDIN

Well, I was looking at something that my visual thinking mind tended to pick up. All the other people that handled cattle didn't notice.

ROBERT GREENE

But it's the fact that you were interested in cattle for instance because it ended up being that the attraction was so strong. You know what I'm saying? It's almost like there's something inside of you that's directing you towards this. Does that seem too weird?

TEMPLE GRANDIN

Well, I got in because I wanted to figure out why, you know, interested in the whole squeeze chute thing, and then when I got interested in that, that led to the interest in cattle. Then I just started learning more and more about everything, and then I started going to every feed yard in Arizona and

helping them work cattle. Then I was seeing how different systems work.

ROBERT GREENE

But I imagine when you went to your aunt's farm in Arizona and you saw the squeeze chute there was something about it and cattle that kind of attracted you even when you were very young?

TEMPLE GRANDIN

Yeah. You see, now, when I was in high school and I was absolutely in the boarding school, I was actually a horse nut, and our high school had a 12 cow dairy. They had Holsteins and they had milking short horns. So I had been exposed to cattle there too. I actually learned how to hand milk and learned how to milk the cows. That was something that I learned how to do. So I was very much into horses. I was totally into horses.

ROBERT GREENE

Amazing [inaudible 36:45]. But that's not the same. Horses are different in that they're a

little more . . . well, cows can be very nervous and high-strung, but horses are little bit more.

TEMPLE GRANDIN

Horses are more high-strung than cattle. But then when I got out to Arizona, I got more interested in cattle than I did in horses.

I also did a lot of photography. So I would get down in the chutes, and I would take pictures of what the cattle were seeing. Back in the early '70s, they thought cattle were black and white colorblind. That's now been proven false. What cattle and dogs and most of the animals are is they're dichromates. They can see blue and they can see yellow and they're red colorblind. But they see contrast better than we do. You see, when you take the pictures with black and white film, you up the ability to see contrast. A shadow that I might not notice when I was there, became very obvious on the black and white film. The black and white film would enhance the contrast. And dichromatic vision, this is stuff I know now. I didn't know this in the '70s. It

increases your ability to see contrast. So I was one of the first people to notice that the cattle were afraid of little things that we tend to not notice.

ROBERT GREENE

Well, I guess I'll ask you about that. Is there any sense of destiny, that you were sort of destined to want to do this?

TEMPLE GRANDIN

Yeah, I had kind of a sense of destiny thing, and I was real, real, real nervous. I thought if I went to the right destiny, then I wouldn't be nervous anymore. Well, now my nervousness is controlled with anti-depressant drugs. As I went through my 20s, the nervousness got worse. I had horrendous, non-stop colitis attacks, and then I went on the antidepressants, that stopped the constant anxiety attacks.

But one thing I figured out very early on is that certain people could open the door. Certain people could get you into things. People used to say, "Well, how did you get

into that feed yard, or how did you get into that plant? Or how'd you get to do this?"

Well, I figured out if you met the right person, you could get into stuff, that that could be the door. I had all these things thinking about doors all the time.

ROBERT GREENE

Yeah, that's my next question, your interest in . . .

TEMPLE GRANDIN

And why did I think about doors all the time. Well, as a visual thinker, I'm a bottom-up thinker. To form a concept, I have to put specific examples that are photorealistic pictures into different file folders. Now at the age of 63, I have a lot more web pages in my head than my Google that's in my head can search than I did when I was in my 20s. But to understand something in the future, I have to relate it back to something in the past. I have parents ask me, "Well, how do I teach my kid not to be rude? How do I teach my kid the concept of privacy?" Well, you've got

to teach it with specific examples, like you go in a public restroom and he forgets to shut the door, you explain you have to shut the door for privacy. Or you don't take your pants off at the shopping mall because that's only done in the privacy of your room. It's taught with specific examples.

ROBERT GREENE

You said the sense of a destiny helped calm you down a little bit, like it was a sense that you were moving in a particular direction as opposed to just sort of chaos where you could be anything or . . .

TEMPLE GRANDIN

Now, I have less of that kind of sense. But I also had a strong motivation in my 20s to prove I wasn't stupid. That was a very, very big strong motivation. And so when I got a chance to design something, I wanted to do it right and prove it would work and take pictures of all my projects. Boy, I made sure I had pictures of all my projects. So then I had stuff in my portfolio to show to people.

But I wanted to prove I wasn't stupid, that also was a major motivating thing. That I could actually design some stuff that actually worked.

ROBERT GREENE

Okay. Well, I was very interested in the idea about these doors and transitions because I have, in this book, number one, I'm talking about a kind of a progression, you're almost like initiating yourself into a different level after your apprenticeship, etc.

TEMPLE GRANDIN

Well, I kind of had a thing, and the movie showed, getting these different cattle pins. I kind of had this idea I can have bronze pins to start with, and then I'd get the silver pins, then finally to gold pins as I learned more about how to work with the cattle industry. I liked the tangible symbols when I had kind of figured that I had advanced. I mean, even now, today, I've got hundreds of convention badges all over the walls of my apartment. I'm not quite so collecting as many badges

now. They've got to be really high quality badges to go on the wall now, like the TED badge, you've got to wear that.

ROBERT GREENE

That's a good one.

TEMPLE GRANDIN

That one I kept it. The TEDx one I kept. But I like keeping all those badges, because when I look at them, it gives me a real sense that I went to a lot of places and I did a lot of things.

ROBERT GREENE

Did this sort of help you in these various transitions, in thinking in these terms, like you were kind of almost going through a door each time?

TEMPLE GRANDIN

Well, that's right, yeah. Yeah, and I did actually do that stuff with the pins. Because for me, you see, I'm not an abstract thinker. So I liked having something. I thought when I got to where I designed a really big project, then I'd get a gold cattle.

ROBERT GREENE

This gets really good.

TEMPLE GRANDIN

Yeah.

ROBERT GREENE

Do you think there is something useful in that idea? It used to be people . . .

TEMPLE GRANDIN

Well, I find there are a lot of kids on the spectrum who are doing very well in Boy Scouts and in karate. One of the reasons why they're doing well in that is because you can get your different belts or you get your different badges. In other words, you work up into different levels. That seems to really appeal to a lot of these kids that are on the milder end of the autism spectrum. Those are two activities that a lot of parents have reported have been very beneficial.

ROBERT GREENE

It's beyond that. It's for anybody really.

TEMPLE GRANDIN

But one thing about both of those activities is you get a tangible symbol, a badge you can sew on your uniform, a different color belt that shows that you have achieved different levels.

ROBERT GREENE

Do you still use this idea of doors and transitions?

TEMPLE GRANDIN

No, not as much now. It's sort of like I've gotten so much information in my mind. I fill up the Internet of my mind. I have so many other real experiences to relate that to. See, I think it's very important, since as a visual thinker I'm a bottom-up thinker, to get these kids out and show them all kinds of interesting things. You've got to like fill up the Internet of their mind with experiences., because concepts are made out specific examples put into file folders.

ROBERT GREENE

Right.

TEMPLE GRANDIN

Parents say, "Well, how do I teach my autistic kid not to run across the street?" Well, you've got to teach them in a whole lot of different places. It's the same way you teach a dog to do something. If you taught a dog to sit just in your living room, he might not do it somewhere else.

ROBERT GREENE

Well, that's the first card.

TEMPLE GRANDIN

And you know what? I'm going to need to use the restroom. The tea is really getting to me. Yeah, just let me back in.

ROBERT GREENE

No problem.

ROBERT GREENE

So this now is about what I call the apprenticeship phase. The idea is that a lot of these people in history, your Darwins, etc. or the people who are contemporary, we tend to focus on their achievements, the things that we can see, but we don't realize the years of

practice and study, which are so important, so that people realize that that's what makes you accomplish something. It's the years that you spent practicing and observing and studying. Now you mentioned in one thing that you had spent, I suppose in your university years, six years studying cattle and how they see the world. Can you tell me a little bit . . .

TEMPLE GRANDIN

Well, there is a thing I wrote in *Thinking in Pictures* where I said I watched David the draftsman do drawings and they sort of magically appeared.

ROBERT GREENE

Yeah, [inaudible 01:38] point of view.

TEMPLE GRANDIN

Well, that magically appeared, but there was a long period of time, and I didn't realize this when I wrote *Thinking in Pictures* back in the mid '90s. There was a long period of what I call filling up the database. First of all, I had to learn how to relate the lines on the drawing to the picture in my head,

because all my building projects I had done, like the gate you could open up from the car and the distorted room illusion, building a squeeze machine, and the nice version of the squeeze machine, those were all just done in the shop. In other words, they weren't done with drawings. My nice squeeze machine and they duplicated it exactly for the movie, that was all made in the shop. There were no drawings.

You see, one of the things I had to learn how to do, and this took time, was how to relate lines on a drawing to the thing. In other words, instead of just designing in the shop, making up the design as I went, and that's what I did when I built the good version of the squeeze machine, I made up the design as I went, to doing the design work on the paper. In other words, learn how to build the thing on the paper.

So what I did to learn this is I went out to maybe ten different feed yards, and I

measured their work area. There were some curved chute systems around. I can't take credit for inventing curved chute systems. What I can take credit for is taking a lot of bits and components of systems and putting them together in the new systems that worked a whole lot better. So I would go out to this feed yard and measure their cattle handling facility. Then I'd go home and I'd draw up the layout. Then I went back to the feed yard and walked through the facility to see if I did it right.

But then the thing that helped me the most to learn how to relate the line on the drawing to the actual structure was I got a complete floor plan for the entire site for the Swift plant in Tolleson, Arizona, a great big, huge drawing. It had all the equipment inside the plant. It had all of the stuff outside the plant, the parking lots, the fence, everything was on this drawing. I spent two days walking around the Swift plant relating every line on that drawing to something real. This was a door.

This little square was a concrete column that held up the building. This big circle was the water tower. These other three circles were the waste water treatment plant. The way they had it marked showed where a window was. Every line on the drawing became something real in the plant. Because what I had to do was to get the picture in my mind to relate to the drawing. In other words, to learn how to read blueprints, that took time. I spent a lot of time doing that, and I went to a whole lot of feed yards in Arizona and Texas and I worked cattle to see how different design components worked.

ROBERT GREENE

Do you think that really helped? That made you a better . . .

TEMPLE GRANDIN

Oh, absolutely. Oh, yes. I've always told students, 'Travel's a great educator. You've got to get out and see all kinds of different things, the worst, the best, all kinds of stuff.' I spent about three years doing that, just sort of

inputting the information. Then when it got time to do the John Wayne Red River project . . .

ROBERT GREENE

Yes, the dip vat.

TEMPLE GRANDIN

Well, I drew this beautiful drawing and it sort of magically appeared. When I wrote *Thinking in Pictures* I hadn't thought about all of this inputting of information I had to do beforehand, before I could pretend I was Davie and the drawing magically appeared.

ROBERT GREENE

This is before David?

TEMPLE GRANDIN

This is before David. And I was doing this even before I did the Swift plant drawing and the thing with the feed yard drawings before I met David. Because I had to learn how to make the transition, so I could design a project on the drawing. I couldn't just go out to feed yards and build things. When you're designing these big projects, I can't just go

out to feed yards and build things. One of the things I found is when ranchers went out and they just built it on the ground, they always screwed up the layout.

ROBERT GREENE

Why is that?

TEMPLE GRANDIN

You can't see the whole layout.

ROBERT GREENE

Yes.

TEMPLE GRANDIN

The layout is something that you need to be doing on a drawing where you can see the whole entire thing.

ROBERT GREENE

So you get a feel for the whole thing.

TEMPLE GRANDIN

That's right. Then when we laid them out, we would lay them out in lime so you could actually see the whole design.

ROBERT GREENE

Laid them out in lime?

TEMPLE GRANDIN

Lime, like you use for football fields, they use lime to mark the football field.

ROBERT GREENE

Yeah.

TEMPLE GRANDIN

So you'd lay them out with lime, just like you'd mark a football field.

ROBERT GREENE

Wow.

TEMPLE GRANDIN

And then you could see the whole design and walk through it, make sure it's right, correct your layout mistakes before you actually built something.

ROBERT GREENE

In other words, another person who would have learned differently or nowadays with computers, this actually trained you in better way, in a sense.

TEMPLE GRANDIN

Well, it did. Also the other thing that happened is all the projects that I'd done

before I actually built myself and they were carpentry projects. Now these were welding projects. I didn't know how to weld, but I'd watched the welders, and obviously I didn't stare at the welders when they were actually welding, I knew better than to do that. But now I was designing steel and concrete projects, where for the most part, I didn't actually do the work. A contractor would do the work.

Then I worked a year and half for this feedlot construction company, and they had a great draftsman named David, and I learned a lot watching him. Then after I left the construction company, a contractor named Jim Uhl, just had a tiny little business he was doing out of the back of his house, came to me to design feedlot cattle handling systems. He recognized my talent and he sought me out. He made a point of seeking me out and finding me, and we worked together on building things. It was sort of like there was just a lot of booming projects. There were

tons of projects around to design. Then in the '80s, the market crashed and that's when I went back to school.

ROBERT GREENE

I see.

TEMPLE GRANDIN

Because of the economy there was two years where there was nothing to build. But there was a long period of time of filling up the database with all the information I could find, and I wanted to go to as many places I could, actually work cattle if I could. If I couldn't actually work them, then I wanted to at least see the facilities. I took pictures of tons and tons of stuff, and if I could get up on the feed mill and get aerial pictures, that was even better.

ROBERT GREENE

You would do what?

TEMPLE GRANDIN

Go up in the top of the feed mill so I could see the facility from the aerial view.

ROBERT GREENE

Wow, and take pictures of it.

TEMPLE GRANDIN

Take pictures of it from the feed mill.

ROBERT GREENE

So that was sort of how you built up your skills for the designing.

TEMPLE GRANDIN

That's right.

ROBERT GREENE

What about for your understanding cattle?

TEMPLE GRANDIN

Well, I read every behavior thing I could lay my hands on. There wasn't very much literature, but what little literature there was, I found it. I was always looking for more information. There was a thing called Insmeier [SP] Stockman's School in the early years, and there was a South African named Ian McFarlane and he came to do some talks, and of course I went that. I was trying to do the book learning too.

One thing I did is I tried to combine both the engineering type of mindset with learning everything I could about animal behavior. When I was at Franklin Pierce College, I had taken classes in animal behavior, so I was trying to hit it from that end too. But I was always trying to get more and more and more information.

ROBERT GREENE

So it was actually, I guess in the '70s, animal behavior was just starting, wasn't it?

TEMPLE GRANDIN

There was no animal behavior in the '70s. My very first animal science, being Jack Albright, who was one of the few American livestock behaviorists invited me to present a paper at the Animal Science meetings in 1978, where I talked about the things that make them balk, the shadows and that stuff. I mean, there just wasn't any behavior then.

ROBERT GREENE

Right.

TEMPLE GRANDIN

Now there are lots of people working on that stuff.

ROBERT GREENE

But you had to find as much information as you could and put the pieces together.

TEMPLE GRANDIN

And you have to remember there was no Internet then. So I would find obscure things and then wait a month to get them through an interlibrary loan. It was difficult in those days.

ROBERT GREENE

And you took notes and put them on index cards.

TEMPLE GRANDIN

Oh, yes. I'd take tons of notes. I had all kinds of notes. Then I'd go visit different meat plants and any little interesting thing they had in their cattle handling. Some of those wouldn't let me take pictures, so I used to do what I called trip notes. I'd get back to hotel that night and I called it downloading

my brain. I'd actually draw diagrams of the things that I had seen and put down notes so that I could duplicate those things I had seen in the places that didn't allow pictures.

ROBERT GREENE

I see. Your observation skills are quite refined. A lot of it comes maybe from being autistic where you're . . .

TEMPLE GRANDIN

Well, you see the thing is a person with autism . . . the thing is I'm a total visual thinker. Now of course in the '70s, when I was working on this stuff, I didn't know that my thinking was different. I thought everybody thought in pictures. I just didn't know.

ROBERT GREENE

But one of the things that I'm talking about in this idea, you've said filling up the data banks or I call it apprenticeship . . .

TEMPLE GRANDIN

It bottom-up thinking. You have to fill up the data bank. There's a lot of information that has to go into the data bank.

ROBERT GREENE

Well, one of my ideas is that sometimes people when they enter a new world, like a transition, they're too eager to assert themselves and what you need to do is you need to stand back and observe the rules, technical and social . . .

TEMPLE GRANDIN

When I would go to a new place to work cattle, I always watched for a while before I just jumped in and did things. A lot of people are very rough and really bad to cattle. I always would watch for a while before I would jump in.

ROBERT GREENE

What kinds of things would you watch?

TEMPLE GRANDIN

Like how many size of groups they brought up, exactly how they did things. Every place is a little bit different. Then I found I'd watch stuff, but then when I actually would do it, certain things that looked easy to do watching it, you found out weren't so easy to do when

you actually did them. You know, like just running the hydraulics on a squeeze chute. I've found that you've actually got to . . .

[sound of computer talking in background]
Oh, God. Why do they have a computer that talks. This is stupid. Some of the hotels they have these computers and they charge you a fortune.

ROBERT GREENE

I know.

TEMPLE GRANDIN

I got stuck in this one hotel and they charged \$5 for each printer page, and I had to get a Brazilian visa and I had to get it printed on both sides and figure out how to get the paper in there to print it right, with a printer that was charging \$5 a page.

ROBERT GREENE

Oh, that's terrible.

TEMPLE GRANDIN

It was totally [inaudible 13:20].

ROBERT GREENE

Well, do you think it's important to take that moment to observe things before you . . .

TEMPLE GRANDIN

Yes. I think it is important to observe.

ROBERT GREENE

Why?

TEMPLE GRANDIN

Well, because you learn by observing. I usually would observe before doing stuff, but what I was trying to do was I also was reading it, every kind of research and stuff I could find. In the '70s, there was just nothing except for the little bit I got from New Zealand from Ron Kilgour, which backed me up because it made me feel I was on the right track. I found out from Ron Kilgour when I met him at the Animal Science meetings in 1978 that he was ridiculed in New Zealand. I remember him saying, "The bureaucrats are angry that I'm getting all this attention and speaking engagements abroad." But the sheep people in New Zealand thought Ron was

nuts. He was doing basically the same thing I was doing. We didn't communicate until 1978, because you didn't call up. Phone calls back then were horrendously expensive. You didn't call people overseas in the '70s. It just wasn't done.

ROBERT GREENE

Right. This idea of learning draftsmanship from David, were there any other skills that you learned like that, or was that sort of an exception?

TEMPLE GRANDIN

Well, one thing that helped me with David was using exactly the right kind of pencils, because I also was painting some signs. For five years, I painted signs with the wrong brush.

ROBERT GREENE

The wrong brush?

TEMPLE GRANDIN

The wrong paint brush. Because the paint brush that's the correct brush to use, when you look at it in the art store, it's a soft fluffy

thing and you go, “How in the heck could you paint a sign with that?” Then an old sign painter taught me how to dip the brushes in lard oil, shape them with lard oil, and then they were beautiful. But there are certain technique things that somebody has to teach you, that you’re not going to figure out how to take a soft floppy brush and dip it in lard oil to shape it. Somebody has to show you how to do that technique.

ROBERT GREENE

And there were people along the way who showed you.

TEMPLE GRANDIN

Yeah, and they showed me how to do it. Then watching David, I watched exactly how he would draw in dirt, how he would tap like this to do the concrete, the exact pencils he used. You see, then I copied that. Then I can remember when I drew my first really nice blueprint, it was for a cattle loading ramp, and I had one of David’s drawings. I had it laying on the floor, and my loading

ramp design was different. I didn’t trace his drawing. But I looked at his drawing to learn the technique. How did he make his lines? How did he do this? How did he shade a pipe to make it look round?

ROBERT GREENE

Right.

TEMPLE GRANDIN

And having that right pencil, with just the right lead is really important. If the lead too hard, it doesn’t work. It was a .05 Pentel pencil, and having that correct pencil was really important for making a nice drawing.

ROBERT GREENE

And it was mostly just watching him. He didn’t talk to you or anything?

TEMPLE GRANDIN

No, he didn’t teach me drafting. I watched him.

ROBERT GREENE

That’s interesting.

TEMPLE GRANDIN

I watched him, and what I learned from that was the technique. I already knew how to read drawings by this time. You see, that I had taught myself previously and that took a long time. But what I did from David, and I kind of said this wrong in *Thinking in Pictures* that it just kind of magically appeared after watching David. But what did come from watching David and getting David’s drawings was learning the techniques. I had drawn other drawing before that, but I had the wrong pencils or the wrong kind of paper. You see, the surface of your paper is important for having a nice drawing, and those are things that I learned. I went out to the drafting store and I bought all the same exact stuff that David had.

ROBERT GREENE

Well, it’s interesting because there was one book I read on tennis, called “The Inner Game of Tennis.” He says that a person has a natural way of learning, a child does, by

observing and watching and imitating, and that what happens with people as we get older is we want everything to be verbal. We want verbal instructions. So nowadays if David had told you, "This is what do, this is . . ."

TEMPLE GRANDIN

No, David and I never talked about drafting. We talked about airplanes. David, he quit working for Krell Industries, and David went to work for the Revell Model company to design toy airplane models.

ROBERT GREENE

Those were the ones that I made as a kid.

TEMPLE GRANDIN

Do you know what he did? He designed a stealth fighter.

ROBERT GREENE

Oh, that's so cool.

TEMPLE GRANDIN

That the government had a fit about because he had figured out how to make a plane stealthy, and he had made up his own stealth fighter and the government about has kittens

over it. He just figured it out himself, how to make a plane stealthy. He's an absolute visual thinker. He could draw anything. No, we talked about airplanes. We never talked about drafting.

ROBERT GREENE

So it was just purely watching and observing?

TEMPLE GRANDIN

I watched and observed. That's how I picked up the good technique, because I had done some drawings before that and they were really crappy drawings. Then I figured I've got to learn how to be David.

ROBERT GREENE

Is there a sense of . . . your attention to detail, which is so important in almost any kind of work . . .

TEMPLE GRANDIN

You see when I draw something, I actually imagine the actual thing as I'm drawing it. I see the actual thing.

ROBERT GREENE

Right. Were you able to train yourself to observe and be attentive to details, or is that something that kind of came natural to you?

TEMPLE GRANDIN

Well, it kind of just came natural to look for details. Let's look at some of the things that are going on now, today. I've been talking for 35 years. Don't have a chain hanging down in your chute. Well you know what? I went to a ranch just a month ago, that's 35 years later, guess what? A chain hanging down the entrance of their chute.

Okay. There's a scene in the movie where they put that slippery ramp in there and they killed those cattle. They actually did that. Now, my center track restrainer for the slaughterhouses has the same kind of cleated ramp going on into the restrainer. People are always taking the cleats off, cutting the ramp off. They're making that same mistake today that they made 35 years ago.

ROBERT GREENE

That's what I'm wondering, why are people so inattentive to detail?

TEMPLE GRANDIN

Well, they think they've got to just jamb the cattle in there. They've got to make them slip. They don't understand that they should be walking down the ramp, and they just don't get that. They're still taking the ramp off because it's the same design. People modify that entrance, and every time they modify it, it doesn't work.

I'm finding on some of my things when they modify them, if they made them better, I'd put it in my design. But they're not making them better, they're making them worse. And the idea that you let the cattle walk in where they're not slipping, rather than forcing them in, that's a concept that a lot of people seem to have a hard time with.

When it comes to all the distractions, I now have checklists of distractions. You can go

to "Animals in Translation" and there's a checklist. Well, you know what? I've had people make training videos that they have me review. Guess what? They took out all the part about the distractions. They didn't think that was important. I go, "Wait a minute, these things don't work if you don't take out the distractions."

ROBERT GREENE

So where does this come from, this inattention to detail? Is it a new thing?

TEMPLE GRANDIN

The problem is, when things go verbal, you drop out the detail.

ROBERT GREENE

Exactly.

TEMPLE GRANDIN

Now, here's an interesting study done at the University of Pittsburgh with Nancy Minshew. Now what they found . . .

ROBERT GREENE

Who's it from?

TEMPLE GRANDIN

Nancy Minshew, she did a paper where . . .

ROBERT GREENE

How do you spell that?

TEMPLE GRANDIN

M-I-N-S-H-E-W.

ROBERT GREENE

M-I-N-S-H-E-W. Nancy Minshew, okay.

TEMPLE GRANDIN

Well, I should have brought you a copy of my new book, *The Way I See It*, because it's got a lot of the references.

ROBERT GREENE

This is out?

TEMPLE GRANDIN

Yeah, *The Way I See It, 2nd Edition*. You have to get the second edition. Another thing you want to get – and you know what, we can get it off one of these computers right here – is a paper that I did for the Transactions of the Royal Society on visual thinking and creativity. With that computer, I noticed they'd Google up on it, so I should be able

to find that paper and we can print that out for you.

ROBERT GREENE

Okay.

TEMPLE GRANDIN

I overslept a little bit this morning and didn't have time to Xerox it.

ROBERT GREENE

That's all right.

TEMPLE GRANDIN

What they show what happened in this study is they took people with autism, where there's speech delay, Asperger's where there's no speech delay, and normal people, put them in a fMRI scanner, and they have the autistic read out of a book and just the part of the brain that gets the detail of the words turns on. Then they have the Asperger read out of the book, and they get the detail of the words and they get the syntax. The normal person drops out the detail of the words. So in other words, the normal mind drops out detail.

I developed a very simple scoring system for animal welfare. It's been very frustrating to me because I build something really nice, half my clients tore up all the equipment and they were handling the cattle badly. I would go there for the equipment start-up, get everything really nice, and then people would regress back into rough stuff and they didn't know they were doing it. So I figured out a very, very simple measurement system where if you have more than three cattle mooing and bellowing in the stunning chute, you fail the audit. If more than 1% of your cattle fall, you fail the audit, period. You just fail the audit.

ROBERT GREENE

That's good.

TEMPLE GRANDIN

And I'm finding when I worked on these animal welfare committees, they want to put all this vague stuff in there, like, "Handle them properly. Give them sufficient space." What does that mean?

ROBERT GREENE

It means nothing.

TEMPLE GRANDIN

It's all vague. Pabulum, BS.

ROBERT GREENE

Exactly.

TEMPLE GRANDIN

Pabulum is a 1950s child baby cereal, is Pabulum.

ROBERT GREENE

Is that right? I didn't know that.

TEMPLE GRANDIN

Pabulum is a brand name for a 1950s baby cereal.

ROBERT GREENE

That's a great word.

TEMPLE GRANDIN

Pabulum, that's what it's called.

They take out the detail. See the thing that I try to do is to figure out which details are really important. You see, if I measure falling, that could be caused by a slippery floor or it could be caused by rough handling. It's

an outcome variable. People have a hard time with the idea of using these very simple outcome variables. My little scoring system, McDonalds, Wendy's uses it and it's worked really, really well.

ROBERT GREENE

I noticed that da Vinci is one of the people highlighted. He had this incredible sense of detail, but he had to train himself over years and years.

TEMPLE GRANDIN

He also had to figure out which details are important. That's the other thing. Not all details have equal importance. Which details actually matter?

ROBERT GREENE

Yes, that's very important. That's interesting.

TEMPLE GRANDIN

You've got to figure out what are the important details.

Okay. Let's take something like a Japanese nuclear power plant. This is kind of a mess. This wouldn't have happened if I had visited

that plant and had anything to do with it. Okay. You have the nuclear engineer who's the mathematician. We haven't talked about the different kinds of minds yet.

ROBERT GREENE

We will.

TEMPLE GRANDIN

We've got to talk about that.

I'm a visual thinker, so I could visualize what would happen if water came over the seawall or maybe the seawall breaks. Guess where their emergency generators were to run the emergency backup pump to keep the reactor core cool? They were in the basement. Well, yeah, and you get water in there and the basement filled up with water. Now your emergency generators to run your emergency pump are underwater, so your backup generator and the backup to the backup generator are both drowned.

This is something that to a visual thinker is so straightforward, it's like, "How could

they make a mistake like that?" I'm now beginning to think that it's different kinds of thinking. They just don't see it. I'm going, "How could you not see that?"

ROBERT GREENE

Well, I think maybe in the old days a person realized that you had to train yourself to think about all of these details, but when you're working with computer models, you lose touch with that kind of reality. If you're someone who's not autistic and you are verbal oriented and you are designing in architecture, you spend ten years with a pen or pencil and going to the site and looking. But if you're not doing that anymore and you're designing from the computer, that's why these mistakes happen, I think.

TEMPLE GRANDIN

Well, and that's actually is quite an old plant. That would have been designed in the '60s before computers were around.

ROBERT GREENE

Is that right?

TEMPLE GRANDIN

Yeah, that's a GE boiling water reactor. It's the oldest, crappiest technology there is. It's the most likely to burn up technology . . .

ROBERT GREENE

We have them here in America too.

TEMPLE GRANDIN

Well, but at least we . . .

ROBERT GREENE

We don't have tsunamis.

TEMPLE GRANDIN

Well, the thing is, is to be a little smarter about the emergency backup stuff. Some of the ones here have it where you don't need a pump to run the coolant system. The water can come out of a reservoir. Now you've got to keep the reservoir full, but that's a lot easier. You can take a fire truck and just keep a reservoir full. So you could keep that going with a fire truck.

ROBERT GREENE

Okay. That was a good example, the nuclear power plant.

I want to talk about when you were at ASU and you were working on cattle chutes, or you wanted to, and some professors blocked the idea.

TEMPLE GRANDIN

Well, yeah, the professors thought it was stupid. One of my early ideas for a thesis was to look at black dairy cows. You know dairy cows are black and white. So you've got some cows that are mostly black, some cows that are mostly white, and then you get cows that are kind of 50/50. So I wanted to put dairy cows in three groups and look at heat stress, and the professor thought that was stupid. Well, like 20 years later somebody actually did that experiment, black cows get hotter and they had more reproductive problems as a result.

ROBERT GREENE

Interesting.

TEMPLE GRANDIN

But the professor didn't think that was science to be doing a study on different kinds of

squeeze chutes. So what ended up actually happening, and the movie really fictionalized this because the professors are still alive. So that part had to really be fictionalized. What actually happened was I had to get a major professor from two different departments. It was Foster Burton with the Construction Department, and I went in to talk to Foster and he was willing to be my thesis head. Then Mike Neilson from Industrial Design was one of my other professors.

ROBERT GREENE

What made you go ahead and do that? That was an important, interesting thing to do on your part.

TEMPLE GRANDIN

I just wanted to do this survey. I was just going to do it.

ROBERT GREENE

You're tenacious.

TEMPLE GRANDIN

Tenacious, doing it. And if one professor didn't want to do it, I'd find somebody else that would do it.

ROBERT GREENE

It's like the door being blocked and you're going to go around.

TEMPLE GRANDIN

That's right. I'm going to go around it. It's like a blocked door was like . . . oh, man, you talk about something that motivated me, a blocked door, it really, really, really motivated me.

ROBERT GREENE

That's good. So you found these other professors.

TEMPLE GRANDIN

I found these other professors and I did my Master's thesis. Of course, that was the early '70s. We had to do it on IBM punch cards. Oh, God. I tell my students about that today. I said, "Imagine taking 3,000 boarding passes that you've punched holes in with

a special machine and you sort them in a machine and that's a spreadsheet."

ROBERT GREENE

It teaches you patience.

TEMPLE GRANDIN

Yeah.

ROBERT GREENE

In this area that we're talking about of filling the database, were there any other important mentors in the space?

TEMPLE GRANDIN

Yes, there were some good feed yard people. The movie showed all the bad nasty people, but there were some good people. There was Jim Uhl with the construction company. Jim Uhl was really important. There was a guy named Allen that handled cattle at some of the different feed yards. He really taught me about how to handle cattle really gently and nicely. He was really good. There was Ted Gilbert with the Red River Feed Yard. There were some good people that saw my ability and that's what kept me going.

The other thing that kept me going is there were some good people that really took care of cattle right. There were a lot of people in the '70s just treating cattle absolutely awful, absolutely beyond awful. But there were good people, like Bill and Penny Porter, Singing Valley Ranch, they took beautiful care of their pure bred Hereford cattle. So these were things that showed it was really possible I could do things right.

ROBERT GREENE

Is there an art to choosing the right mentors, to finding the people that you think are going to work for you?

TEMPLE GRANDIN

Well, the people that helped me were also attracted to my ability.

ROBERT GREENE

That's true.

TEMPLE GRANDIN

You see, because one thing I figured out early on, I made portfolios of my work. I designed all the front end of the Cargill plants, and

they way that I sold my work to Cargill originally was I made a portfolio, had one big foldout drawing in it. It had some plastic pages with pictures in it. It had a couple of articles I had done, a client list, and a cover letter. People opened that up and they went wow. I learned how to sell my work. So I always carried my portfolio with me. I could whip out pictures of my jobs. In other words, I sold my work rather than myself, and that is something I figured out to do very early on.

ROBERT GREENE

It's important for anybody to do that.

TEMPLE GRANDIN

But the other thing I had to learn was don't put too much junk in your portfolio. You have to show the right stuff to the right people. I can remember trying to sell a military base on some sign painting and showing them drawings I did for my aunt's third grade classroom and it did not impress them. No, you've got to show the right stuff.

Right.

ROBERT GREENE

Don't put too much junk in. It's got to be very neatly presented. That's another thing I learned. You want something that in 30 seconds they can go, "Wow. Wow, this is the person to do it. This person really knows."

ROBERT GREENE

So with these mentors, it was kind of a mutual thing. They recognized something in you and you gravitated towards them?

TEMPLE GRANDIN

Yeah, they did. That's right. And these are people that'd recognized my ability and they were very supportive.

Then there was all of the Scottsdale Feed Yard horribleness. We can use the real name of the Scottsdale Feed Yard because they've been bulldozed 25 years ago.

ROBERT GREENE

Oh, okay.

TEMPLE GRANDIN

Actually, when the movie was being made, we went through Who's Dead so we could tell the dirt, and who's we couldn't, had to fictionalize. The Scottsdale Feed Yard thing that actually happened with the bull testicles, and I just found out about it a month ago from some people that knew those cowboys. That they were a member of the thing called the Scottsdale Charros. It was like a male group that would take . . .

ROBERT GREENE

Is that the guy, Ron, that blocked you . . .

TEMPLE GRANDIN

Yeah, that's right. They would take the Scottsdale businessmen out on rides where no women were allowed, and they were like the ultimate male chauvinist pigs. The only reason I was going over to that feed yard, it was the closest feed yard to where I lived. It was only a half an hour drive, where everything else was an hour and a half drive.

ROBERT GREENE

One thing that you did early on was your decision to write for magazines.

TEMPLE GRANDIN

That was really important because that helped establish my credibility, because I very quickly got a credibility of writing really accurate articles and I didn't misquote people.

ROBERT GREENE

What made you do that? If you can remember.

TEMPLE GRANDIN

Well, I had done my Master's thesis on these different kinds of chutes, and I wanted to write something for my Master's thesis. There's a scene in the movie where I go up to the head of the Farm and Ranchman and get his card. I actually did that. That scene is accurate. I went up to him and I told him that I wanted to do this article on different kinds of squeeze chutes, and I got his card and he told me to send him an article. So he sent me

an article and I sent it in and they published it. They published my article.

ROBERT GREENE

So this sort of happened by happenstance.

TEMPLE GRANDIN

Well I got his card, just like the movie showed. I went up to him and I got his card. I knew I was going to get an article in that magazine. So then when I wrote the article and I got back issues of the magazine to see how to write the article, have it be the right length and stuff like that. I wrote up one article. Then what happened, I got kicked out of Scottsdale Feed Yard. What I did when I got kicked out of Scottsdale Feed Yard, I went right down to The Farm and Ranchman office. My revenge for being kicked out of Scottsdale Feed Yard was to see if I could write a column for The Farm and Ranchman. So I went down to their office and I said, "Well, I'll write a column for you." So the first year I didn't get paid anything, but I wrote a little column every month and

it was called "Feed Lot Bullying." I got a reputation for being a good reporter, maybe weird but, again, I was getting I was getting judged by my work.

ROBERT GREENE

This is important.

TEMPLE GRANDIN

They said that when I wrote up the story to cover the Arizona Cattle Feeder's meeting, I didn't misquote people. I would cover the Cattle Feeder's meeting accurately. Then for the national magazines, the way that I got into a national meat magazine is I went to a meeting as an Arizona Farm and Ranchman reporter, and I walked up to Gregory Pitchseck [SP] , he was the editor for the national version and I got his card. I learned about this getting cards. I used to call it card hunting and this business of getting the card of the right person.

I got very good on the telephone tricks too. Like calling up a company and find out that the plant was going to building a new

addition and getting hold of the engineering office and getting the secretary to give me the direct extension.

ROBERT GREENE

Very clever.

TEMPLE GRANDIN

Yeah. I learned things like you call up at 11:30 and you hang up before it rolls over to the voicemail. I learned every phone trick there was.

ROBERT GREENE

Oh. So do you think it was important to have this other skill, this other outlet as far as writing?

TEMPLE GRANDIN

Yes. Yes, because the things that I was learning about, I started writing about. I wrote articles for our national cattle magazines. At the end of the movie, they show some articles, one of them was "Chute Losses Aren't Accidents." That was the first article that I had done for a national beef magazine. Yes, those articles are very

important. When I designed the dip vat, and they did get it fixed and get the metal plate out of there, in a major cattle magazine, that was really helpful.

ROBERT GREENE

We were talking earlier about the Borg. You decided to leave the Borg and go freelance in your life. That's something that I don't know exactly what you meant.

TEMPLE GRANDIN

Well, I was working for a construction company and one of the reasons I left is they were ripping off a lot of people. Because I also had to do their advertising and they were not paying for advertising. I couldn't continue to do that, and a lot of people left for those kinds of reasons.

ROBERT GREENE

But you didn't really like working for Borg.

TEMPLE GRANDIN

Well, actually that wasn't a very large corporation. It was only like 25 people in the office.

ROBERT GREENE

I see.

TEMPLE GRANDIN

But I couldn't work for a company that was ripping off clients.

ROBERT GREENE

I see, okay. Very briefly, I was just very interested on your Ph.D. thesis on pigs because it seems interesting about some of the things that I'm writing about, which is the relationship of your environment to you . . .

TEMPLE GRANDIN

Well, one of the problems with the Ph.D. thesis on pigs is that the papers never got published, and one of the reasons they didn't get published, except in a book form in "Animals Make Us Human," is they went against several million dollars worth of NIH grants hypotheses.

ROBERT GREENE

Oh, okay.

TEMPLE GRANDIN

Yeah. So my thesis advisor wasn't real thrilled with the results.

ROBERT GREENE

But it ends up being very true what you wrote about.

TEMPLE GRANDIN

It was true.

ROBERT GREENE

It's been completely demonstrated.

TEMPLE GRANDIN

Oh, totally.

ROBERT GREENE

Even Charles Darwin had something where he said that the brains of domesticated rabbits were much less varied. They were smaller than the wild rabbits.

TEMPLE GRANDIN

That's right.

ROBERT GREENE

What drew you to that idea?

TEMPLE GRANDIN

Well, they were just starting to get interested in how can we assess animal welfare? You have animals living in a barren environment. You've got the lion that's pacing. You've got the pigs bar biting, doing these repetitive behaviors. Bill Greenall had done some papers and I found these papers, that if you take rats and you put them in an enriched environment. In other words, for a rat that's a box full of all kinds of wood and junk that you change every day to give him new stuff to crawl around on. The controls were just in a cage with sawdust on the floor, a plastic shoebox type of thing. The rats that were in the enriched environment had more dendritic branching in the visual cortex.

So I got to thinking maybe we can do kind of a welfare test for pigs, where we're going to us the snout because pigs are rooters. So we'll look at the visual cortex and we'll look at the somatosensory cortex attached to the snout. So I had to find this old paper to figure

out where the somatosensory cortex was in the pig, and we found that. The pigs had two treatments, one was indoor pens with plastic floors, standard commercial. The other was straw bedding, every day I gave them new junk to play with, toys, old phone books to tear up, pipes, just all kinds of stuff, things they could rip up. The hypothesis was that with the enriched environment pigs would have more dendritic branching, both in the visual cortex and the snout.

It was laborious. We'd get the frames in formula and then we'd stain them. They you would have to draw the neurons.

ROBERT GREENE

You had to kill the pigs it sounds like.

TEMPLE GRANDIN

Yeah, we did. We had to slaughter the pigs.

Then what ended up happening with the results is that the indoor pigs in the barren environment had more dendritic branching in the snout. Visual cortex had no differences.

That was opposite to the hypothesis. Because, you see, all of Bill Greenall's research before that was that an enriched environment builds more neural circuits. That was the hypothesis then. I remember giving him the results and he goes, "Oh, shit." That's exactly what he said, exact words. A whole lot of grants that he was having with the opposite hypothesis.

So he made me do the experiment over, but this time we put video cameras in there, so we could find out what the pigs were doing at night when we were not around. Because one of the things that I observed was that my indoor pigs, when I went to clean the pens, they were craving stimulation and they'd bite my hand and they'd bite the hose. They were just like cuckoo to get stimulation. My outdoor pigs didn't do that. There was some very definite differences in the behavior between my indoor pigs and my outdoor pigs. So we put these video cameras on where we could spy on them in the middle of the night. It was timed lapse video. You could get 23

hours of recording one big old reel-to-reel thing.

We get the tapes back and we find out that the indoor pigs were rooting each other for hours with their noses, rubbing like this. They were manipulating the water for hours and rooting into the floor, and my outdoor pigs did not do this.

ROBERT GREENE

Oh, that was the cause for the changes.

TEMPLE GRANDIN

So the cause was use. So then I started to look for papers to find use. I found two papers in the literature on use. One they made a cat lift up its paw repeatedly, and I don't remember what the other paper was, but Bill Greenall called one of the papers a piece of shit. That's exactly what he called it. And the other paper he called a bad study.

So it ended up that it never got published because it went against too much grant money hanging on that. It turned out that

basically I was right to what makes the dendrites is use. One of the ideas I had is that maybe you can have bad dendrites forming because these pigs were spending all day building dendrites where they shouldn't have them, doing basically autistic stereotyped behavior. So the link I then make into autism is one of the reasons is it's bad to just let these kids just do repetitive behavior all the time is maybe they're going to build a bunch of dendrites where they just shouldn't have them.

ROBERT GREENE

Have you heard of the kitten, what was it called? The kitten carriage experiment in the '60s.

TEMPLE GRANDIN

Yes, I was very familiar with that. Yes. I studied that.

ROBERT GREENE

With the one kitten moving and the other in a carriage.

TEMPLE GRANDIN

We studied those in those in experimental psychology in the '60s, and I took experimental psychology. So I was real familiar with those experiments.

ROBERT GREENE

Well, that's the end of the second card. Did you want to take a little break or something?

ROBERT GREENE

This card then as I talked about was about plasticity and teaching yourself to overcome any certain inadequacies that you might perceive.

TEMPLE GRANDIN

Well, let's talk about the different kinds of minds.

ROBERT GREENE

Do you want to do that now?

TEMPLE GRANDIN

Well, was that another card?

ROBERT GREENE

Yeah.

TEMPLE GRANDIN

All right. Okay.

ROBERT GREENE

That's the next card.

TEMPLE GRANDIN

All right. Okay.

ROBERT GREENE

Why did you want to talk that?

TEMPLE GRANDIN

Well, no, we can talk about it in the next card. I'll do this card. I just want to make sure we talk about it.

ROBERT GREENE

Sure.

TEMPLE GRANDIN

Okay.

ROBERT GREENE

To me, what's interesting is like you did it with the Save the Doors at the Safeway.

TEMPLE GRANDIN

Actually, it was AJ Bayless.

ROBERT GREENE

Oh, they had Safeway in that book. Isn't it?

Maybe I have it wrong.

TEMPLE GRANDIN

No. Okay. Yeah, Safeway was probably there too, but AJ Bayless was the first one.

ROBERT GREENE

Okay.

TEMPLE GRANDIN

Okay.

ROBERT GREENE

But also with your lecturing where you take it very seriously and you really work at getting it better and better and better.

TEMPLE GRANDIN

Yep.

ROBERT GREENE

Where does this come from? Because a lot of it is pretty fearless, because a lot of people are afraid of failure, and they don't work towards actually strengthening their weaknesses.

TEMPLE GRANDIN

Well, one of the things I did on lecturing, I made sure I had really good slides. I had taken all these pictures of all the different distractions, things built right, things built wrong. My lecture style wasn't the greatest in the beginning, but I had fantastic slides.

The other thing is I watched how other people did their slides in their lectures, and one thing I learned, I remember one time going to an ag engineering meeting and the guy had said he'd left his best slide of the new equipment at home. I go, "Oh, man, you never want to admit that you left your best slide at home." Then I started reading my evaluations, and I remember getting evaluations and one of the evaluations said that I always gave the same lecture. Then I realized that I always used the same cattle vision diagram as my first slide, and I'd go, "Cattle have wide-angle vision. They can see all the way around themselves without turning their head." So what I did to fix that

was I got rid of that slide, or I moved it not as the first slide. In other words, I varied my first slide. Then I figured out in my evaluations some of these people just write you hate mail. Then other times they write things that really could make my presentations better. So I read the evaluations carefully and would try to modify my talks to make them better.

ROBERT GREENE

A lot of people don't do that. Are you just really motivated to improve, or what is it about it?

TEMPLE GRANDIN

I had a real motivation to really prove I could do stuff. You see, in the '70s one of my big motivations is I wanted to prove I wasn't stupid. That was a big motivation. I had all my cattle fixations, but the other motivation is after I had designed a project, I'm going, "Well, a stupid person wouldn't have designed this."

ROBERT GREENE

I see.

TEMPLE GRANDIN

Because they thought I wouldn't amount to anything. I can remember when I was in college some of the other girls would go, "You'll never amount to anything."

ROBERT GREENE

Well, now look at it.

TEMPLE GRANDIN

And I wanted to prove to them that I could.

ROBERT GREENE

Yeah, like, if they could see you now, it's better than where they are.

TEMPLE GRANDIN

And so there was sort of like something to be conquered.

ROBERT GREENE

Well, also does it give you a sense of satisfaction as well?

TEMPLE GRANDIN

Yep. Trying to prove them wrong, that I really could do stuff.

ROBERT GREENE

But also to be a very successful lecturer, to have improved that.

TEMPLE GRANDIN

Well, and people tell me that my talks are better at 60 than they were at 50. You see, you keep learning. People are always looking for a single magic turning point. There isn't one. It's much more of a gradual getting better and better and better and better.

ROBERT GREENE

And you've noticed that in lecturing?

TEMPLE GRANDIN

Yep, I've noticed that in a lot of things. I noticed that in lecturing. When Clare Danes played me in the movie, I made sure I gave her all the oldest tapes I could find. The oldest stuff I had that was on VHS was from the late '80s and the early '90s and I gave her that. And then she spent five hours with me where she videotaped about four of those hours.

ROBERT GREENE

I think she did a very good job.

TEMPLE GRANDIN

She did a fantastic job.

ROBERT GREENE

I think it was great.

TEMPLE GRANDIN

But I wanted to find the old tapes where I sounded more autistic like.

ROBERT GREENE

So the sense of gradual improvement. One thing people don't realize is that adults have the capacity to constantly learn, and the brain is plastic well into your 70s or 80s.

TEMPLE GRANDIN

Well, yeah, and people tell me my talks have gotten better. When I'd read something in the evaluations that I didn't explain something right, well then I would try to work to explain it right. I'm also getting, as I get older, I'm less dependent on the slides. If I had to do a talk without slides, it doesn't freak me out so much. Now to do a talk without slides, I

have to make a list of bullet points so that I don't ramble all over the place. I kind of go through the slides in my mind and make a list of bullet points to go down through. Now a cattle handling talk, if I have to talk about layout, that would be impossible to do if I didn't have a blackboard then to write on or a whiteboard to write on, because I don't know how I could talk about layout without pictures.

ROBERT GREENE

Right.

TEMPLE GRANDIN

There are quite a few things a could talk about without pictures, handling stress, training animals to tolerate novelty, that animals actually need to learn that a certain amount of change in their routine is okay and they don't have to freak out over it. They can be taught that.

ROBERT GREENE

I see. Well, the thing that really interests me the most is your ability to observe other

people. Oliver Sacks calls it your quote as being an anthropologist from Mars.

TEMPLE GRANDIN

Yeah, that's right.

ROBERT GREENE

I mean, I do this myself. I don't think I'm autistic. I might have slight Asperger's tendencies, but I have the same thing where I feel like I'm observing people almost as if I'm a different species.

TEMPLE GRANDIN

Well, I've done that, especially when I watch romantic behavior. Like when I'm on a plane in the window seat and this boyfriend and girlfriend are kind of doing goo goo eyes at each other and I'm kind of watching that, and I'm going, "Well, I just don't get it."

ROBERT GREENE

Yeah, right. But what about just sort of social behavior in an office type situation?

TEMPLE GRANDIN

Well, I've learned how to avoid a lot of problems, and I've learned that people don't

want to go talk on and on and on about my favorite subject.

ROBERT GREENE

They don't want you to . . .

TEMPLE GRANDIN

Well, I've learned don't tell the same story more than twice. I have a rule like that.

ROBERT GREENE

How do you learn these rules?

TEMPLE GRANDIN

Well, people told me that I was getting them bored and that I'm talking about the same thing over and over again. I've also learned that really controversial things, like sex, religion, and politics, I don't discuss. Especially partisan politics I don't discuss. I will discuss the fact that the government doesn't do anything anymore, but I'll always make sure that the partisan politics is kept out of it. These people just aren't rational on that subject.

ROBERT GREENE

No. But things like, you were once fired and that had a big effect.

TEMPLE GRANDIN

Well, yeah. I was really upset about that.

One thing I got fired for was an equipment company had me to work on some equipment, and I went out to this other Swift plant, not the one in Arizona, and they really messed up a restrainer installation because they hadn't come and visited our plant to look at our installation. So I stupidly wrote a letter to the president of Swift and of course that made the engineers go berserk. I made the mistake of going over the head of the person who hired me.

So after that I had a new rule. If I'm hired by the plant engineer, I only go over his head if I'm in project failure mode. If the project is going to fail, then I'll go over his head. But as long as the project is going to come out, I never go over his head. Now, that's a rule I still follow today.

ROBERT GREENE

What do you think that's about?

TEMPLE GRANDIN

Well, because they get really angry and I've got fired from a job for doing that, even though I was technically right.

ROBERT GREENE

So you learned this because you were fired?

TEMPLE GRANDIN

Well, yeah, that's how I learned it.

ROBERT GREENE

Okay.

TEMPLE GRANDIN

Then I also learned the deal with what I call "Jealous Engineers Syndrome." I'm hired by the plant manager. Okay, now the engineer doesn't like this weirdo coming in on his turf. I've actually had equipment sabotaged and damaged, a meat hopper jammed in equipment to break it on purpose because they were jealous.

ROBERT GREENE

Yes, I had heard that.

TEMPLE GRANDIN

And it was very, very difficult for me to understand how a plant engineer could do thousands of dollars worth of damage because he was jealous. Because I kind of naively assumed that if somebody worked for this company, they'd do things in the best interest of the company.

ROBERT GREENE

So jealousy isn't an emotion you ever feel or deal with?

TEMPLE GRANDIN

Well, I've learned how to deal with it now.

ROBERT GREENE

But you personally, you don't feel it?

TEMPLE GRANDIN

What happens to me when I get a little of that jealousy thing is that it motivates me to make my stuff better.

ROBERT GREENE

Yeah, I understand.

TEMPLE GRANDIN

I'm motivated to make stuff better. Boy, I'm going to show you. I'm going to design something really, really good. I'm going to just make something so much better than you can do. I'm not motivated to wreck his stuff, and I don't go around bad mouthing and saying his stuff's terrible. I've learned not to do that. I remember being taught by a salesman, "Don't trash the competition."

ROBERT GREENE

Right.

TEMPLE GRANDIN

That was actually a washing machine salesman that told me that. You don't trash the competition. You tell what your product can do. You don't bash the competition. I learned that from an old engineer that worked at Krell Industries, named Tom. When I was going to do my very first talk for the American Society for Agricultural Engineering in 1974 and I'd gotten these slides together, but I was just criticizing a lot

of stuff that was designed wrong. Tom said to me, “That’s way too critical. You need to be presenting things much more positive.” I took Tom’s advice and I totally revamped my slides. He was an old engineer. He was an engineer my age now, he was 60, something like that, and he said that’s just not the thing to do. See, that was before I gave my very first major big talk in 1974 at the Chicago meeting of the American Society for AG Engineers. So I’d gotten rid of that negativity and I’d show, “Well, here’s something done right. Here’s the mistake, but here’s how to fix the mistake.” Rather than just getting in there and saying, well this is bad, and this is bad, and this is bad. Then I revamped and changed my slides and then showed them to him again. I have to thank Tom for that, and I don’t even remember Tom’s last name.

ROBERT GREENE

That’s all right. So a lot of it is people giving you feedback or telling you, and another is you observe if something has gone wrong

like being fired or sabotaged. You’re very observant.

TEMPLE GRANDIN

Well, I was very, very upset. But then I learned, if the plant engineer sitting in a meeting with his arms crossed like this, in a project meeting, and he’s real silent, and I’ve been hired by the plant manager, then I may have a jealous engineer on my hands. And the way I learned to deal with that is to pull him into the project, give him a piece of the action.

ROBERT GREENE

Very good.

TEMPLE GRANDIN

That is how you stop that. Like I went and found some electrical boards that this engineer had made, because he was an electrician by training, and we’d had to rip out his hydraulics because it didn’t work, all the plumbing was undersized, and that stopped it. The other contractor that I was with, he went out in the shop and he was

bitching about the engineer. I’m telling him, “Stop it. Stop it. Stop it. He’s in the office and he’s going to hear you. Stop it. All right. Let’s go out in the cattle catwalk where nobody can hear it. We can’t talk about it at the restaurant. Somebody could hear it. No, we go on the cattle cat walk, it’s the only place that’s private and then you can tell me what you’re mad about. But don’t do it in the shop.”

ROBERT GREENE

But the idea of involving somebody instead of alienating them . . .

TEMPLE GRANDIN

Well, I learned that that’s how you stop it.

ROBERT GREENE

I see.

TEMPLE GRANDIN

I found that that worked. I found the way you get rid of that jealousy thing is you pull them into the project, and I’d give them a little piece of the action in the project and I’d take some of his advice.

ROBERT GREENE

Excellent, excellent.

TEMPLE GRANDIN

And that's what I found stops that.

ROBERT GREENE

You're very observant.

TEMPLE GRANDIN

Yes. Did I enjoy doing that? No. But I've got this thing, I call it "project loyalty." My job is to build the projects.

ROBERT GREENE

Yes. Results, you're results oriented.

TEMPLE GRANDIN

I'm totally results oriented. Now, I'm not going to do something grossly unethical to build the project, but I'm project loyal. My job is to complete that project and make it work.

ROBERT GREENE

That's right. It's probably what I do as a consultant. I deal with a lot of people in businesses who have no sense of how to handle the politics in an office. You're really

smart and observant. I'm really impressed with some of the . . .

TEMPLE GRANDIN

Another thing, basically since I have to live here at CSU, I bend over backwards not to fight in my own backyard.

ROBERT GREENE

Is to not fight in your own backyard. What does that mean?

TEMPLE GRANDIN

I don't fight in my own backyard. And if they're doing something wrong, I don't want to know about it, not here, somewhere else fine, but not here.

ROBERT GREENE

Say that again. Rephrase that so I can use it.

TEMPLE GRANDIN

Well, what I mean by that is, let's say there was something that somebody did bad to an animal.

ROBERT GREENE

Yeah.

TEMPLE GRANDIN

I don't want to know about it. If it's where I have to work, I don't want to know about it. I fight my fights, but not in my backyard. I don't fight in my own backyard unless I'm dragged into it.

ROBERT GREENE

Why?

TEMPLE GRANDIN

Because I'd like to keep my job.

ROBERT GREENE

I see.

TEMPLE GRANDIN

And I'd rather not know about it.

ROBERT GREENE

It's also very stressful and you won't necessarily get any results.

TEMPLE GRANDIN

That's right. And you won't get any results and everybody just gets pissed. I've watched other people lose their jobs when they fought in their own backyard. Because what I see

when I read the business press, whistleblowers get shot.

ROBERT GREENE

It's what?

TEMPLE GRANDIN

Whistleblowers get fired and shot or crack up. You have to decide what you want to do. Do you want a career, or do you want to be an advocate? And where I've been an advocate, I do it not in my backyard. If I'm going to fight, I don't do it in the backyard. In other words, I can get more done by not doing it in the backyard. I can train my students in the right way to do things.

ROBERT GREENE

That's so smart. That's great.

TEMPLE GRANDIN

If somebody in my backyard is doing something wrong, I'd rather not know about it. Just keep me out of it. I don't want to have anything to do with it.

ROBERT GREENE

I agree. That's very . . .

TEMPLE GRANDIN

Because I can get more done to improve how animals are treated by doing my fights outside the backyard.

ROBERT GREENE

I think the thing might be to put it in the autism context is . . .

TEMPLE GRANDIN

I'm totally results oriented, totally.

ROBERT GREENE

I know. And a lot of people in offices and work are very emotional. They can't divorce their emotions from the results.

TEMPLE GRANDIN

Well, I can. I can go, "I hate this guy. I can't stand him, but I'm going to reference his scientific papers in my paper because they're good papers and they deserve to be referenced."

ROBERT GREENE

Well, that's very smart.

TEMPLE GRANDIN

But I find a lot of scientists cannot separate how they hate another scientist from judging his work. They cannot take those two. I can go, "Yes, this guy is jerk. I don't like him as a person, but this is a very good paper he's done and I'll use it and I'll reference it."

ROBERT GREENE

That's excellent.

TEMPLE GRANDIN

I will do that.

ROBERT GREENE

You're the eighth person I've interviewed. You've given me the best information for this section. I wish everybody talked like you did.

TEMPLE GRANDIN

What am I doing to give the best information?

ROBERT GREENE

Well, for instance, I interviewed an artist, and she was a great interview, Teresita Fernandez, but I know the art world because of my book packager, his wife is an artist I know a lot of

people in the art world, and it's very political and very cutthroat.

TEMPLE GRANDIN

Well, the meat world is political too.

ROBERT GREENE

But you wouldn't think the art world would be like that.

TEMPLE GRANDIN

Well, I can imagine.

ROBERT GREENE

Okay. And I wanted her to talk about it.

TEMPLE GRANDIN

The scientific world gets very, very political too. That's terrible.

ROBERT GREENE

Oh, I know. I asked Professor Ramachandran, and he wouldn't really talk about so much. They feel like it's . . .

TEMPLE GRANDIN

I'll talk about stuff. I won't give you specifics on real recent stuff.

ROBERT GREENE

I don't need that. I need general ideas for lessons.

TEMPLE GRANDIN

Yeah, but I can talk about it in general ideas without talking about anything specifically. But basically, one rule I have is I do not go over the boss' head unless I'm in project failure mode.

ROBERT GREENE

Okay.

TEMPLE GRANDIN

So if I'm doing a consulting job and the plant engineer hired me, then he's my boss. If the plant manager hired me, then he's the boss. If the corporate VP hired me, then he's the boss. I report back to the person who hired me.

ROBERT GREENE

Well, that's law number one in my "48 Laws of Power." Never outshine the master.'

TEMPLE GRANDIN

Yeah, and I don't. I don't do that.

ROBERT GREENE

Are there any other sins of the system that we could talk about, because this is really great? Are there any other codes or things that you've learned? I call them tripwires. When you do something wrong or somebody does something wrong, because these are codes and things that are unspoken, there not written down, nobody goes to an office and tells you about them, you find them when somebody trips a wire and makes a mistake or you do, and you have to be aware of them.

TEMPLE GRANDIN

Well, I can tell you the jealous engineer stuff, I can spot them a mile away.

ROBERT GREENE

How do you spot them?

TEMPLE GRANDIN

We're in a project meeting, he's very silent, often with the arms folded, too silent, doesn't seem to be happy about giving ideas and things. That's my first warning sign that I might have a problem. Then I can tell he's

going to do something nasty. And I can remember when my friend Tina was doing her doctor's thesis, and there was this one faculty member, I used to call him Dr. Jerk.

ROBERT GREENE

Doctor what?

TEMPLE GRANDIN

His name sounded sort of like jerk, so I called him Dr. Jerk. This guy had a history of doing rude and nasty things to students. I had heard about other things he had done, and Tina's going, "He's my friend, he won't do anything to me in my thesis defense." I go, "I don't think so. He's going to do something." She comes out of thesis defense and she was crying. Now he signed off on it, but he drilled her for 45 minutes on what is science. Just to be mean. She came back out and I said, "Tina, I know that jerk would do that." I know he'd do it because he'd had a history. There were stories going around the department about things he'd done to students that were mean like that.

ROBERT GREENE

So there were two things. One is . . .

TEMPLE GRANDIN

Prior history. I had a prior history on him.

ROBERT GREENE

Prior history and being too silent.

TEMPLE GRANDIN

Yeah, prior history I look at, and then if I don't know the people at all, and also if I'm hired by the plant engineer, you're much less likely to have a problem than if I'm hired by the plant manager. In most of the jobs where engineer sits there too silent, the plant manager hired me, not the plant engineer. So I'm looking at who hired me, that also goes into the equation.

ROBERT GREENE

I see.

TEMPLE GRANDIN

If the plant engineer hired me, then I'm usually best buds with him. You see, then also I've done a lot of different jobs. So I go back on that job the plant engineer hired me. It

was David, that the name of a plant engineer. He hired me and I'm best buds with him, and we would kind of like work together to try to get the plant to do stuff that we wanted.

ROBERT GREENE

I see. Any other sins?

TEMPLE GRANDIN

Well, the other thing is sex, religion, and politics, let's just leave those subjects at home. We don't need those at work. Those just cause trouble. We don't need to be discussing that at work.

ROBERT GREENE

I agree. That's another law of power that I have.

TEMPLE GRANDIN

What is your other law of power?

ROBERT GREENE

It's called, "Think as you want, but behave like others." So if you have interesting, unconventional thoughts, sort of keep them to yourself or only share with people who you know are like-minded.

TEMPLE GRANDIN

Well, that's what I do, especially on the subjects of sex, religion, and politics, because those subjects people get really irrational about and it's safe to talk about movies as long as they're not on controversial subject, pets, the weather. I talk about the weather a lot. I talked about the Japanese power plant a lot. What do I like to read in the paper? I like to read how they did the Bin Laden expedition.

ROBERT GREENE

Yeah, me too.

TEMPLE GRANDIN

How they pulled that off. Boy, they pulled that off. One of the things they did, nobody in the White House knew about it except the people that were in that situation room.

ROBERT GREENE

They never do that anymore.

TEMPLE GRANDIN

I mean his secretary didn't know. He's at that silly banquet and nobody knew.

ROBERT GREENE

Yeah, I think Obama's really good at that, but I'm not going to bring politics into this.

TEMPLE GRANDIN

Well, in other words, that was a project that worked.

ROBERT GREENE

I'm going to send you the power book, and I'm also going to send you my war book. It's a book about strategy. You might find it interesting, because each chapter discusses a classic strategy and how people applied them beyond warfare. You might find it interesting because it's all about how things are done.

So sins of the system, I pretty much think we have . . . anything more?

TEMPLE GRANDIN

Well, the sins of the system, I also basically have my rules of society. Rules of society, if you want a civilized society where you can stay in this hotel and maybe there are kids are running around in here, but they're not burning the place down or looting it. You

can't have people doing really bad stuff, killing each other all the time, tearing up buildings, stealing everything. Otherwise, you're not going to have food in the stores, you're not going to have money, you're not going to have jobs. You won't have a civilized society.

Then you have your courtesy rules. When I first made up my code in high school, I didn't put the courtesy rules in there because they had been so pounded into me I didn't even consider them a category. That got added a little later.

Then you have illegal but not bad. This is where you break stupid rules to get things done.

ROBERT GREENE

Right. Which we commonly find.

TEMPLE GRANDIN

And then you have the sins of the system. Now, they're very society specific. Like in one country a drug offense sends you to jail

forever, and in another country they're legal. You see, the thing about a sin of the system is they're very variable from one society to another. But when you mess with the sins, you get in so much trouble it's not funny, and you sometimes get in more trouble than if you went out and got drunk and killed somebody on the highway drunk.

ROBERT GREENE

Well, if I would add something to your sins of the system, it would be, when you enter in an environment that you're not aware of culturally, either another country or another corporation, you have to now learn the new sins for that particular system. They vary from place to place. So you can't apply the sins of . . .

TEMPLE GRANDIN

Well, most of the sins of the system that I think about, they're non-issues in a corporate situation because they're things like drug offenses. They're not things I'm going to be doing at work.

ROBERT GREENE

No, that's true.

TEMPLE GRANDIN

Let's just take, for example, this book out called "Look Me in the Eye" by John Robinson, and when he was a boy, he was blowing stuff up in the backyard. That was just kid games in the '60s. Now the FBI is going to get you. You see, that's now become a sin of the system. Like I saw a chemistry professor wearing a T-shirt at a high school science fair and it said, "We do in the lab what would be a felony in your backyard." Okay. Now that's an example of a sin of the system. That didn't used to be a sin of the system, but since September 11th, there are certain things that kids did in the '50s nobody thought anything of it, and now it's a sin of the system.

ROBERT GREENE

Sometimes you've got to be politically incorrect to be with [inaudible 24:12].

TEMPLE GRANDIN

Well, now don't mess with sins of the system, because the problem is sins of the system have draconian penalties.

ROBERT GREENE

Yeah, you're right.

TEMPLE GRANDIN

Like major jail time, or they can get you in as much trouble as the really bad things.

ROBERT GREENE

Well, you get fired. You get . . .

TEMPLE GRANDIN

Or worse than getting fired. You get thrown in jail for a long period of time.

ROBERT GREENE

Right. But the ones we're talking about, like with the jealous engineer . . .

TEMPLE GRANDIN

No, no, no. Those things are not sins of the system. Sins of the system are things like a teenage boy does some stupid sexual transgression, and now he's on the sex offenders list for the rest of his life.

ROBERT GREENE

What are these other rules that we were talking about that deal with work related things?

TEMPLE GRANDIN

Well, that's just getting projects done. That's part of project reality.

ROBERT GREENE

So I shouldn't call those sins of the system?

TEMPLE GRANDIN

No, no, no. That's all project loyalty stuff.

ROBERT GREENE

All right. I'm going to give them my own name though. I call them rules of the game.

TEMPLE GRANDIN

All right. Those are rules, yeah. But sins of the system are things where they're usually less bad than killing somebody, burning down a building, or stealing everything in this hotel, which in most civilized societies is stuff they don't allow. But a sin of the system is something where you can get in more trouble

than some of the really bad stuff, and they're very, very society specific.

ROBERT GREENE

I have a man I know in New York, a black guy in his 40s. He's the nicest person. He was in prison for 25 years, he grew up in the Bronx, because he got his third drug offense and it was like just smoking marijuana.

TEMPLE GRANDIN

That is a sin of the system. That is a sin of the system.

ROBERT GREENE

It's just unbelievable.

TEMPLE GRANDIN

Yep, that is a sin of the system. All the things I'm talking about, jealous engineers, that all goes in what I call project loyalty and getting projects done.

ROBERT GREENE

All right. My rules of the game.

TEMPLE GRANDIN

No, your rules of the game are the same as my project loyalty.

ROBERT GREENE

All right. All right.

TEMPLE GRANDIN

But a sin of the system is like your guy who got three pot offenses and now he's in jail for 20 years.

ROBERT GREENE

Well, probably his first offense might have been dealing. You know, serious crimes that normally should get a couple of years, but because they had a three strike rule in New York, the third one, which trivial, put him in prison for 25 years.

TEMPLE GRANDIN

That's a sin of the system, yeah. And then in some other place it's legal.

ROBERT GREENE

In Holland, he would . . .

TEMPLE GRANDIN

It's legal. You see and that's why it's a sin of the system, because a sin of the system tends to be very society specific. A drug that's legal

in Holland would get you thrown in the slammer forever here.

ROBERT GREENE

Yeah. Okay. We've finished the third, which is technically the halfway point, and maybe you want to take a little break.

TEMPLE GRANDIN

I'm okay now.

ROBERT GREENE

Okay. All right, so moving along down here to the real important stuff. The juice is the creative stuff.

TEMPLE GRANDIN

Okay.

ROBERT GREENE

So, in looking at things like your squeeze machine and when you talked about the dipping vat, it seems like a lot of it is what you call a visual association and combining things. You're combining images.

TEMPLE GRANDIN

Well one of the things I did is I went out to all these feed yards and ranches. When I

did that, I had probably been to at least 50 different places, and I looked at a lot of dip vats. They would slide the cattle in, and they would flip the cattle backwards. It was just horrid. I took a lot of good bits of things, and I put all the good bits together. But then I did have to invent some things. The idea of having a non-slip ramp going into the dip vat, that was totally novel.

ROBERT GREENE

Where did this . . .

TEMPLE GRANDIN

I just made that one up.

ROBERT GREENE

Where did it come from?

TEMPLE GRANDIN

Well, in the movie it showed going down to the edge of the pond. In fact, that particular scene wasn't in the script. That was a gift from the cattle gods. And I got the idea that if I could walk down to the edge of the pond, how about just setting it up on a 25 degree angle so that when he takes the step over the

steep drop off, his center of gravity is going to tip him right on into the water. But the idea of having a non-slip ramp going into the dip vat, that was totally new. Everything else, I had taken a lot of bits and pieces. The actual concrete design for the reinforcement rods, I got that from a USDA drawing. There were engineering things that I got that came from the US Department of Agriculture.

ROBERT GREENE

You sort of take the best . . .

TEMPLE GRANDIN

Well, there were certain things I had to do. Dip vats have some legal rules on length and depth and stuff, and that I just took off a USDA drawing. But the ramp and the thing that kept the cattle from jumping up, that was my design. And the idea of having a thing not to jump up, that idea came from a meat plant, but the meat plant ramps were still kind of slippery. But the thing that kept the animal from jumping up, the metal rack overhead, that came from a meat plant. The idea of

having a non-slip ramp, that was totally new. And that's the thing I find today that people still are changing that. That center track restrainer, they're still taking those ramps off. Jump the cattle in, cut the cleats off the ramp. I'm still fighting people that are cutting the cleats off the ramps. They're still doing that.

ROBERT GREENE

I did a lot of research on creative thinking, how mathematicians think. A lot of it is the idea of combining ideas, where you have a rich amount of information in your head, and suddenly out of nowhere, an idea comes. To combine two things . . .

TEMPLE GRANDIN

That's exactly how my mind works, too.

ROBERT GREENE

Visually.

TEMPLE GRANDIN

Visually, yeah. One thing I designed, I've done a lot of work on improving kosher slaughter. They need to make a head holding device that would go on the end of the

conveyer. A normal kosher head holding device, the thing is like a cradle that lifts up the head. If I have it on the end of a conveyer, how do I make this work? Well, to find a revolutionary idea is to cut it in half and have it in two pieces. Well, I didn't think that up right away.

ROBERT GREENE

Have what and cut it in half?

TEMPLE GRANDIN

The head holder, so that instead of having a single piece that lifts up the chin, the cattle will have to go through the conveyer. So, I just made it so you just cut the thing in half, and that just comes in from the side.

ROBERT GREENE

I didn't quite follow, but that's all right.

TEMPLE GRANDIN

Well, the idea was that it didn't have to be in one piece.

ROBERT GREENE

The head restraint.

TEMPLE GRANDIN

The head restraint did not have to be in one piece, like cut it in half. But why did it take me so long to figure out that I could cut it in half? Sometimes, the idea just comes to you. One thing I did when I would go to the ag engineering meetings is I'd go to a lot of the crop meetings, because I just wanted interesting ideas on how equipment works put in my head. The more interesting ideas of how things work, you can use that for other things. So I'd go to crop meetings, like harvesting equipment, because that . . . you've got to get interesting ideas, and you make something work like something else.

ROBERT GREENE

So you just have more associations, things to draw upon now.

TEMPLE GRANDIN

Well, I'm always wanting to fill up the database. I like to read things about how things actually get done. I like to figure out a lot of plane action and see what exactly

happened. I usually get it figured out before the come out with the official report. So I'm reading all of these newspapers, and I'm picking up little details.

ROBERT GREENE

There's a part of the brain they've located that is more interested in how things are done.

TEMPLE GRANDIN

I'm very interested in how things are done.

ROBERT GREENE

I wonder if there's any part of your brain that is more developed that way.

TEMPLE GRANDIN

Well, I'm very interested in how things are done.

ROBERT GREENE

Me too.

TEMPLE GRANDIN

And then I'm also able to figure out, okay, let's look at the last 20 years . . . if you look at my TED talk, in the last 20 years, they've had plane accidents where it's not pilot error.

Well, the tail either came off the plane or the steering is screwed up. So, if there's one thing that's really important, it's called tails. I always try to find, what's the common denominator? What's the common thing?

Sometimes the most obvious is the least obvious, but I'm very, very interested in how things work. How do . . . I find a lot of people, when there's a problem, they have a very difficult time saying, is it a people problem or an equipment problem? I find that people have a very difficult time making that categorization. That's very easy for me. And if it's an equipment problem is it a major design fault where you've got to throw the whole design out, or is it a glitch?

I'll give you an example in a meat plant. One thing that works really badly, and this is something you've learned after you've worked in a lot of startups, is you don't want to have new track and put old trolley wheels on new track. They jam, and then they end

up having to grind the track down to fit old trolleys. Well, of course during startup, you're going to get some jams in there, and you've got a bunch of down time. And the plant manager is out there screaming. Well, he's not recognizing the difference between a stuck trolley, which I know I can fix, and something where maybe the design is just not going to work. We're going to have project failure. They don't seem to be able to . . . I find most people have a very difficult time categorizing problems. Glitches from real, real serious problems to something where people just aren't operating right.

ROBERT GREENE

Why do you think that is? Why do people have that problem?

TEMPLE GRANDIN

I think it has to do with the fact that language makes thinking more vague. I really think it does. When I can think of things, like in my equipment startups, glitches, stuck trolleys, something that was tacked well [inaudible]

that just broke. I'm seeing specific examples. Then you have things where there's project failure. I had this one thing in this plant where we tried to put pigs on this conveyer that flipped them over backwards, and we had to tear the whole mess out. I had a major rethinking that you don't use engineering to treat symptoms of problems. Then you have things where people just aren't operating things right.

So my approach to troubleshooting is I go into the plant. The first thing I do before we change anything on the equipment is make the people operate it correctly. Stop screaming, stop poking all the animals with electric prods, bring up smaller groups. And then I see how it works. Then I go, "Okay. He's balking at seeing a lady standing there writing down cattle IDs. All right, get a big piece of cardboard, I'll cover her up. He'll balking at the restrainer. I'll turn a light on the restrainer entrance.' So I just do a lot of little things, a lot of modifications with lights

and cardboard to see if I can get it to work. And then after I've done that I go, "Well this is hopeless. You're going to have to build a new system, or we can fix it with these changes." There's an awful lot of systems where it's certainly not a system I would want to copy, but I can make it work. The plant can live with it.

But I kind of go with a real systematic troubleshooting. Do I have a people training issue? Do I have things just designed wrong? Then you get into things where people rush. I watched the BP Oil disaster thing. Well, they were rushing. They were rushing, and they didn't use enough spacers. They didn't do the cement right. It was push, push, push, rush, rush, rush, and they had a blowout preventer that they knew would not work. The engineers had presented papers at scientific conferences saying the blowout preventer was not strong enough to cut a pie.

ROBERT GREENE

You would write a great dissonance book for people in business. I know you've done it for autistic people . . .

TEMPLE GRANDIN

But how do you categorize problems? I see it as all these specific pictures. I can see a boss at the break room trailer at that oil rig going, "Aaahh, I've got \$20,000, and now I tell you a run this rig, and nah nah nah." Yeah, \$20,000 an hour or whatever it was. 'Nah, nah, nah, I can't have it here for another three days.' I've been there. I've been on that kind of crap job where they were taking safety devices off and stuff. I've been there. I've done that kind of crappy project. And then I've worked for the companies . . . one of my best companies, Cargill, where we were doing a plant startup, and everybody was getting really tired, and the plant manager decided to send the crew home and give them 24 hours to rest. People were just getting so tired, they

were worried someone was going to get hurt, and let's just take a day of rest.

ROBERT GREENE

You've sort of developed a system of designing and troubleshooting.

TEMPLE GRANDIN

Well you have troubleshooting, the first thing, you've got to go, is it a people problem or an equipment problem? That's the first thing you've got to do. So what I normally do is I go in, and I make the people operate it as right as they can possibly do it. Then I can separate the variable out. Then if I get cattle that constantly back up all the time, then I know I've got something wrong in the equipment, because they're backing up all the time. But it's really systematic. A lot of people talk about a systematic approach, but mine is a visually systematic approach.

But I'm finding a lot of people, they do all this risk analysis stuff, and I think it's kind of a verbal . . . trying to do visual thinking verbally. And to me it's like a big waste of

time. So you go out to the cattle loading ramp, and you discuss what the risks are. I go out to the cattle loading ramp, and I just think in my mind, "Okay, slipping and falling. What have I seen is the biggest problem on a cattle loading ramp?" It's worn out, it's turned into a skating rink, cattle falling on their butts. That's the number one equipment problem with a cattle loading ramp. Well, you can fix that with rubber mats or with steel rods. But I'm finding that most people have a very difficult time categorizing where a problem is.

Okay, you take something like the nuclear reactor. I have read that the GE boiling water reactors are like the worst design there is. It's totally non-forgiving for screw ups. It'll burn up before any other reactor will burn up. OK, say it's a crappy design, but you could have poor installations of this design or good installations. Good installations don't put their generators in the basement when they're by the sea.

Basements have a tendency to flood. But you see, this is something . . . and I'm going, "How could they be that stupid?" See, I used to get in trouble for calling them stupid. I'm now saying it's different ways of thinking. Maybe the mathematicians who designed that reactor don't see it. They don't see it.

ROBERT GREENE

I would call it stupid.

TEMPLE GRANDIN

Well I think that is stupid, but they . . .

ROBERT GREENE

That's my definition of stupidity.

TEMPLE GRANDIN

But basically, let's get into my three kinds of thinking. I'm a photo realistic visual thinker, and I think in specific pictures. If you ask me to think about a church steeple, there is no generalize steeple in my mind, there is only specific steeples. I absolutely can't do algebra. I've got really poor verbal working memory, and I'm finding a lot of kids like me that should be jumped to geometry and trig, and

I wasn't jumped to geometry and trig, and that was a mistake. Because trig stuff, I could figure out. I was at a fancy office in New York where they do mathematic stuff. They have this deck on the 7th or 8th floor. They bring the students up there, and they make them do a trig problem, and the trig problem is with a black condo building, if it fell, hit our building. That's the trig problem.

ROBERT GREENE

Verbal.

TEMPLE GRANDIN

Well, you see I'm immediately going, now let's put some constraints on it. Am I allowed to go outside to try to triangulate the height? Okay, what if I'm not allowed to go outside? I only can use stuff that's inside this building, an office type of building. Well, the first thing I've got to do is I've got to figure out the height of the deck. Now if I can't find a string long enough to dangle over the side of the building, how else could I figure out the height of the deck? Well I could measure

on each floor, and then I've got to figure out how thick in between the floors is. I could get a pretty good approximate height, but I've got to figure out the height of that deck if I'm even going to think about triangulating off the black condo tower. See I'm starting already to visually figure out how I could get measurements. Now I cannot shoot a laser at it, because I would be arrested if I did that. The police will arrest me if I shoot a laser at it. I can't use any laser device to triangulate this building. But for me it's totally visual. Now the second kind of mind is pattern. This is your mathematicians.

ROBERT GREENE

And music.

TEMPLE GRANDIN

Music, and music. Absolutely. And music. When I talk to these people about how they do programming and stuff like that, it's patterns. Daniel Tammet writes about, in "Born on a Blue Day", numbers having colors, seeing numbers . . .

ROBERT GREENE

Synesthesia.

TEMPLE GRANDIN

Well, synesthesia, seeing landscapes, things like that. It's patterned. I tell people think extreme origami, think organic chemistry. It's a pattern. And these kids often have trouble with reading. These are the kids that might need to be three to four grades ahead or five grades ahead in math and have trouble with reading. They're your mathematicians, your physicists, the pattern thinkers. Now you see, the different kinds of thinkers, they need to work together on projects. A visual thinker like me doesn't put generators in the basement.

But let's look at another mistake, where the engineers blindly follow the spec, but the result was disaster. Airbags killing children. Well the spec was the airbag had to hold in an unbelted adult male. Well you're going to have to have a lot of power to hold in an unbelted adult male. I would have looked

at those crash videos and gone, “Oh god, a kid in there who’s five . . .” You see, they blindly followed the spec. Well you need the visual thinker in there to go, “No, this ain’t gonna work. Babies are going to die, little kids are going to die. You can’t do this.” How could they make a mistake like that? And then you’ve got word thinkers, where it’s all verbal. And the word thinkers are very good at sequential things. I’m not good at . . . like one of the reasons I have a coauthor on a number of my book is because I’m terrible at the sequencing.

ROBERT GREENE

You do have somebody to work with you?

TEMPLE GRANDIN

Well, *Thinking in Pictures* doesn’t. That I wrote myself.

ROBERT GREENE

It’s great. You did a wonderful job.

TEMPLE GRANDIN

Thinking in Pictures and then *My Way I See It* book is totally, that’s all my writing with light editing.

ROBERT GREENE

Well, language is all about sequencing.

TEMPLE GRANDIN

Yeah, you see, and I’m not all about sequencing. I tend to jump around. I’m working on another book right now, and my coauthor, Richard, we were doing visualization games. So I asked him the word individual, and he saw individual socks. Then he started getting all these associations with different socks in the sock drawer, but he might have went five or six associations, and he’s still in the sock drawer. They were visual, but he stayed in the sock drawer. When I got in the sock drawer, it was immediately airport security with a holey sock. I was at a meat packing plant. You’ve got to wear your best socks, because when you put your boots on, everybody sees your socks, so you better have

your good ones on. So now I’ve gone from airport security to a meat packing plant. But I could stop and stay in airport security and do associations, or I could stop and do meat packing plant associations, or I could stop and do shoe store associations. You see, I’m not going to stay in the sock drawer.

ROBERT GREENE

Is this a book you’re working on, or is . . .

TEMPLE GRANDIN

Working on it.

ROBERT GREENE

Is this to train to think visually?

TEMPLE GRANDIN

Well, I’m really getting into the different kinds of thinking.

ROBERT GREENE

Because there are some very interesting books, and I’d be very interested to read this. Books written in the 60s and 70s about visual thinking and how to exercise this, et cetera that were really great.

TEMPLE GRANDIN

Well, I was looking at some stuff on creativity. The old thing, think up all the uses for a brick, a single brick. And I do that with my students. Of course, one of the things that you've got to do is to start changing the form of the brick. Cut it up, grind it up. Then you can really start thinking about different things you could do with that brick.

ROBERT GREENE

One important creative device, I'm wondering if you've used this visually, is what they call reframing, so that you suddenly see an old problem from a different angle, a different perspective. Everybody sees it the same way, and suddenly, you try and look at it from a totally different angle.

TEMPLE GRANDIN

I was looking at a creativity test where they had a little circle, and you're supposed to do all these little drawing with a circle. Of course the uncreative things were a smiley face on it. A creative example was it's a window of

a plane and there's a sleeping passenger in the window. So then I got to thinking, 'OK, now . . .' Now it didn't tell me I had to stay inside the confines of a circle.

So I started drawing things, and the first thing I got was that James Bond movie where they're looking through the rifle. I got that, I drew that. Then I got a camera iris. Then I got a periscope, looking through a periscope, waves with a ship. Then I got a milky pearl that was round, a merry-go-round. Those things all stayed inside the circle. Then I thought, maybe I'm allowed to go outside the circle a little bit. How about a Ferris wheel? The cars are going to look a little bit outside the circle, but I've got to have a base for it. How about a hamster running wheel? That has to have a base. And then it's all getting into constraints. Doing pictures where I have to stay inside the circle. Doing pictures where I can go a little bit outside. Now maybe the circle could be anywhere in the drawing, so I could make it the sun, or I could make it

the moon, or I could make it the center of a flower, or make it just a little small part of the picture. It didn't give me constraints.

As a designer, I'm used to working with constraints, because I've got to find out how many cattle per hour, how many people do you want to work, the space constraints, cost constraints, material constraints. I haven't had a single project where it doesn't have some constraints. You can't build it out of plastic or something. There are certain things. You can't build it out of paper or something like that. That's isn't going to work.

ROBERT GREENE

My approach is maybe a little different. You're saying that bringing more visual people into . . .

TEMPLE GRANDIN

What I'm saying is that the different kinds of minds need to work together, because they complement each other. Even on my projects, I had to do engineering stuff. Like on my

center track restrainer, there was driver units that had to be designed that required some mathematics, so the engineer did that.

ROBERT GREENE

I'm not entirely disagreeing with you, but my only different take is I think individually, people need to be trained more in different ways of thinking as well.

TEMPLE GRANDIN

I think they need to be trained . . .

ROBERT GREENE

To think more visually . . .

TEMPLE GRANDIN

. . . to understand different ways of thinking and value different ways of thinking, but there's no way I can do the mathematics that an engineer could do. I can't do it.

ROBERT GREENE

But this is my . . . don't you think people could be trained to think more visually? Not

. . .

TEMPLE GRANDIN

Yeah, they can be. They can be. Let's say this clipboard is the continuum of visual thinking. One is over here is a total visual thinker, a ten is here, not a visual thinker, and then a lot of people are in the middle. Well this person that's a total visual thinker might be able to think a little bit more word. You can move them some, but you're not going to move them to the other end of the spectrum.

ROBERT GREENE

I know.

TEMPLE GRANDIN

And so the thing I've tried to do is understand the other kinds of thinking, because where I've had really good projects is where visual thinkers and the math thinkers have actually worked together, and you've got to recognize where each kind of mind works . . .

ROBERT GREENE

I agree with you.

TEMPLE GRANDIN

. . . and what part of the project they should do.

ROBERT GREENE

I agree with you completely. I'm just thinking, in the age that we're living in now, where people are not outdoors, they're becoming less and less visual. Their visual skills are deteriorating. Most people may be around a five on the spectrum, and you would be more on the ten. Now people are shifting more to the four and the three and the two.

TEMPLE GRANDIN

They'll shift down. I think you can shift it some.

ROBERT GREENE

A little bit.

TEMPLE GRANDIN

You can shift it a little bit, but you're not going to move them from a one to a ten.

ROBERT GREENE

I agree with you.

TEMPLE GRANDIN

You're not going to move them all the way totally down the spectrum.

ROBERT GREENE

I agree with you. This idea of adding to your, you call it your video library, do you think you've become more creative now that you have more associations?

TEMPLE GRANDIN

Yes. I think the older I get, the better I think, because I have more . . .

ROBERT GREENE

Interesting.

TEMPLE GRANDIN

I call it more web pages in my mind for my Google to search. And I always emphasize to the parents of autistic kids, get them out doing lots of stuff. You've got to fill up the database. And I read a lot, and I read a lot, and I just want to take in information, because I want to put lots of things in my mind. To understand something in the future, I have to compare it back to something in the past.

ROBERT GREENE

Now you mentioned that sometimes autistic people have a problem with too much association, where it's kind of going like crazy.

TEMPLE GRANDIN

Yeah, you've got to be able to control it. Yeah, and there are some people where they can't control the associations. I can control.

ROBERT GREENE

Have you learned? Is it something you've learned, or was it always that way?

TEMPLE GRANDIN

Well, to be a successful designer, you've got to control it. I've had situations where I've sat in a conference room, and they've said, "Oh, we could make it like this." And then I'll run it in my mind and go, it's not going to work. I can control it. If you tell me to keep the drawing inside the circle, I'll keep them inside the circle.

ROBERT GREENE

But is that something you've learned? Is it a skill you learned, or is it you had to train yourself?

TEMPLE GRANDIN

Well, associations would go all over the place if I let them, but I can control them. I've talked to people that have a very difficult time controlling them. I can control them and say, okay, do all . . . and I do have a tendency to go in a category and go through some stuff and then get off a category.

ROBERT GREENE

There was one other form of thinking. I don't know if it's a fourth of the three that you mentioned or maybe it's [inaudible] . . . he talks about it in frames of mind. It's sort of kinetic, where people are very much . . .

TEMPLE GRANDIN

That's motor memory.

ROBERT GREENE

Motor memory, physically oriented.

TEMPLE GRANDIN

I find sometimes if I can't remember a phone number, I go back and I do just like on the phone, then I can remember the number. That's motor memory.

ROBERT GREENE

Yeah, some people think that way or are stronger in that sense.

TEMPLE GRANDIN

Yeah. Sometimes I just can't remember the number, and I go, wait a minute, okay. Then I remember it. I'm very bad at remembering numbers. I do not remember numbers well.

ROBERT GREENE

Really? You can't visualize them?

TEMPLE GRANDIN

Well, I end up just visualizing the phone pad.

ROBERT GREENE

I see.

TEMPLE GRANDIN

I have a hard time remembering melodies if you don't have words or a movie to put it with. A lot of classical music, when it comes

on, I recognize it, but I can't recall the tune, because all I see is my car radio. My mind is visually indexed.

ROBERT GREENE

I think that's great.

TEMPLE GRANDIN

I had somebody ask me about a smell one time, and what I saw was my grandfather's living room. Then I smelled the nice smoky smell from the fireplace.

ROBERT GREENE

A lot of poets are like that. Good poetry and good creative writing is very concrete and visual and will think of the concrete example before the abstract one.

TEMPLE GRANDIN

Now you're looking at something philosophical, right? Abstract, I don't understand.

ROBERT GREENE

I know, but a poet like Keats or Shakespeare, they're very concrete oriented. They associate

everything. I wonder if there might be something there.

TEMPLE GRANDIN

I notice, I've worked on a lot of different board on animal welfare guidelines. People want to write all this vague crap that doesn't . . . the other thing, you also want to have 100 things on a checklist. There are certain things that are critical control points, like industrial process and food safety, they use what's called hazard analysis critical control points. What you do there is you measure five or six things that are really important. Those five or six things are outcomes of tons of other bad stuff. So if you measure those five or six things, you will locate all the other bad things.

Let's take lameness in a dairy cow. There's 10 different things that make a dairy cow lame. So I don't have to check the farm if I'm doing just an audit for animal welfare. I don't have to check the farm for foot diseases, because if she's got a foot disease, she'll be lame. If the housing was bad, she's going to be lame. If

she's just got crappy leg confirmation, she's going to be lame. Lameness is the outcome. The presence of lameness, there could be a multitude of sins there, so I'm not going to measure each one of the sins that makes a cow lame. I'm going to measure lameness is the outcome variable.

ROBERT GREENE

Okay. That's interesting.

TEMPLE GRANDIN

That's the critical control point approach, and I really like that approach, and that's the approach I've used in evaluating animal welfare. You shouldn't pass an audit for a meat plant if your stunners are broken. You need to fail an audit. There's also a tendency now to turn everything into a paperwork audit. I put the emphasis on things I can directly look at. So many people just want to do paperwork. Well, I worked in construction for 20 years supervising my projects, and I saw more fake paperwork, and I've still seen more fake paperwork. People just fake it up.

ROBERT GREENE

You know where that's really getting bad in what profession is in medicine. They used to be able to talk to the patient, get a feel for what their problem is, and then be able to read an X-ray. Now it's all rules and procedures that are written down.

TEMPLE GRANDIN

But they don't have clinical skills anymore. I gave a talk at the CU medical school just last Friday, and I talked about Dr. Thorson, my general doctor that really knows how to use a stethoscope and really knows what little skin cancers he can burn off with liquid nitrogen and what ones would be dangerous if he did that. He knows when to use high tech and when to use low tech. He's got clinical skills. I said we need more doctors like that so that healthcare doesn't get so outrageously expensive. We don't have to do an MRI on every sprained ankle. But if there's something wrong with the head, then it's right to the scanner. You don't mess with the brain. In

Canada, 90% of the MRI scanners are of the head.

ROBERT GREENE

Are what?

TEMPLE GRANDIN

Are just used for brain stuff. It's not used for much else. They've got to keep their costs in line. You don't need to use a scanner for something wrong with your elbow. You just don't.

ROBERT GREENE

What about your powers of concentration, your ability to focus on a single thing?

TEMPLE GRANDIN

I can really focus and just get stuff done. The thing I've found on that is you've got to find some blocks of time where you're not interrupted. I find serious writing I get done on the weekends where I've got blocks of time where I can just do it and nobody's going to be interrupting me.

ROBERT GREENE

I know that autistic people sometimes have unusual powers of concentration.

TEMPLE GRANDIN

Oh yeah. One of the bad things now is I'm seeing too many of them get addicted to video games, and then they're just not doing anything else.

ROBERT GREENE

Yeah, it's tragic.

TEMPLE GRANDIN

It's absolutely tragic. There's something about the way the lines move and the pictures move in video games that's just hypnotic.

ROBERT GREENE

Very addicting, yeah.

TEMPLE GRANDIN

And there's kids sitting in the basement just playing video games on social security. That's not a good thing. I've said, one geek goes to Hollywood, another geek goes to Silicon Valley, another geek is just going nowhere, and they're the same geek. It depends on

what environment they're in. These are kids much less severe than I was.

ROBERT GREENE

So your ability to focus and concentrate, that plays a major role in your being able to be creative do you think?

TEMPLE GRANDIN

Well yeah, because if you're going to create something, you've got to sit down in blocks of time and get it done.

ROBERT GREENE

Focus deeply on something.

TEMPLE GRANDIN

Yeah. You have to really think about it. And then sometimes when I'm coming up with new design ideas, some come to me when I'm just drifting off to sleep.

ROBERT GREENE

I know, I was going to talk to you about that.

TEMPLE GRANDIN

In the shower, driving on the freeway when there's no traffic.

ROBERT GREENE

Why do you think that is about drifting off to sleep?

TEMPLE GRANDIN

I think that's when the verbal stuff is shut down. I think it's when the verbal stuff gets shut down. It's in the shower, and I'm even not even thinking about the project. It just pops into my head. I find that lots of times when I'm trying to figure something out, just as I'm drifting off to sleep, the answer comes. Another thing I say to myself, think simple. The best answers are simple. Think simple. What's the simplest way you could do it?

ROBERT GREENE

Occam's razor.

TEMPLE GRANDIN

Yeah. What's the simplest way you could solve the problem?

ROBERT GREENE

But drifting off to sleep or whatever, it's the fact that you've spent four intense days

thinking about something, and then . . . you had to have the preparation.

TEMPLE GRANDIN

I did. Yeah, I had been thinking and thinking and thinking about it. I'm just sort of laying there, it's real quiet, and I'm not asleep yet. I'm not dreaming about it. It's before I fall asleep. Or I'm just in the shower or maybe I'm driving where there's no traffic, so I can kind of daydream a little bit.

ROBERT GREENE

Every had anything happen in a dream itself where you have a solution?

TEMPLE GRANDIN

No.

ROBERT GREENE

That's a sort of classic thing.

TEMPLE GRANDIN

No, it's not in the dream itself. It's as I'm getting ready to go to sleep.

ROBERT GREENE

Paul Graham, the guy who . . . sorry. We're just doing an interview here, so never mind us.

MAN

Oh sure, I'm sorry.

COMPUTER

Thank you for choosing . . .

ROBERT GREENE

I was going to say Paul Graham . . .

TEMPLE GRANDIN

Why do they have the stupid computer talk to you? I just . . .

ROBERT GREENE

I think they find it's more soothing.

TEMPLE GRANDIN

I think it's stupid.

ROBERT GREENE

It could easily just be right there on the screen, couldn't it?

TEMPLE GRANDIN

Yes, and we're going to charge you \$10 a minute to use this computer. At some hotels, boarding passes are free, but that's it.

MAN

It's free actually.

ROBERT GREENE

It is?

MAN

They just want your credit card I guess for insurance purposes. It's completely free.

TEMPLE GRANDIN

They want your credit card? God.

ROBERT GREENE

Paul Graham, the one that invented online shopping, he and his partner were trying to figure, because mostly for years in the very beginning, he would develop a software program, like Microsoft Word, that then he would sell to a company that they would then use to then set up their online store. He's been working on this program, and finally he's in bed and he's sleeping. He wakes up,

and he goes, “Why not just put it directly on the computer? It’s directly on the Internet. You don’t have to sell anybody a software program. They don’t have to buy it from you. It’s all there.” He was the first person that invented it, and it just came to him out of nowhere. After years of thinking, he suddenly saw, why not something so simple?

TEMPLE GRANDIN

Well, sometimes the most obvious is the least obvious. There’s why people don’t take the chain out that’s hanging in the front of the shoot for the cattle that don’t want to go in there? It’s right there, but people don’t see it. They just don’t see it.

ROBERT GREENE

I know a lot of it is visual, but it does seem like you do intense research.

TEMPLE GRANDIN

Yes, I do.

ROBERT GREENE

And it’s not just visual. It’s reading.

TEMPLE GRANDIN

No, I do lots of reading. Lots and lots and lots of reading. I like to read factual stuff. I like to read about the brain. I like to read about how people do stuff. Because I find that I can relate those things then back to things I do in the future. When I was reading about the BP accident, boy, some of the stuff they did on that was like a really bad project, like they did a really badly run meat plant where they were rushing and they took safety devices off and they were having accidents.

ROBERT GREENE

This isn’t visual . . .

TEMPLE GRANDIN

But I convert the stuff to pictures.

ROBERT GREENE

You do?

TEMPLE GRANDIN

Yes.

ROBERT GREENE

Everything?

TEMPLE GRANDIN

Pretty much so. If I’m going to remember something, it’s got to be kind of changed to a picture.

ROBERT GREENE

Is that right?

TEMPLE GRANDIN

Yeah. Otherwise I don’t remember it very well. I convert it to pictures.

ROBERT GREENE

And how do you organize all of these images? Organization is a huge part . . .

TEMPLE GRANDIN

Well, I can . . . okay, like put in . . . well, I could have one file that’s just BP. There’s a lot of images. I’ve read stuff about it, the rushing stuff they did. Now some things may be visualized wrong, because some of the equipment, I don’t know what it looks like exactly.

ROBERT GREENE

But you have to put an image to it.

TEMPLE GRANDIN

Yeah. They talked about centralizers in the pipes. You've got a little pipe inside a big pipe, and it's got to stay centered. Otherwise you can't cement it. So they've got these spacing devices. I've just made up a thing of what they might look like. I don't know what they look like. I've never seen them, but I know how you might possibly make something like that.

ROBERT GREENE

I see. OK.

TEMPLE GRANDIN

And I can visualize it as a drawing.

ROBERT GREENE

And it's just all there kind of categorized?

TEMPLE GRANDIN

Well I can categorize. I can put things in different categories. Something could be in the BP file, but it could also be in the screwed up job file. Bad bosses file, it could be there, some of the stuff that went on. In fact, the lady that called in the SOS got chewed out

for doing an unauthorized SOS. Well there's 200-foot flames coming out of the top of the derrick. The crane's already melted and falling down. I don't think you should have to worry about an unauthorized SOS.

ROBERT GREENE

Do you like reading about disasters? Does that . . . ?

TEMPLE GRANDIN

I like figuring out then how to prevent them. I've been reading about these tornadoes, and now I'm getting very conscious of where I would go. I was in the grocery store yesterday, and I was checking out the employee areas. In Whole Foods, I actually go into them and in King Soopers and all that. But I was looking where I would go back in the employee area, so that when the store comes down, I know just which employee door I would go into. There's a little supervisor's office that's under the stairs. That's one of the places I'd go.

ROBERT GREENE

Do you have them here, tornadoes?

TEMPLE GRANDIN

We haven't yet, but I might be in a grocery store somewhere else, and grocery stores are one of the worst places you could be.

ROBERT GREENE

You'd have to go in the basement.

TEMPLE GRANDIN

Well it doesn't have a basement.

ROBERT GREENE

In places like Wisconsin, every grocery store has a . . .

TEMPLE GRANDIN

Well ours don't have basements. They don't have basements. Then should I go in the walk-in, or I've got to know if they've got ammonia refrigeration. If they've got ammonia refrigeration, I don't want to be in the walk-in, because if that breaks, I'm dead. If they've got freon refrigeration, then I'm going to go in there walking. So I've been thinking about . . . you know when I go in the

airport parking lot. That couldn't be a worse place to be, because cars, they just get picked up like toothpicks and thrown around.

ROBERT GREENE

I studied that for earthquakes, because where I live it's all earthquakes. The new study is you don't want to go under anything. You want to be next to something, because when something falls, it creates a triangle. You want to be inside the triangle. So if I'm like right here, that falls, there's going to be a space.

TEMPLE GRANDIN

Wooden structures usually stay together. A wooden house usually stays together. Outside is where you really want to be, where there's nothing to fall on you.

ROBERT GREENE

Yeah, but in a city, there's a lot that could be collapsing.

TEMPLE GRANDIN

Well, that's right, yeah.

ROBERT GREENE

But you're right. If you could go out, maybe in the middle of the street, telephone poles aren't going to be falling I don't think.

TEMPLE GRANDIN

A masonry building, stuff could be coming down.

ROBERT GREENE

We don't have too many of them in Los Angeles. They're not code, or they've been retrofitted.

TEMPLE GRANDIN

Masonry is the worst, absolutely the worst. That's what you don't want to be in. And you don't want to be in these parking garages, because those things have just got little weld plates, and those snap, those come down like a bunch of Legos.

ROBERT GREENE

Well, if you were in a parking lot, then I would put myself next to a car, because then supposedly it would create . . . I think by the time . . .

TEMPLE GRANDIN

Those beams are so heavy . . .

ROBERT GREENE

. . . you'd just be crushed.

TEMPLE GRANDIN

Yeah. I don't want to be there. But I've been thinking a lot about tornadoes or where I would go at King Soopers.

ROBERT GREENE

You might want to also read about Katrina, because that's another interesting thing like the nuclear plants. Supposedly that's an incredible . . . the Army Corps of Engineers is . . .

TEMPLE GRANDIN

I did read about the dams. I read about the dikes in Katrina, and that the [inaudible 43:08] had predicted they would fail exactly the way they failed. I did see some diagrams of the dikes, and I'm going, 'Oh, this is crazy. This would never work.' A dirt burm with a concrete wall on the top? What? That's not going to work.

ROBERT GREENE

Well supposedly, the Army Corps of Engineers is a completely dysfunctional environment. There are lots of disasters waiting to happen.

TEMPLE GRANDIN

But how do we prevent some of these problems? Because I like to solve problems. I find solving problems . . .

ROBERT GREENE

To me it's structure of an organization. People aren't communicating with each other. There's egos.

TEMPLE GRANDIN

But the other problem you're getting now, I'm finding, when people get interested in something, like the environment or interested in animals, they want to become lawyers now, rather than becoming field people that figure out how to solve problems.

ROBERT GREENE

Lawyers are destroying our work.

TEMPLE GRANDIN

Oh, I know. What's one lawyer at the bottom of the ocean?

ROBERT GREENE

A good idea.

TEMPLE GRANDIN

A good start.

ROBERT GREENE

There are people who create nothing. They create no money. They create no wealth. They're just there to make their own money. They create their own world where it's just lawyers talking to each other, billing each other.

TEMPLE GRANDIN

Stressing everybody else out, but that's not going to fix things.

ROBERT GREENE

No. Just the last thing on this card, is there an emotional component to your creativity?

TEMPLE GRANDIN

Yeah, I get really excited when something works, and I figure out how to make it work. That's very exciting.

ROBERT GREENE

What's the feeling like?

TEMPLE GRANDIN

It's just really happy. It's like when I figure out how to make my parachute strings not tangle. It's just figuring out how to do it. I get a real satisfaction out of figuring out how to make something work, and something that makes good change. I'm finding in the autism field, for example, I've had parents write to me and say the movie inspired their kid, or their kid went to college because of one of my books. That's something real. I get satisfaction when the things that I do make real things that are valuable happen, like a kid goes to college, or a kid gets a good job, or builds something that works really well and the client's happy.

ROBERT GREENE

So that's what motivates you is getting to that point where you've solved the problem?

TEMPLE GRANDIN

Yeah, I really like to solve the problem, and I like to figure out the problem. I can remember when the Trade Center collapsed. I watched that and I'm going, that shouldn't have come down. Something is wrong with this building.

ROBERT GREENE

You think?

TEMPLE GRANDIN

Yes.

ROBERT GREENE

How could that be? A plane loaded with that much combustible . . .

TEMPLE GRANDIN

Let me tell you. There's more fuel in the file cabinets than there ever was on that plane, and that building would have come down if a sprinkler system had failed.

ROBERT GREENE

There wasn't a sprinkler system?

TEMPLE GRANDIN

Let's say you had a fire in that building. If there was some reason the sprinkler system didn't work, that building would have collapsed.

ROBERT GREENE

But the amount of jet fuel is so powerful.

TEMPLE GRANDIN

But think of how much fuel is in every file cabinet. Paper.

ROBERT GREENE

Yeah.

TEMPLE GRANDIN

Think about how much fuel is in urethane panels in the office partitions.

ROBERT GREENE

Yeah, but nobody thought of a plane crashing into a building.

TEMPLE GRANDIN

Yeah, but the plane [inaudible 46:37] when it hit it. The crash didn't break it. It had

great tensile strength. What happened was it's a very cheap design. That building has no vertical concrete in it. There's no concrete central elevator shaft. It's all steel. Then, you have 80-foot trusses. Do you know what the trusses look like in a supermarket? You go in a supermarket back room, and you've got these little thin trusses like that? They had those coming 80 feet out to the perimeter, bolted on with little flimsy bolts.

ROBERT GREENE

But what would have brought it down?

TEMPLE GRANDIN

Yeah, what brought it down? I'll tell you what brought it down. What brought it down was when you heat that type of truss, it's spaghetti.

ROBERT GREENE

But what would have heated it if it weren't an airplane?

TEMPLE GRANDIN

A fire, a regular fire would have heated it.

ROBERT GREENE

You think?

TEMPLE GRANDIN

Oh yeah.

ROBERT GREENE

That would be one hell of a fire.

TEMPLE GRANDIN

Look at every supermarket that's ever burnt. Where the hell do you think the roof is? It's collapsed. That type of roof when there's a fire, just a regular fire, collapses. Those type of trusses just turn to a wet noodle when they get hot. The problem you've got with that type of truss is you've got such a high amount of surface area in relation to the weight of the steel. And so what happened is they got hot, and then one floor snaps, and then the bolts just sheared off. There's one thing I noticed very early on when they were digging up the rubble pile, is that the ends of the beams, there were phalanges with holes in them for bolts, and those phalanges were not bent or deformed. That tells you the bolts sheared. I noticed that in the rubble pile. Two years later, the report came out with the anatomy

of the collapse exactly the way I figured it out. When I saw the drawing of that building, I'm going . . .

ROBERT GREENE

What were they thinking?

TEMPLE GRANDIN

Oh, god. What are they thinking? There will never be another building ever built again with that design. It should not have fallen down.

ROBERT GREENE

But I noticed that the things are not designed nearly as well as they used to be.

TEMPLE GRANDIN

Well you see now with computers, they're designing them too close to the safety margin. You take the old buildings, man, they didn't know how to calculate, so they triple, quadruple over-designed.

ROBERT GREENE

Yeah. kayThere's two cards left. One of them is not very much, so do you want to do lunch

now, or do you want to plow ahead? What are you . . .

TEMPLE GRANDIN

What time is it right now?

ROBERT GREENE

It's exactly noon.

ROBERT GREENE

That was very nice. But you want to enact a moment of silence before the . . .

TEMPLE GRANDIN

Well, the thing is, is when you're taking a life and that's not something that you just take lightly.

ROBERT GREENE

Yes.

TEMPLE GRANDIN

I feel very strongly we have to give farm animals a decent life.

ROBERT GREENE

Yes.

TEMPLE GRANDIN

Our relationship with them should be symbiotic. I got to thinking those cattle would

have never been born if we hadn't put the bulls and the cows together and raised them, but we've got to give animals a good life, a decent life. The thing that people forget is nature can be very harsh. There's nothing nice about how wolves kill things.

ROBERT GREENE

No.

TEMPLE GRANDIN

They'll tear out the live guts and eat the animal's guts while it's alive.

ROBERT GREENE

Yeah. I see it with my own cat when he kills a bird. There's nothing nice about it.

TEMPLE GRANDIN

There's nothing nice about it. That's right.

ROBERT GREENE

Yeah, he tortures the damn thing.

TEMPLE GRANDIN

Yeah.

ROBERT GREENE

Which has a purpose evolutionarily.

TEMPLE GRANDIN

To teach the kittens.

ROBERT GREENE

But also, it paralyzes the animal, and then it's easier to eat. I forget what it was . . .

TEMPLE GRANDIN

Well, it's also to teach the kittens.

ROBERT GREENE

To teach the kittens, yeah. I was interested in your idea. It seems like because you're around animals that are being killed so much, you have sort of a relationship to death that's a little different. Do you have this sort of sense of your own mortality?

TEMPLE GRANDIN

One of the things that designing slaughter equipment does is it has made me think about, well, when I die, can I look back and say that I did something that was of value, that got things done? It made me look at my own mortality, and most people don't like to look at their mortality. I'll often think, well, you know, I could just get in a car accident on

the way to the airport, and that would be the end of me.

ROBERT GREENE

Yes.

TEMPLE GRANDIN

And so I better get this manuscript in the mail before I go to the airport, because at least this will be done. If there's a car accident tomorrow, that manuscript will get published. It almost motivates me to get stuff done, because I know that . . .

ROBERT GREENE

Your days are numbered.

TEMPLE GRANDIN

The days are numbered.

ROBERT GREENE

It gives you a sense of urgency.

TEMPLE GRANDIN

That's right, that's absolutely right. The other thing I've found on management of slaughter plants and keeping the treatment of the animals good is you have to have a manager who's involved enough to care but not so

involved that they get desensitized. This is true of things like slaughter plants. It's true of a lot of different kinds of things. Prisons, that would be another example where that would be true.

One of the things that really changed the slaughterhouses was having big companies like McDonald's and Wendy's insist on standards, using a big economic clout to do that. When I first started, I thought I could fix all the problems with engineering. I could fix all cattle-handling problems with engineering. Then I found I could only fix half the problems because a lot of my clients didn't run equipment right. Then I started training employees, but managers would un-train employees. So now I'm training managers. Now the people I work with the most are the customers.

There are a lot of people that say a lot of stuff in agriculture is bad. I just gave a talk at a large college, and they were kind of talking

about factory farms and stuff. I said, "Look, you've got all your little electronic toys there. I don't think you know that a bunch of people jumped off the roof of the factory that makes those electronic toys and they died." I think that the companies that contract with those factories over in Asia need to be going over there and finding out why the people are so upset they're jumping off the factory. But just remember that everything is not all pretty on where your little electronic toys come from.

ROBERT GREENE

Right. I see, yeah.

TEMPLE GRANDIN

I mean, they never even thought about that. Well, I read a lot and that's one of the things I read in The Wall Street Journal. The Wall Street Journal had a gigantic article about that factory. They make Apple products and a bunch of other products.

ROBERT GREENE

I see. Yeah, it's very true. This is the last thing. It seems like you talk about the idea of

being remembered as sort of an immortality, like your ideas don't die with you. Do you think this is an important motivating device for someone in life, to feel like your life has a meaning and a purpose?

TEMPLE GRANDIN

Well, I think it's important that life have a purpose.

ROBERT GREENE

For everybody.

TEMPLE GRANDIN

For everybody. The things that you do end up making life better.

Now, why did I end up in slaughterhouses?

One of the reasons, one factor is the fact that that's an industry with no barrier of entry. I couldn't become a doctor because I couldn't pass the exams. I'd be a very good internal medicine doctor. I'm very good at diagnosis.

Oh, yeah. But I couldn't pass the math requirements. I couldn't pass some of the calculus requirements and things like that,

that have nothing to do with being a doctor. So a lot of professions were closed.

One of the things about doing freelance work on things like meat plants is that's an industry that has absolutely no barrier of entry at all, and that's one of the reasons why I'm designing slaughterhouses rather than – and I have thought about this – rather than find a cure for cancer. Because there are certain professions where the door was totally bolted shut and there was no way I could get through it, and I knew that.

I think there's a lot of . . . I think that some of the medical schools and things are starting to realize that now. They're taking in more of a diversity of students. Because my kind of troubleshooting would be extremely good at taking a complex patient and trying to figure out what's wrong with him. Not have him on so many drugs that he's a zombie; and bankrupt the insurance company doing a bunch of useless tests on him. Figure out what

things would I need to do to help this patient. That's the kind of stuff that I'd be very good at, because it's the same exact type of thinking that is involved when I solve a cattle handling problem at a slaughterhouse or at a feed yard.

ROBERT GREENE

But you took what you had to go into and you made it so it's something that had purpose and meaning for you.

TEMPLE GRANDIN

That's right. Another thing is I went to the University of Illinois and got into the neuroscience stuff, and I thought maybe I would just change professions.

ROBERT GREENE

You went to the University of Illinois?

TEMPLE GRANDIN

Yeah, I went to the University of Illinois for my Ph.D. in animal science, and that's where I did that pig experiment. I thought maybe I'll become a neuroscientist, but then I was still doing consulting on the side. I thought I

can't give up a profession that I'm so good at. I just can't do that. And I found I really didn't want to give up something I was really good at and go into something I might be only mediocre at. It's sort of like you get so far into a profession you've got to kind of almost stay in it.

But I get to thinking how if I hadn't flunked the Grad Record Exam in math, which I did, maybe I would have been, I could have gone into a profession with a high barrier of entry. Well, I had to go into a profession with a low barrier of entry. I didn't have any choice. So I wanted to really make something of it.

ROBERT GREENE

And you think people should be able, is there a lesson there for everybody?

TEMPLE GRANDIN

Well, I think the lesson is some of the people that might make the very best doctors are going to be what I call the good B+ student.

I actually had an interesting talk with a pharmaceutical rep, when they're hiring pharmaceutical reps to go out and work in the cattle. The kid that's a straight-A student doesn't have the problem solving skills to solve problems in the field.

The vaccine's getting blamed for killing some cattle, and they know darn well the vaccine didn't do it. So the pharmaceutical rep has got to go out there and figure out what actually did kill the cattle. Well, that takes problem solving. They've told me that oftentimes the solid B student, not a crappy student, but a solid B+ student has better problem solving skills.

Then you have the kids who are very good with the hands-on stuff, but there's certain book-learning they can't do. I think there are a lot of very talented people that are getting locked out of some of the professions where we really, really need them. It used to be you would just take them in the vet school based

on whether or not they got straight A's, but then they started noticing that some of those grade-A bookworms, as I call them, they let their dog wake up during anesthesia because they just looked at the dials and they didn't look at what the dog was doing.

ROBERT GREENE

Right.

TEMPLE GRANDIN

Or let the dog practically die because they gave it too much anesthesia. There are a lot of really intelligent people that calculus is not . . . if you actually practice medicine, calculus is not something I need to know to practice medicine.

ROBERT GREENE

Right, okay.

TEMPLE GRANDIN

Then when I go and work with these meat plants, there are an awful lot of really smart people there in the maintenance department. They build some of the most fantastic equipment. They invent all kinds of things.

One time I went to a big research lab, a big corporate research lab. I can't tell you where it was because I signed confidentiality agreements. But I went into a room that was about the size of this hotel atrium, and they had the most fantastic fish farm that you ever saw, that was like a mechanized fish farming factory. And whoever built that, I could tell by looking at the parts, had bought everything either at the Farm and Fleet Store or at Home Depot, and the Ph.D. scientists were running this fish farm.

I said, "Who built the lab?" It was the maintenance man. The maintenance man built the whole entire thing. Well, they couldn't even do their research without this thing that was built by the maintenance man. He's the maintenance man because he couldn't do the other stuff.

ROBERT GREENE

Right.

TEMPLE GRANDIN

You see, this is where different kinds of minds need to work together.

ROBERT GREENE

Right. I see.

TEMPLE GRANDIN

And the thing is, some of the minds that are really brilliant at one thing have a real deficit in something else.

So what do I do now with my students? They do the statistics. But where I'm really good is figuring out the methods of the experiment, because when they describe the methods, I can visualize what they're doing with the cattle. There are a lot of experiments where they do fancy statistics, but the way they did the experiment was real sloppily done. I'm like the methods police. But the guys that are really good at the math, they get lost in the numbers and forget about the cattle.

ROBERT GREENE

Yeah.

TEMPLE GRANDIN

That's the problem.

ROBERT GREENE

Yeah. Okay. Well, I guess the thing is the sense of having a kind of a purpose to what you're doing is very important for motivating you to continue . . .

TEMPLE GRANDIN

Well, then some people, their purpose in life is just to have a lot of power and to have a lot of money.

ROBERT GREENE

But that's not a good purpose.

TEMPLE GRANDIN

No, it's not a good purpose at all. To me, what matters is something that I did was to actually make something real happen out there in the world, something decent happen out in the world.

ROBERT GREENE

Yeah, because the people who are obsessed with making money never actually end up making much money because they

don't really take care of the skills that are necessary.

TEMPLE GRANDIN

Well, and then there are some people I've seen, I mean, I've had lots of different kinds of clients. I've had some clients that were very rich, but boy, ethics? I don't think they knew what the world meant.

ROBERT GREENE

Or they don't have a very rich life. They have money, but they don't . . .

TEMPLE GRANDIN

Yeah. One thing I've found in designing stuff for clients is some of the richest clients I've had have been some of the worst clients I had.

ROBERT GREENE

Yeah.

TEMPLE GRANDIN

I've had some very wealthy clients that have been really good. Some of the worst clients I had were ultra-wealthy, and I learned very early on, money doesn't buy happiness. They were also some of the unhappiest clients.

ROBERT GREENE

Right. Okay. Well, I think . . .

TEMPLE GRANDIN

I think we're done now.

ROBERT GREENE

It's like four hours.

TEMPLE GRANDIN

Okay.

ROBERT GREENE

We did little breaks. That was pretty good.

TEMPLE GRANDIN

Okay.

ROBERT GREENE

I know I wore you out. It's like I ran you around the track, and I really appreciate it.

ROBERT GREENE

Continuing our conversation on rules of the game.

TEMPLE GRANDIN

Well, the other thing I've found when I first started out in business is that selling people the thing, the new piece of equipment, is a

whole lot easier than getting people to do the management. Because I'd put in the piece of equipment and about half my clients tore it up and wrecked it. That was very, very discouraging. The thing is like a quick fix – the new computer, the new drug, the new whatever. But management is attention to a whole lot of little details.

ROBERT GREENE

What is it that you do then?

TEMPLE GRANDIN

Well, one of the things that made people manage it was when you have a big company like McDonald's to start enforcing animal welfare, it forces them to manage it. I hate to say it, but in some situations they have been forced to manage.

ROBERT GREENE

Who provides the force in that case?

TEMPLE GRANDIN

Losing a million dollars worth of business in a single plant in a year. Economic incentive.

ROBERT GREENE

What was the management thing? I don't quite follow you.

TEMPLE GRANDIN

The issue was . . . so I put in the new cattle handling system. I go there during start-up. I get everything working absolutely perfectly. I come back a year later and things are broken and they're not running it right. People slowly lapsed back into old bad habits.

ROBERT GREENE

But you said something about management and not the thing . . .

TEMPLE GRANDIN

People want the instant fix. Buy a piece of equipment.

ROBERT GREENE

So how do you get over that, past that?

TEMPLE GRANDIN

Well, this is a difficult thing, and one of the things that made the meat industry get by that . . . I found maybe 20% of my clients really would have the management too.

About half of them had to have the power of a big customer breathing down their throats, take away business. I hate to say, it's kind of negative what I'm saying, but to really force good management. Although some people really have good management. The top sets the tone on management. The top definitely sets the tone. No question about that. When I first started, I thought I could fix everything with engineering, if I could just build the right equipment. Now I know I can only fix half of the problems with engineering.

ROBERT GREENE

It's people.

TEMPLE GRANDIN

You have to have at least adequate equipment. If I had a choice, what would I rather have, state of the art equipment, bad management or maybe just adequate equipment, older but adequate equipment with really good management? I will take that.

ROBERT GREENE

I would take the latter.

TEMPLE GRANDIN

That's exactly what I was going to say. I'll take the adequate equipment with the good management. That's what I will take. It has to be at least adequate. You have to have at least a certain level of equipment. But that's something I have found. The other thing we talked about earlier was transferring technology.

ROBERT GREENE

What was that about?

TEMPLE GRANDIN

That was about I designed this new center track restrainer system, and you have to find a plant that really is in love with the idea of trying something new, because I have had projects fail because . . . one project, for example, the vice president at the corporate office is totally behind it. He picked out the plant for me. The local plant manager was not behind it, and when my vice president

died, we were kicked out of the plant because the local plant wasn't interested. So one of the things I find is you've got to find when you first . . . see, this is like big industrial stuff. This isn't a product like an iPad. So you've got to find a plant to be your first early adopter. And in order to not fail, you need to make sure that that plant management is in love with it. I want to make sure that both the plant manager and the assistant manager are in love with it. So if one of them quits or retires, I still had a believer in charge. That's really important. It's very important that I have a believer in charge.

Also, I was living there. When I was figuring out how to invent these things, I was living there at the plant. I was living at that plant. But then you have to make sure that plants 2, 3, and 4 don't mess up because I went to plant number 2 and they modified the design and it did not work. If I hadn't been there, that would have failed. They were doing things like taking the ramp off and those kinds of

mistakes. I had to make sure plants 3, 4, 5 and 6 worked. Now, I didn't have to live at those plants, but I had to be there very shortly when it started up, or within a week after start-up, to go in there and correct problems. You have to make sure early adopters don't fail.

Then the other thing you don't want to do is when you're perfecting a piece of equipment to put it out on the – and I do talk about this in "Animals Make Us Human" – out on the general market before it's ready. You want to make sure that plant number 1, or farm number 1 or whatever it is really works before you do 2, 3 and 4. I use an example in my book of an automatic pig feeder that was put out on the market before it was ready. That was a king sized flop. There's been stuff in electronics, like the Apple Newton. That was a real disaster. Well, you've got to make sure it works before you put it out on the general market.

ROBERT GREENE

Google doesn't do that anymore. Their whole thing is getting it out early and then having the customers fix it. But that's a whole different thing.

TEMPLE GRANDIN

That's a whole different thing. You're talking about a program now. You're not talking about . . .

ROBERT GREENE

Something where it's between life and death [inaudible 05:57] and things are designed well.

TEMPLE GRANDIN

You wouldn't want to put a steering mechanism for cars out that you didn't know worked right. You don't want software that crashes and wrecks people's computers.

ROBERT GREENE

They don't release things until they feel fairly competent that it's 90% there.

TEMPLE GRANDIN

And it's not going to do something terrible, that's going to really make people angry,

like have their computer get totally invaded by viruses.

ROBERT GREENE

How did you remember this though? That was something that I totally forgot that we brought this up earlier. Is it a visual thing?

TEMPLE GRANDIN

Yeah, it's visual.

ROBERT GREENE

It was tied to something visual?

TEMPLE GRANDIN

I actually saw the copy of the paper that I wrote about this, and I was invited to talk at the Animal Ethology meeting.

ROBERT GREENE

Do people have better memory?

TEMPLE GRANDIN

Things are remembered as a picture. You see, then when I talk about the early adopters not failing, I'm actually seeing the plants. I'm now getting snapshots of each plant and the goofed up things they did wrong.

ROBERT GREENE

I'm just thinking it's simpler to remember an image than it is to remember the verbiage.

TEMPLE GRANDIN

I don't remember the verbiage. I just remember the pictures

ROBERT GREENE

So maybe it's easier to remember. I don't know.

TEMPLE GRANDIN

But I have to have key words, transferring technology. Then we talked about people wanting the thing more than the management. It took me about ten years of my career to fully understand this. The other thing is you have to make sure you treat causes of problems, not symptoms. That you use engineering appropriately.

After I'd been in business for about nine years, I had a big project failure that really changed how I looked at approaching problems. It was one of my very first jobs in pork. This plant was one of the old-fashioned

plants where pigs had to walk up to the third floor, and they wanted me to build a conveyor to take the live pigs up to the third floor. I was stupid enough to go in and do this. The thing was an absolute failure. It flipped them over backwards. Then I started keeping track of which pigs were not capable of walking up the ramp, and they all came from one farm. I could have fixed the problem by changing the genetics at this one farm. New boars at this farm would have fixed the problem at a fraction of the cost.

I learned an important lesson of you want to treat causes of problems, not symptoms of problems. I went into a gigantic big depression over having my first project failure, but it really taught me a lesson that you've got to treat causes of problems. The reason why pigs couldn't walk up the ramp was genetics. It should have been corrected genetically.

ROBERT GREENE

It would have been hard for you to know that right away.

TEMPLE GRANDIN

Well, now I know. You see, this is where experience does matter. There's a saying in the meat industry. If a manager works one year in one plant, he has a year of experience. If he's worked 20 years in the same plant in the same job, he's just got one year plus 20. In other words, he doesn't learn anything new. You say, "Well, this guy's been here for 20 years." He wouldn't even know any way to even do something differently.

ROBERT GREENE

That's true. You could apply that to a lot of things.

TEMPLE GRANDIN

Lots of things. Being a consultant, I was getting out and I saw so many things. I saw really good things and I saw really bad things. I always tell people, "Travel is a big educator." It doesn't matter what industry

you're in. But you've got to look at what the problem is. One thing I learned is you can't fix it all with engineering, but I actually believed that in the beginning. There are people today that thought, "Well, we put Internet in the schools, it's going to make the schools wonderful." Well, it didn't. They play video games. It did not make the schools wonderful.

ROBERT GREENE

Somebody did an interesting study in the '80s where the Soviet Union was collapsing and they asked, it was like a department of academics study, they asked five people what they think would end up happening to Russia in five years after the collapse of Communism. They asked a professor who was very smart but not steeped in Russian history. They asked somebody else and then they asked one person who studied Russia exclusively and was just so steeped in it and then they asked a journalist. Sure enough, they could bring it numerically to the degree

of predicting what happened, and this one man who had studied it for so long and had so much experience in dealing with the Russians on a day-to-day basis, he got 96% of it right and the others didn't.

TEMPLE GRANDIN

Because he understood. The thing on dealing with experience, he didn't have experience dealing with just one little part of Russia. He'd probably been all over Russia. You see, the things that I've done with different consulting clients, I've worked in other countries. I've worked for many different companies. I've seen how companies have cultures. One company has kind of a mean culture, and another company has got a much nicer culture. One company's got a culture of building projects as cheap as they can build them and cutting corners, and another company does not do that. Some companies are better managers of construction projects than others. When you start to figure that out, they have personalities.

ROBERT GREENE

It's very true.

TEMPLE GRANDIN

Corporate cultures are really different in different companies.

ROBERT GREENE

Microsoft and Google is a classic example. One of them is the Borg, and the other is trying not to be.

TEMPLE GRANDIN

They're trying not to become the Borg, but the problem is when you get really big, it's hard not to become the Borg to someone.

ROBERT GREENE

They've done really well considering. They're just hitting a limit. Once you have 30,000 people, you can't keep it as creative and loose as it used to be. But they're much better than Microsoft, even still, considering all that. It's a reflection of the top. As you say, it reflects from the top down. Bill Gates created a company that reflects him and Google are these two guys that are much different.

They're geeks, but they're not like Bill Gates.
They're not control freaks.

TEMPLE GRANDIN

The other interesting thing I read about Bill Gates was his mom was a contracts lawyer. That might have something to do with it, changing how he looks at things. You see, where I look at things, all these patent wars that are going on, some of these patent trolls, that's violating the whole idea. The whole idea of patent law to start with was to foster innovation by giving you a period of exclusivity to sell a thing that you made, something that you actually made. I mean, some of these process patents are beyond ridiculous, and then patenting things like genes that are discoveries . . .

ROBERT GREENE

One of the most important things that I'm saying in the book is that I'm very interested in the idea that people I think who master something end up getting a feel, almost an intuitive sense for what . . .

TEMPLE GRANDIN

Well, I can look at layouts and go, "Oh, that's not going to work." Just very, very, very quickly. I can sometimes walk into a place, and I instantly see the chain that's hanging down or the shadow. I remember one plant, this was just a year ago, and they had this little back stop gate and they had a rope on it so they could lift it up out of the way. But it was just jiggling. It was just jiggling like this and the cattle wouldn't go in. I said, "The reason the cattle won't go in is the gate's jiggling." I bring the plant manager out there and I show him how the gate's jiggling, and he's going, bump, bump on his head and going, "Why didn't I think of that?" I saw that in 15 seconds.

ROBERT GREENE

You can recognize this . . . this is something that's come up from years of experience.

TEMPLE GRANDIN

Years of experience do matter. I've just trained myself to look for those things.

ROBERT GREENE

Now you can see a layout and just almost instantly you can spot the problems?

TEMPLE GRANDIN

The bad layouts I can instantly spot. The ones that won't work I can instantly spot. There are a whole variety of layouts that will work, but there are a few bad layouts. One thing I tell people, I say, "Yeah, I'm open to new ideas, but after 35 years of doing it, there are certain things I know absolutely won't work." Like having a crab pen on a ramp. That doesn't work. The cattle are going to pile up on the gate. I can say there are certain things that absolutely don't work that you don't want to do. That's one thing I can tell you.

ROBERT GREENE

I'm particularly interested in your relationship to animals, because you seem to have an incredible insight and feel for how they're thinking.

TEMPLE GRANDIN

You see, an animal doesn't think in language. An animal is a sensory based thinker. It's going to think in pictures, think in touches, think in smells, think in sound, in audio. One thing I figured out early on is animals get a fear memory, and they get afraid of something they either were looking at or hearing the moment that the bad thing happened. I've told a lot of people about this horse that was scared of black cowboy hats because when he was abused he was looking right at a black cowboy hat. Black cowboy hats are bad, White cowboy hats are fine. It's specific. They tend to be pretty specific, where white hats are good, black hats are bad, ball caps are okay, but then maybe a large black purse would be bad because that's kind of the same size as a cowboy hat.

ROBERT GREENE

This idea where you could do with a layout where it took you years to really get it so it's

fast. Is it the same thing as getting a feel for how the animal thinks?

TEMPLE GRANDIN

Well, at first, I didn't know my thinking was different. As I learned more and more about how my thinking was different and I learned more and more behavior and neuroscience stuff, that gave me more insight because then I realized that most people don't think the way an animal thinks. Because you've got some philosophers that say, "Animals can't even think because they don't have verbal language. So how could they . . ." That's just ridiculous. I have some papers up on my website. Have you been to Grandin.com?

ROBERT GREENE

Not yet. I will.

TEMPLE GRANDIN

Then I've got a paper I did for . . . if you just go to Google and type in "Temple Grandin Visual Thinking," you can find a paper I did in the transactions of the Royal Philosophical Society or other. It was from an autism

meeting on creativity in London, England, and I have a paper on the different kinds of thinking. You might want to look that up.

ROBERT GREENE

What's the paper called?

TEMPLE GRANDIN

It's called something like "Visual Thinking from the Mind of a Person with Autism." Something like that.

ROBERT GREENE

Okay. I'll find that. You mentioned that when you first started studying cattle that it was mostly intellectual because it had been from books but it became more tactile.

TEMPLE GRANDIN

When as you touch them, you can tell whether they're calm or whether they're scared, and it wasn't just intellectual anymore.

ROBERT GREENE

In other words, do you think this intuition that you have with animals where you know how they think has that gotten deeper with the years as well?

TEMPLE GRANDIN

Yes, and you keep learning more and more. It's a combination of experience and the book knowledge. One thing I've always tried to do is to cross that divide between the scientific book knowledge and the practical world. That is a hard, hard bridge to cross.

ROBERT GREENE

Say that again.

TEMPLE GRANDIN

I always want to bridge that gap between the practical world and all the research and book knowledge. It's hard to cross that divide because the scientific people say, "Well, you're not talking a scientific language." The practical people say, "You're too theoretical." I also find in the sciences and in a lot of different things, everybody stay in their own category. Neuroscience reads their journals, animal science reads their journals, veterinary reads their journals, psychologists read their journals. Nobody's reading across disciplines. I've always made it a habit to try

to read across disciplines because that's where you can really learn stuff, really figure stuff out.

Let's take the issue about animals having emotions. You still have people who think that animals didn't have emotions. That's just stupid because the neuroscientists proved that years ago. There are hundreds and hundreds and hundreds of papers on that, that animals have fear, animals have separation anxiety. Neuroscientists call that panic, but it's a different emotion than fear. They've got rage. They've got novelty seeking, going out and wanting to look at new things, play, a mother-young nurturing behavior. These are separate emotional systems and they've all been mapped. But it's not in the animal science or the veterinary literature. In fact, they tend to want to avoid that.

ROBERT GREENE

It complicates their life.

TEMPLE GRANDIN

They don't want to admit that animals have emotions. So you get into what makes us different from an animal. We still have got a much bigger computer set up on top than any animal's got.

ROBERT GREENE

That's for sure.

TEMPLE GRANDIN

That's what separates us from the animals. It's not emotions because that's the same.

ROBERT GREENE

Well, our emotions are more complex.

TEMPLE GRANDIN

Because they're filtered through that great, big computer, and that makes them more complex because you filter them through a gigantic, huge, big super computer that an animal does not have.

ROBERT GREENE

Yes. And who knows how complicated animal emotions . . . you deal with a domesticated

animal, like I have a cat or a dog. They're pretty complicated.

TEMPLE GRANDIN

That's right. You see, the thing is their world is sensory based, so everything is visual. It's touch. It's smell. It's little audio clips. It's sensory based. I think animals communicate with tone of voice. I think that's where music comes from. Animals communicate with tone of voice, so a different tone of voice you can tell whether the dog's happy or the dog's sad or . . .

ROBERT GREENE

This is a totally off the wall question, but do you think we could imagine on another planet a different kind of creature that would have intelligence like ours but would be completely visual?

TEMPLE GRANDIN

I remember reading a science fiction book about some animals that were like dolphins on another planet. They were called the Singers, and they had a whole world of

music, a very complicated world of music underneath the water. That really made me think. Then, of course, you could have life that's made out of some other kind of material. Those kinds of things got brought up on *Star Trek*. I really like *Star Trek*, because especially on the original *Star Trek* they had kind of a moral . . .

ROBERT GREENE

Those were always really good. I just wondered if there would be a way to imagine a culture as complicated as ours with a different form of intelligence, not symbol oriented. Not verbal.

TEMPLE GRANDIN

In *Thinking in Pictures*, the pre-literate Incas kept track of their economic transactions with a complicated knotting of cords.

ROBERT GREENE

There were literate but they had no written . . .

TEMPLE GRANDIN

They were knotting cords in very complicated patterns to keep track of their economic transactions.

ROBERT GREENE

This sort of feeling that you have where you have a real sense of how, for instance, a cow is thinking . . .

TEMPLE GRANDIN

Cows being a prey species animal, they can be real high fear. They get scared. They have wide angle vision and then you've got to watch what they're watching with their ears. They will turn their ears around, point their ears towards different things independently.

ROBERT GREENE

This is kind of a . . . I call it a form of knowledge that's participatory, where you're almost participating in the thing that you're studying, where you're almost putting yourself inside of it, participatory knowledge.

TEMPLE GRANDIN

Give me an example of that.

ROBERT GREENE

Traditionally science is very much detached and objective. It doesn't want to mix anything subjective in. But you're . . .

TEMPLE GRANDIN

When as you get into science, some people say, "If you don't have a controlled experiment, you don't have science." I say, "Observation is the beginning of science." What's astronomy? You have a telescope, you point it up at the sky. You don't point it at the ground. That'd be the control.

ROBERT GREENE

Yes. But then also the sense of trying to think about how cattle react to something. In other words, what its experience is gives you a kind of knowledge that from a distance you would never get. This is a form of knowledge that's very important. For instance, I use the example of Jane Goodall, who I wanted to use for this book but she's too busy to be interviewed. For 80 years or 60 years, people tried to study . . .

TEMPLE GRANDIN

When she started the idea of tools, people thought that was just crazy.

ROBERT GREENE

The idea that I want to get at is that people studied chimpanzees either in a cage or in very controlled environments because they're violent creatures. Nobody could study them in the wild

TEMPLE GRANDIN

The wild's where you need to be studying them.

ROBERT GREENE

She was the first one, and from studying them in the wild, she gave them individual names. No one had ever thought you could differentiate chimpanzees with different characters and personalities. She said at one point in her book, "In order to understand the chimpanzees, I had to think like a chimpanzee." I want to say that this is actually a legitimate form of science.

TEMPLE GRANDIN

I think it is. I've had a lot of fights with professors over what is science and very careful observation. You have to start with the careful observation in order to have a hypothesis to do it on a controlled experiment. You've got to start with observation. Then you get into the whole thing about anecdotal evidence. I have a category, since I worked as a consultant also advising parents of autistic kids, what I call "good anecdotal evidence." Let's say there's some new treatment for autism. Before I would even consider it, I've got to have three families that convinced me that it was helpful, and I ask them very, very detailed questions about, "Do you get more speech, less tantrums? Did you start a drug or some other treatment right at the same time?" Because lots of times they've started some other treatment at the same time, so you confound it. There's a point where anecdotal evidence starts to become evidence. You take

something like an airbag thing originally, well after five or six of those, that starts to get pretty obvious we've got a problem there.

ROBERT GREENE

What about the idea of literally putting yourself inside a cow's experience?

TEMPLE GRANDIN

That's what I kind of try to do is imagine, okay, I've got a nervous system that's really, really tuned into looking for threats. Well, I found out through brain scan research that my fear center's three times bigger than normal. Like little things that are sort of vague threats would really set me off. You see, a cow's an animal that's designed when she's grazing, she's always scanning the horizon. Things like rapid movement, something that looks out of place, something that might be a threat. Always looking for threats. I find in my dreams there are two occurring themes. One is being late to get on planes, and the other is sort of vague threats. Not things coming in and smashing everything up. A

weird aircraft off in the distance that might do something. It might not.

ROBERT GREENE

But the things that you've invented or helped develop to make treatment more humane for cattle, this idea of trying to be inside their experience has actually led to some very concrete improvements, inventions.

TEMPLE GRANDIN

When I worked on the center track restrainer system, I still had the same idea of having a ramp where they could walk in and not slip. I'm going, "I don't want to slip. I don't like walking on ice. If I'm this great big 1,200 pound animal, I certainly don't want to be slipping. What would it be like to be 1,200 pounds? You certainly don't want to fall, that's for sure." You still go into a lot of vet clinics and they're putting the dog up on that slippery table and it's skidding all around. Then you wonder why the dog is freaked out. When I do my class at the vet school, I say tell the owners to bring in a bathmat from

home that's got a rubber backing, let the dog stand on that matt so he's not slip sliding around all over the place. Just simple things like you don't pat it, stroke it. Stroke it, don't pat it. The other mistake people make when they restrain an animal, I don't care if it's in a squeeze shoot or just holding a cat in your hands, they squish them too tight. You've got to make them feel supported and held, but you don't squash it just when he starts to struggle a little bit.

ROBERT GREENE

Do you think this is a legitimate form of knowledge? What I'm talking about?

TEMPLE GRANDIN

Yeah, I think it is. A lot of it gets into what they call procedural knowledge or motor memory. It's sensory based memory. You take somebody that's a really good carpenter or a really good artist or let's say someone like that Japanese special script painting, that's motor memory. I know in Japan they value that highly and they call them Living Treasures

and they want to encourage people to learn those crafts so they don't die out.

ROBERT GREENE

My image of that is like for the piano, like Glenn Gould or someone, at the level of after 20 years of experience, the keyboard is internalized. It's like part of your nervous system. It's an extension of your fingers.

TEMPLE GRANDIN

People that run back hoes will tell you the same thing.

ROBERT GREENE

They run what?

TEMPLE GRANDIN

Back hoes, excavating equipment. I have found just on working a hydraulic squeeze shoot when I got really, really good at it, it became an extension of me. Even before the kosher plant, I remember just going up to this Arlington Feed Yard, and I would reach out to the cows and hold them really gently with the squeeze shoot and it became an extension of my hand. Then one of the side bars flipped

open and a bunch of stuff got spilled, and the spell was broken and it didn't work after that, after the side bar popped open.

ROBERT GREENE

But the sense of knowing something from the inside . . .

TEMPLE GRANDIN

Working a kosher shoot, I got to where I could just hold the animal really gently. The other thing that's important is a steady motion. A jerky motion scares, so it's got to move with a real steady motion. I could just kind of hold the animal and he wouldn't struggle. It's like the shoot did become an extension of my own hand. It wasn't a metal head holder holding them. I was like holding them with my hand. The other thing I found is I completely forgot about the controls and moving the controls. I would just look at the animal and the machine would move. In other words, the controls were gone. So what I had to do is I had to practice. When I had equipment startups, usually equipment

startups were two to three days. So the first day I would just go out during a break and I would just learn the controls. Then at night, I would practice in my mind doing the controls because I've got to push them in the right way. Then I would go out there the next morning and just try to forget about the controls and let my motor memory do it. I could just hold the animal and the controls were gone. There were no controls. Those six levers and a bank I'd completely forgotten about that.

ROBERT GREENE

They've shown that . . .

TEMPLE GRANDIN

I know that they've shown that people can learn. I can learn something by practicing it in my mind. You're activating the same parts of the brain that are activated when you actually do the task.

ROBERT GREENE

One thing that they've shown is when you learn an automatic skill, like holding these levers for the hydraulic system . . .

TEMPLE GRANDIN

Or even driving a car, for that matter.

ROBERT GREENE

Well, driving a car's a little different. They've shown us with children that once you've made something automatic, your mind can now see what the rules of it are. It doesn't have to think about them anymore, and it can think about other, higher things.

TEMPLE GRANDIN

I remember finding a paper, and I wish I hadn't lost this paper, but I remember reading a scientific paper. It was either in Science or Nature, and what it was about is when you learn a motor task, the frontal cortex is involved when you're learning the task. Then when that task gets fully learned, it goes into the motor cortex and you no longer have to think about what you're doing with

your hands. That would be the same thing.

Learning how to drive a car would be the same thing. I can remember trying to learn how to drive a pickup with a clutch, and man, I had to totally think about it. A real balky, difficult one too.

ROBERT GREENE

But with the kosher plant experience, it was almost like there was no boundary between your body and . . .

TEMPLE GRANDIN

That's right. It got to the point where the machine was part of me. People who run excavating equipment will tell you exactly the same thing. The excavating machine becomes part of them. I've read some articles about them, and they have contests on picking up eggs with an excavator machine and stuff like that.

ROBERT GREENE

You become better at it when you get to that point.

TEMPLE GRANDIN

Well, that's right. The machine becomes part of you, and you don't even think about the controls. You're just looking at what the bucket's doing.

ROBERT GREENE

They call it tacit knowledge, and I think it's a very important part of being a human being is to be able to have . . .

TEMPLE GRANDIN

The problem is people today are getting away from these sorts of things. I don't think you can do everything with computer simulations until the computer simulations give this kind of feedback. Let's go back to when the hand draftsmen went over to computers or the young kid coming in and drawing the drawings and making all of the mistakes on them, I think the only way you could get around that without actually going out and doing the real things would be if you drew your drawing in Google Sketch Up and then you had a way of holding your drawing and

feeling it. Or they have these machines now that can build a scale model out of plastic resin. Then I can pick up my thing and I can hold it. But you're going to have to get the tactile back into it.

ROBERT GREENE

I agree with you.

TEMPLE GRANDIN

It goes right along with that Oliver Sacks article about the guy that got the cataracts and he couldn't tell his dog from his cat, even though they're both black and white, until he touched them.

ROBERT GREENE

I think we have to go back to that. You have this uncanny connection to cattle. Are there other animals as well? Like horses?

TEMPLE GRANDIN

Cattle's the one I had the most interest in. One of the things is being very observant. What are the ears doing and what are the eyes doing? I train students now. Okay. You're veterinary students. If you see the

whites of the eyes and the tail is switching, the horse might kick you. You want to read those warning signs so the horse doesn't kick you. Or if the horse gets really disturbed and upset, it might be a good idea to take a half an hour break and let it calm back down. It takes a half an hour for it to calm back down. There are a lot of things that I can just teach them to read these signs.

One of the things I've observed with the really good animal trainers is a lot of really good animal trainers are not good at explaining what they do because they see the tail switching subconsciously. Now I see the tail switching consciously and I go, "Oh, the tail's switching. I better back off." One thing that I'm good at doing in my cattle handling stuff is writing up directions for people on how to do stuff. That is something I'm really good at. There are a lot of other people that teach a cattle handling stuff, and I've gone out and gone to their workshops. I went to one workshop by a guy named Curt Pate

who does some really amazing things with cattle. Then I drew up some diagrams and I took them back to Curt and said, "I want to make sure these diagrams are right before we publish them," but he couldn't have made those diagrams. There are people that can do stuff with cattle that I can't do. But you know what? I can write up directions.

ROBERT GREENE

Like horse whisperers or dog whisperers.

TEMPLE GRANDIN

The problem is a lot of this stuff they're doing subconsciously. They don't consciously see that the horse's eyes are white or the tail is switching.

ROBERT GREENE

Right. I'm really taken with that story about the elk on the highway and you then say that's how an animal thinks.

TEMPLE GRANDIN

That was when I almost hit an elk out on the highway. What happened there . . .

ROBERT GREENE

This happened in a splash of a second . . .

TEMPLE GRANDIN

It would have been maybe five seconds. I was on Interstate 25 going south, late morning, nice, bright day. It was the second day of hunting season. I didn't know that at the time, but I found that out later. An elk crosses the northbound lane. I'm on the southbound. I had maybe three or four seconds. The first picture that came into my mind was being smashed in the rear end. That's what would happen if I stopped. The next picture came in my mind of an elk rolling across the hood of the car and smashing in my windshield. That would have happened if I'd swerved. Those were the two impulse things that came first. Then the last thing that came into my mind was to slow down in a calculated manner and he could just miss and he would go by me. That's what I did. But the panic response came up first. It came up like a series of pictures. Then the elk smashing through the

window. I went to that "Horse Whisperer" movie, and there's a scene in there where a horse smashes through the window of a vehicle. It looked just exactly the same. Now, I hadn't seen the "Horse Whisperer" yet. I saw it after I had the elk experience. The picture of the horse smashing through the car window was exactly like what I had imagined.

ROBERT GREENE

Wow. You had enough time to slow down so that nobody would rear-end you?

TEMPLE GRANDIN

I could slow down. There was enough time for that. Then another time I had a situation where my emotional system, this is another avoiding an accident thing. I felt it go from the seeking mode to the fear mode. There's a system in the brain that's now been discovered, the nucleus accumbens, that's sort of a bio-chemical teeter totter. You either go into fear mode or you go into seek mode. I was minding my business on the freeway.

I was in the right-hand lane, 75 miles an hour, minding my own business. A car with a trailer passes me and a 2 by 6 board, probably 4 or 5 feet long, slips off this little trailer. It's coming diagonally across the pavement. My visual system had slowed down. I'd locked onto that board like radar and I managed to move over, go across the rumble strip and then straddle the board. I wasn't scared at all. Then the instant I had successfully avoided the accident and straddled the board, the fear system kicked in and my heart was pounding and everything else. So I went from fear to seek. When I bring this up, then other people tell me their stories. An old lady told me when a car hood came off of a truck full of wrecked cars and she had exactly the same experience. I basically think with the subconscious.

ROBERT GREENE

I wanted to get to that. That was my next question. This idea this is how animals think . . .

TEMPLE GRANDIN

It has to be how they think because most people the subconscious . . . I think the subconscious is just sensory based thinking, and I can see the stuff is in the subconscious. There are rude pop-up ads that I'm not going to talk about, all the Freudian crap it's there, but I know better than to talk about it. I just call them rude pop-up pages, rude web pages that I've got to click and get them down, click them off but they're there. I see all the garbage that's in the subconscious. When I was in college and they talked about the subconscious, I couldn't see how you could go any deeper because some of that Freudian crap, I saw some of that stuff. I just know better than to discuss it, that's all.

ROBERT GREENE

But you're just maybe supposing that this is how an animal would think?

TEMPLE GRANDIN

First of all, if you've studied it, look at the neuroscience. We know in neuroscience that

visual memories are stored in the visual part, motor memories are stored in the motor part, auditory in the auditory part. The hippocampus helps us assemble images. The emotional tags are stored in another part. Memory files are stored in sensory based areas. How else could an animal remember anything? If it's not verbal language, it's going to have to be sensory based memory. There's no other way the brain can store the information. Then I look at things like the black hat horse or you get a horse that's afraid of guys with beards or the elephant that's afraid of diesel powered equipment. In other words, if it's diesel powered, it's bad and if it's gas powered, it's good. Somebody did something bad to him probably with construction equipment, pushed him around with construction equipment and that's diesel powered. So the diesel powered, distinctive sound is associated with bad. Now every piece of equipment that's got a diesel engine is bad. If it's got a gas engine, then it's okay.

ROBERT GREENE

For horses?

TEMPLE GRANDIN

For this particular elephant. This was a particular elephant. No. Horses in general don't make that distinction.

ROBERT GREENE

It's only because of some traumatic experience.

TEMPLE GRANDIN

It's because of a traumatic experience, and that sound of the diesel engine was associated with a traumatic experience.

ROBERT GREENE

Do you feel like you could sometimes understand what a particular cow is thinking at a moment?

TEMPLE GRANDIN

Well, sometimes you can. But I find when you troubleshoot animal behavior problems or even autism behavior problems, people don't give specific enough information. They say, "My dog just gets crazy." I say, "What do you

mean by that? Did he bite somebody? Is he all wiggle butt and happy when you come home? What is crazy?" Or, "My horse goes berserk." I find I have to really dig to get people to give the specific information. Or they'll say, "Tell me the most important thing about autism." Well, if it's a two-year-old kid it's 20 or 30 hours a week of one-to-one really effective teaching. Or, "How do I deal with behavior problems in the classroom?" Well, I want to know age first of all. What kind of behavior problem? Fidgeting? Does he haul off and punch the teacher in the nose? What exactly was the behavior problem?"

ROBERT GREENE

That's part of language too to know details.

TEMPLE GRANDIN

There's no detail. But the thing is when people are that general, there's no way I could even troubleshoot their problem. You can't troubleshoot the problem. I've got to know a lot of things. What exactly does the dog do? What exactly did the kid do? I've got to know

something where I can picture it. I've got to ask questions to where I can make a picture of what the dog did.

ROBERT GREENE

This business where you think with your unconscious, you have direct access to the primary. Does that enter into your creative process at all?

TEMPLE GRANDIN

Well, yeah. Everything I think about I think about in pictures. You see, when I was talking what did the kid do or what did the dog do, I'm seeing pictures. If you want to see how my mind works, why don't you just ask me some stuff and I'll tell you how I access the information. And don't ask me something I can see in this room.

ROBERT GREENE

What do you mean? I'm sorry . . .

TEMPLE GRANDIN

Just ask me something and I'll tell you how my mind digs up information about it.

ROBERT GREENE

This idea of the World Trade Towers falling down because of a fire would have happened anyway with any kind of normal fire?

TEMPLE GRANDIN

Well, the sprinkler system had failed and they couldn't get it out. Let's say a whole floor got going. If the whole floor had gotten involved, it would have come down because those trusses would have turned into wet noodles. What I'm seeing right now is the diagram of the building that was published in the Chicago Tribune. I am seeing the type of truss they used that supermarkets have in their roofs. A very cheap kind of truss. I'm seeing that. I'm seeing a collapsed supermarket roof. Now, we've already discussed this. So why don't you ask me something we haven't discussed.

ROBERT GREENE

Do you remember where you were when we landed on the moon and what your thoughts were?

TEMPLE GRANDIN

I was doing an internship at a research lab with the Foundation for Experimental Biology, and I can remember we were in our lab listening to it on the radio. Then I remember going back to the rented house I was staying in and going out in the backyard of that house and looking up at the moon and going, "There are people walking around up there." Now I'm pulling up other files. I remember where I was when the Challenger blew up. See now I'm associating. I was just pulling up to the post office when I heard that and I heard it on the radio. Now I'm thinking about when I was really young and seeing the Mercury astronauts on the cover of Life and they were super heroes. I had all these books I had collected on the space program. I was really into that. Now I'm getting memories about that. I'm seeing a newsstand that we had when I was a kid and I bought a book there about the space program.

ROBERT GREENE

That's fantastic.

TEMPLE GRANDIN

I can kind of get in that file. One thing you asked me was, "Where was I?" That's why I thought about the Challenger. Now, all the big events. Where was I when Kennedy was shot? I was in a history classroom in high school. Where was I when some other big thing happened . . .

ROBERT GREENE

I'm wondering if Leonardo da Vinci might have been autistic.

TEMPLE GRANDIN

I think he may have been. I think he may have been, and I think Gould definitely was.

ROBERT GREENE

Glenn Gould for sure.

TEMPLE GRANDIN

Mozart I think was.

ROBERT GREENE

Mozart I don't know.

TEMPLE GRANDIN

Mozart certainly wasn't normal.

ROBERT GREENE

Mozart's a little harder, but definitely Glenn Gould. The reason da Vinci was totally visually oriented . . .

TEMPLE GRANDIN

But you see not everybody with autism is visually oriented.

ROBERT GREENE

That's true.

TEMPLE GRANDIN

I talk about there are three kinds of minds. Those three kinds of minds exist in autism because there are people in autism who are word thinkers and they know all the facts about history, medieval knights or whatever.

ROBERT GREENE

It's more about that executive function where it gets fixated on something.

TEMPLE GRANDIN

That's right. There tends to be fixated interest and repetitive behaviors. That is something that goes across all of the autism . . .

ROBERT GREENE

I'm on my last card. It's really short. Did you want to take a break?

TEMPLE GRANDIN

No, I'm fine.

ROBERT GREENE

I just wanted to get a sense of just to catch up now about where . . . because mostly on these books and things, where you are now or what your businesses are and your consulting work?

Where are you at the present?

TEMPLE GRANDIN

I'm going to be visiting a pork plant. I'm going to fly out there tomorrow afternoon. I'm still doing some consulting. Not as much as I was, because I'm doing a lot of speaking engagements. That's where my business is at.

ROBERT GREENE

And you're teaching?

TEMPLE GRANDIN

I just finished up my class. I teach my class each semester. I've got 50 or 60 students. In my class, I have my students actually draw a cattle handling facility, and a lot of the students are pre-veterinary and probably will become a dog and cat veterinarian. They won't really care much about designing a cattle facility. Now I'm telling them, "Look at this as a visual problem solving. You've got to figure out how to lay this out. There are certain rules and you've got to follow the rules and figure it out." Then I take half the drawings that are really good and I lay them out so people could see that there were different ways you could lay this out that would work. The drawings that are bad, I don't lay out. My final is essay. I ask questions like you've got to buy a piece of equipment for the veterinary school. What kind of a head gate would you get and why? I want you to

explain why. I don't do any multiple choice or anything like that because that's not the real world. I try to keep everything real world.

ROBERT GREENE

Anything about the future, where you want to go in the next couple years? Are there any projects or things that are . . .

TEMPLE GRANDIN

I have five Ph.D.s that have graduated with me, and two of them are professors. I'm really, really happy about that.

ROBERT GREENE

What do you mean by that?

TEMPLE GRANDIN

Two of them are professors.

ROBERT GREENE

You mean people that you taught?

TEMPLE GRANDIN

Yeah. Ph.D. students that I taught and they're now professors at a university. I'm real happy about that, and they're doing really well.

ROBERT GREENE

But are there any kinds of projects that you think you haven't conquered yet that you want to?

TEMPLE GRANDIN

I have projects that I want students to do, and then I have projects that sort of just come alone and they do them

ROBERT GREENE

Just a final bit, a little bit philosophical but not too grand here. I was interested in the idea of making the death of [inaudible 37:19] of the animals a bit more sacred, like a ritual. I was sort of intrigued by that. Why do you think that's something important?

TEMPLE GRANDIN

When something has to die, that's just not a thing. In these big slaughterhouses, a lot of cattle are dying. You've got to control killing and only do it in certain specific places, and it's not business until they're dead.

ROBERT GREENE

What is the point or the importance of . . .

TEMPLE GRANDIN

First of all, cattle feel pain and fear. It says in the movie, "Nature can be cruel. We don't have to be." I'm sorry. I'm getting distracted. ♦

YOKY MATSUOKA

ROBERT GREENE

One thing I'm interested in is because you have so many different projects, but even one project requires a lot of organizational skills, and that seems to be something, part of what you're teaching other women who to juggle having a family and children and a career. Have you always been someone who's really good at organizing a project or organizing your life, or you don't think of yourself that way?

YOKY MATSUOKA

It's funny. My mom asked me that same question kind of recently and said, "How did you get to where you get to? Where did you acquire that skill?" That's kind of an interesting question from my own mom. So, clearly I didn't have it . . .

ROBERT GREENE

She was asking about what in particular? Just you in general?

YOKY MATSUOKA

Yeah. Just sort of to the point of having the people skills to manage people, to do so many different scientific levels. She just didn't see me as somebody who . . . when she knew me as a kid. So, I think that's sort of an interesting question that I often go back and think . . . it's interesting. My mom asked me that question. When I'm raising my kids, I feel like I really know everything about them, right? And often there are things that are surprising, but I have a certain model of who they are, and usually what they do fits that model. So, I think clearly over time it changed. My mom's theory, and I agree, is one of the things was, at some point, I was in such an intense tennis program while I was still going to normal school. Most of the kids who were in the tennis program basically started going to half-day special school, basically like go academia, and then really focus on tennis. In Japan, I was still going to one of the top schools until 3:30, run to the

train, and then do all the homework on the train. The training from 5:30 to 9:30 . . .

ROBERT GREENE

You trained for four hours?

YOKY MATSUOKA

Yeah. Not train tennis.

ROBERT GREENE

Train tennis.

YOKY MATSUOKA

So yeah, 3:30 to 5:30 to get there change and be on the tennis court. And then 5:30-9:30 was tennis training.

ROBERT GREENE

That's a two-hour train ride.

YOKY MATSUOKA

Two-hour train ride. Yep. And then an hour and half back. It was just like my house and then school and then tennis and then back. So by the time I got back, the train was usually pretty close to 11:00. In the train, I guess I did homework and I ate some, and then by the time I got home I was so tired. But definitely, I learned that if I don't do

homework on the train . . . in Japan, it's just a weird thing to do homework when you're standing up possibly on a train.

ROBERT GREENE

You were standing?

YOKY MATSUOKA

Sometimes I was standing up and just doing homework.

ROBERT GREENE

How can you do homework when you were standing?

YOKY MATSUOKA

Well, you've got to do it, so you do it. So, you just use whatever you can. So I was doing homework that way. So my mom thinks that I started to develop a skill to have to do certain things in between things.

ROBERT GREENE

Maximize your time.

YOKY MATSUOKA

Maximize my time, yeah. And also, I liked doing other kids' homework, so during

recess and stuff, I was doing a lot of other people's work.

ROBERT GREENE

You mean like math problems, you said?

YOKY MATSUOKA

Yeah, yeah. That's right. Other people's cram school math homework. I just do it for them.

ROBERT GREENE

That's a very nerdy thing.

YOKY MATSUOKA

Isn't it?

ROBERT GREENE

[laughs]

YOKY MATSUOKA

Somehow, it was so much fun. I didn't think it was nerdy. They might have thought, 'My god. Just give it to Yokky and she'll do it. She's such a nerd.' But I never realized that because it was so much fun.

ROBERT GREENE

And see, look where they ended up and look where you ended up.

YOKY MATSUOKA

Right. Yeah. So, one of my Japanese friends, actually it's really funny, but she said to me, this was about three years ago when I was back in Japan. I was getting together with about four or five of my elementary school friends. And then she said, "Yoky, you know you were weird right?" I said, "I kind of felt weird, but I didn't know." She was like, "You know, you didn't fit in this country. This country is too small for you." That's kind of a compliment and an insult at the same time.

ROBERT GREENE

Kind of a back-handed compliment.

YOKY MATSUOKA

Yeah. [laughs] I thought it was kind of funny. I took it as a full compliment and that's fine. But anyway, just to digress. So back to where we were. In terms of this multitasking and management skills and all of that, it's something that I think I've always liked.

ROBERT GREENE

Liked?

YOKY MATSUOKA

I liked, yeah. But I never was in a position to ever practice it until I was at Barrett. So, at Barrett, I started as an engineer, but as the company started doing better and I started managing people, I was doing a really good job managing people, and then I started to see that I have that in me. And it became really exciting to me.

ROBERT GREENE

Managing people. What is it that you liked exactly?

YOKY MATSUOKA

Being able to do more than what I could do on my own with still my ideas and directions.

ROBERT GREENE

You get other people to help you do it?

YOKY MATSUOKA

Yeah, in a way, right? So, management is kind of about that. You still get to do a lot of . . . now you have eight sets of hands instead of two sets of hands or one set of hands or

whatever it is. So sort of that's how I saw it, and it was really . . .

ROBERT GREENE

And you're good at that? You enjoy it?

YOKY MATSUOKA

Yeah, I enjoy it, and I think generally I like more of the high level story than the details anyway. And I realized that management, you kind of stay in the high level and let other people do the details. So if I hire lots of people who are really good at details, and I can tell the high level story to everybody, that's great. So that's sort of the position that I do enjoy. And the professor is kind of like that in a way.

ROBERT GREENE

That's right.

YOKY MATSUOKA

So it's a whole lot more education than management, and in a company, it's much more management. But yeah, so I think that I started to really get a sense of enjoyment out of that over time. In terms of juggling

multiple things, it's a little bit different. As I say, initially it probably got seeded when I was a teenager by doing multiple things. I had to do multiple things. I had to squeeze in multiple things. But I got obsessive. So right after I went from Barrett back to grad school, I started to really want to know what my limit was. So, I don't know if you've read somewhere about this new . . . Nova talks a little bit about this, but I basically reached a point where I said, "You know what? I work for a company full time really, even though I called it part-time. I'm a full-time grad student. I date five guys. I party all night."

ROBERT GREENE

This was at MIT?

YOKY MATSUOKA

MIT, yeah. "And then I sleep four hours a night and I'm not tired. I play tennis every day. It just all fits just fine." And I thought, I can do more. So I started fitting more, and I started cutting sleep, and eventually I was sustaining between two to four hours of sleep

every night. And then to the point when I was lying down, my mind was going so fast . . .

ROBERT GREENE

You couldn't sleep.

YOKY MATSUOKA

. . . that I couldn't sleep. And I thought . . . so January 1st, 2007, I decided I don't need to sleep anymore, because it's a waste of my time.

ROBERT GREENE

2007?

YOKY MATSUOKA

2007. I'm sorry, 1997.

ROBERT GREENE

Okay.

YOKY MATSUOKA

I'm sorry. They all kind of mirror. But in 1997 I decided January 1st, "You know what? For the last so many months, I've been lying down not sleeping anyway, so I'm just going to cut it out." I made the bed that morning and I said, "I don't need to sleep. I'm not coming back." So I didn't sleep for 23 days.

ROBERT GREENE

Wow.

YOKY MATSUOKA

[laughs]

ROBERT GREENE

I didn't see that in any of the articles.

YOKY MATSUOKA

So I'm just very interested in discovering the human body. I'm also very interested in discovering about myself. So I sort of thought, "How much can I stack and then keep going?" And I realized that I was starting to hallucinate during the day. I was sitting in my office, and the short hand of the clock would move. And I'm like . . .

ROBERT GREENE

[laughs]

YOKY MATSUOKA

It's like weird, right? So definitely some weird things were happening. Some professors and grad students would come by my office and say, "Why are you here all the time?" I said, "There's no reason to go home. I'm totally

fine. I'm not tired." And then at some point, one of the grad students said, "You know, this is called insomnia? It's a disease." And I said, "Never heard of it. It's not a disease. Come on." That was the first time I even remotely thought that maybe it's a disease. Anyway, 23 days later, I went home to take a shower and everything seemed fine, but for the first time in my life, I had this amazing angry feeling. I just picked up a dining chair, and I wanted to throw it out the window. And I'm like [makes sound]. I'm like, "What is this anger?" And I put it down and said, "Oh, I have this disease." I called the MIT hospital and said to the nurse, "I might be dangerous. I don't really know. I feel this incredible anger in me that I've never felt before." And then five minutes later, she figured out that I hadn't slept for a long time. And then she basically said, "You know, you probably have CVS close to you, right? Just go there, pick up Benadryl, lie down for two hours, then come and see us in the morning."

ROBERT GREENE

Pick up a what?

YOKY MATSUOKA

Benadryl. So I took Benadryl. I kind of lied down for two to four hours, and then I went to see them. And then I saw a psychiatrist for a year and a half after that.

ROBERT GREENE

About your sleeping, or just about . . .

YOKY MATSUOKA

About my . . .

ROBERT GREENE

. . . your mother and your anger?

YOKY MATSUOKA

No, no, no. This is completely separate it turns out. This is all about my life and how I have to multitask to get satisfaction out of it. How I have to cut everything about myself out of it to get satisfaction out of it. And then she was like, “Don’t you ever just want to just relax and take a bubble bath and think about yourself?” And I said, “No, that’s a waste of time.” And then she was like, “No, it’s not a

waste of time. It’s actually productive.” So it took a long time of conversation to make me realize what I was doing. And I still have that disease of wanting to overload myself.

ROBERT GREENE

Yes, I can see that.

YOKY MATSUOKA

So, I reach a point . . . it happens maybe every 10 months. This is the description that I have for my husband. I said, “I have tossed too many balls up in the air. I can’t catch it. What should I do?” And sometimes it’s just like a break down crying feeling. I can’t believe . . . everything is so critical, I can’t believe I’ve reached this point. Sometimes it’s more of like, “Okay. I reached it again. I have to restructure. Which one should I cut?”

ROBERT GREENE

Also, you get older and you can’t do it as well.

YOKY MATSUOKA

Mm-hmm. That’s precisely . . .

ROBERT GREENE

I know in myself . . .

YOKY MATSUOKA

And then in my life, it’s all about the priorities. I’m having kids because I want to spend time with them now. Eventually, soon enough, they don’t want to be with my anyway, so I might as well really spend time with them when they have to have me. So I’m in that phase. So I feel like that’s the most important time. I cannot cut that down any shorter than I have now. So then starting from there, it’s just a very short period of time that I have, and I’ve sliced it into tiny little chunks often.

ROBERT GREENE

So, you advise women about how to multitask their life and how to organize? Is that part of something that you do? What’s some of the advice that you give?

YOKY MATSUOKA

Yeah, it’s very interesting. I sort of feel like I’m still learning how to do it, but at the same time, I still advise that if you want to have a lot of kids and then balance that with

career, you have to do it. There is no reason to hesitate and not do it and then later think, “I only did the family life,” or, “I only did my career.” Just, I’m doing it. It’s hard. Yeah, it’s damn hard. There are times that I cry because of it. Yeah, I cry because of it. But am I glad that I’m doing it? Totally. So that’s always my advice that if they reach those points, I’m here to talk to them, because I know what it’s like to go through this thing that it feels like there’s no way to do it.

ROBERT GREENE

Are there any strategies or things you’ve learned about how to organize your time better? A lot of people, myself, when I multitask, I think generally women are better at multitasking than men. I know when I multitask, I end up wasting a lot of time.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

Do you have tricks? Maybe I can even learn from you.

YOKY MATSUOKA

[laughs]

ROBERT GREENE

Do you teach men or anybody how to organize your life?

YOKY MATSUOKA

Interesting. I definitely reach a point where I’m spinning in place, because again, just trying to go back and forth and back and forth takes so long. You just have to know your limit. There’s nothing useful about that advice. But for me, I have to be conscious about . . . I’m always aware when I’m spinning and losing time, and eventually that piles up, and then I say, “Beep, beep, beep. Warning! Warning! I have to change something.” So if I actually let myself sit in an unproductive moment for months, of course that’s horrible, but I don’t let myself do that.

So if I start to realize that I’m unproductive, I really revisit the issue and then cut something out and then keep going again.

ROBERT GREENE

Do you do things where you allot a certain amount of time per day to one thing and then another thing? Or is it looser than that?

YOKY MATSUOKA

Yeah. I’ve tried all kinds of ways, and none of them work, because everything has urgent things that I have to attend to anyway. And I think, yeah. It just doesn’t work. But there are ways. So I’ve been told recently many times that there are people who run tons of companies successfully, just that their role is very different in their company. They’re viewed as a visionary person. They come around only so few times a year, and that’s okay. Everybody’s expectation has to be at that level, and then you have to come to live with that level of control that you lost. And so . . .

ROBERT GREENE

Exactly.

YOKY MATSUOKA

Right. So, that's what I've kind of, over time, I've come to say . . . so especially this big shift that I made from Google to startup. I've said, "Okay. This feeling of control in many things that I'm doing is great, but I'm going to have to give up, because it's all falling apart because I'm not doing a good job." So I let go of many things. I restructured it. I changed my attitude and expectation as well as I changed their attitude and expectation.

ROBERT GREENE

Who's they?

YOKY MATSUOKA

My employees at different startups and non-profits. And I said, "Now you're only going to see me one hour every two months. You won't be getting lots of e-mails back from me, and Lisa is in charge. You will listen to Lisa, and then Lisa will communicate with me sometimes, and that's just how it's going to be. And if that's not good, this is not the place for you." So just really changed their

expectation, my expectation, my level of control. They also said, "Yoky, you can't just have all the control because you don't have time. You think you do, but you don't." So I think those are the processes that I went through in every little thing, and that helped a lot. And I'm in a place where I'm coasting, being pregnant and having this job and stuff and still being able to manage. I don't have too many balls up in the air right now, so I'm in a good place right now.

ROBERT GREENE

Good. That's probably why you agreed to do this interview.

YOKY MATSUOKA

[laughs] That's probably true in a way. But if you reached me in October last year or in September, that's when I was having some crisis and way too many things in my hands. So I go through phases. But again, it's all about being aware of who you are and then paying attention.

ROBERT GREENE

Know your limits a little bit.

YOKY MATSUOKA

Yeah. I probably don't know my limits, but I at least know when the warning sign is coming. And also to know the priority. So I never compromise time with my kids. No matter how broken I am, I never let that go.

ROBERT GREENE

Also about priorities and which particular job is more urgent and more important at this moment, and you don't waste time on something that can be done in a few weeks.

YOKY MATSUOKA

Yeah. Maybe so.

ROBERT GREENE

Is it kind of a compulsive thing, or is there actually any kind of pleasure that comes from being disciplined and organized?

YOKY MATSUOKA

Oh yeah, certainly. So I think that's, again, part of the disease to a certain extent that I

think doing multiple things somehow gives an incredible amount of pleasure.

ROBERT GREENE

I find it does.

YOKY MATSUOKA

Yeah. And that's why I keep doing it.

ROBERT GREENE

But also how about being organized [inaudible 17:11]?

YOKY MATSUOKA

Yeah. If you asked most of the people, I'm very disorganized. I surround myself with organized people to organize things for me. So I have assistants who are top notch organized on everything that I do. My husband is organized, to begin with. My university has an organized assistant who reads my e-mail for me. I have all those domains.

ROBERT GREENE

She's the one that put me in touch with you.

YOKY MATSUOKA

Probably, yeah. So all those people flag if it's important. They actually text me and say, "You might want to pay attention to this one."

ROBERT GREENE

Oh, that's good.

YOKY MATSUOKA

Otherwise, I just have things coming out of my ears. So I think that's one way I manage, and that's worth spending money for.

ROBERT GREENE

That's what?

YOKY MATSUOKA

Spending money for.

ROBERT GREENE

Spending money for.

YOKY MATSUOKA

Yeah, like I'm willing to spend money to pay people who are organizing my life for me.

ROBERT GREENE

Yes.

YOKY MATSUOKA

So that I can get away with sort of not cleaning up after myself and moving on to another thing.

ROBERT GREENE

Right.

YOKY MATSUOKA

It's a different thing from organizing people, which I feel like I have to be very meticulous about. But it's different from leaving a huge mess on my desk even though I've already moved on to the next thing. Does that make sense?

ROBERT GREENE

No, I missed it.

YOKY MATSUOKA

There are two kinds of organization. So organization related to people.

ROBERT GREENE

Yes, and then like your desk and your papers and your . . .

YOKY MATSUOKA

Yeah. And I have meticulous to-do lists which are divided into all different categories, and that gets updated. It also has to be hand written, it turns out, and then I carry it around. But it's divided into different categories, and then I have different priorities and ways that I organize it. So I guess at that level, I kind of usually know if they ask me, "What are the three things you have to do today?" I know boom, boom, boom. So at that level, I'm organized.

ROBERT GREENE

Okay. One of the reasons I was asking is that I do books that are a lot of research. I read 200 or 300 books to write one book. It's all in how it's organized that I'm able to write it. So those note cards, different categories.

YOKY MATSUOKA

That's true.

ROBERT GREENE

I actually kind of enjoy working at it and creating a structure for the book. I find a sort

of pleasure from that. I was wondering if you do that as well.

YOKY MATSUOKA

Yeah, right. I totally understand. I think I get pleasure out of organizing it and then crossing it off. I don't know if you have to-do lists that you cross off and get incredible satisfaction out of that. But I sometimes even put things that I know I'll definitely get done that day so I get that. [laughs] Brush teeth.

ROBERT GREENE

I was wondering if you were maybe going to give me some ideas, but . . .

YOKY MATSUOKA

Sorry. Yeah, that's very abstract.

ROBERT GREENE

It is. Maybe you just have your own life and you have to do it yourself to figure it out. One of the most important ideas in the book is the sense of what I call mastery.

YOKY MATSUOKA

Mm-hmm. Isn't that the title?

ROBERT GREENE

The title is either going to be "The Master Player" or "The Masterful Mind" or something with the word master in it.

YOKY MATSUOKA

Isn't "Masterful Mind" . . . isn't there a book called that? Maybe you told me.

ROBERT GREENE

It might be.

YOKY MATSUOKA

Did you tell me that it's a possible title?

ROBERT GREENE

Yes.

YOKY MATSUOKA

Okay. Then that's where it came from in my brain then.

ROBERT GREENE

Yeah. And so, if I take something like . . . I talk to people about chess or piano or tennis. Maybe I'll take tennis with you. It's more like in the beginning when you first play tennis, you feel kind of awkward. You have to learn the rules, you have to learn the

basic strategies, the hand movements. It's uncomfortable, and you're anxious to get to a point where you feel more comfortable. And slowly, two years, three years, four years, you gain a comfort. You know things that you never knew before. If you watched a tennis match, you see . . .

YOKY MATSUOKA

Yeah, yeah. Subtle things.

ROBERT GREENE

. . . five times more than other people ever saw beforehand. If you go for 20 years, and you're at the level of McEnroe or Agassi, when you're playing in the moment, so many more things are being processed in your brain than in other people. And you have an immediate power. You don't have to think.

YOKY MATSUOKA

Sure.

ROBERT GREENE

Normally, before, "Oh, I have to get my backhand." And when you get really good, it

just happens, and then it frees your brain up to think of other things.

YOKY MATSUOKA

Yeah. Very true.

ROBERT GREENE

Like two shots ahead.

YOKY MATSUOKA

That's right.

ROBERT GREENE

So I want to apply that to everything. And one of the main ideas is that when you get to that level, you're able to use your intuition a lot. So I wanted to talk about your intuitive powers. The thing you're describing is it's almost as if you were always intuitive, and it's not something that kind of developed as you got better and better. Or is that not true?

YOKY MATSUOKA

Both. So, I understand precisely what you're talking about, but at the same time, there are people who do science and life based on intuition, and there are people who do it based on methods or something else.

ROBERT GREENE

It's called the analytical versus the intuitive.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

Some people are purely analytical.

YOKY MATSUOKA

Yeah. So I always fall on the intuitive side. I've taken personality tests and all those things, and it's always on the intuitive side. So, there's something natural about how I believe my intuition. I feel like I have more senses about the situation than other people earlier. Like if I meet a person, like my husband, a lot of people say this, I usually judge about people really fast and what I think those people are. And if I tell the other people, they're like, "What are you talking about?" And then a month, six months later they're like, "Wow. You were right."

ROBERT GREENE

Psychic.

YOKY MATSUOKA

Sort of that intuition about that. Or how I raise my kids. I don't read any books, but I sort of have a very strong philosophy about how my intuition says, "This is how this is going to affect them in the long term. This is how I'm going to do things."

ROBERT GREENE

Where do you think it comes from? You study the brain.

YOKY MATSUOKA

Usually people say intuition all comes from experience, the experiences that you build. So my theory, I've thought about this, because everybody puts me in this intuitive category, is my memory. So my ability to remember many, many details of my life. Intuition is about experience, but if you can't remember some things, maybe intuition becomes not intuitive, because you can't remember some of the history and the experiences. But if you can remember every . . . this is not the case, but if you can remember every little

detail of everything about your life, you can make sense out of the connections of all those experiences, and that feels like intuition, because you can't remember all those details. So it might be something like that, that I just remember things a little bit better in my brain.

ROBERT GREENE

You have so much more knowledge and information that you're accessing in ways that are faster than you can understand where they come from.

YOKY MATSUOKA

Yeah. Everybody's intuition is that. Everybody's intuition is possibly based on your past experience that you might not remember. So it feels irrational, therefore it's called intuition.

ROBERT GREENE

Well, there's another kind of intuition that animals have.

YOKY MATSUOKA

That's true. Some of them are wired, hard wired.

ROBERT GREENE

And so for instance, there was this tsunami that struck Indonesia . . .

YOKY MATSUOKA

All the animals started fleeing.

ROBERT GREENE

There were people, as the water ebbed all the way out, people would walk further out into the ocean, and they all drowned.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

There were tribes that lived in the area, primitive tribes, and they knew the moment they felt it and they went up to a higher hill. They're not animals. We have it, too.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

We're wired for it, too.

YOKY MATSUOKA

Yeah. Interesting. Interesting. Yeah, maybe those things are born . . . it may be something that you're born with.

ROBERT GREENE

As a mother with your children, perhaps some of that could be.

YOKY MATSUOKA

Maybe. They do say that, like mothers often have intuition more than fathers have, because they bear the children, and it's something that develops for hormonal reasons. So yeah, I totally believe all of that. I think I'm intuitively driven possibly through the memory process, yet there's a counterexample of that, so I think. My mom claims to be an extremely intuitive person, which is very true. She reads people like a textbook. But she also claims she cannot remember anything, which is also true. So maybe it's not related. But my dad is not an intuitive person. He remembers everything.

My mom is an intuitive person who remembers nothing.

ROBERT GREENE

Yeah, but if she remembered it, it wouldn't be experienced as intuition.

YOKY MATSUOKA

So yeah. So it could be a wiring thing. At least my explanation is that I remember things and I'm intuitive, so therefore it feels like it's a combined thing, and that has allowed me to explain why I feel so strong about certain things.

ROBERT GREENE

Were you always this way when you were a child?

YOKY MATSUOKA

I have no idea. I can't remember.

ROBERT GREENE

You can't remember.

YOKY MATSUOKA

[laughs] Well, I think my model of who I am changed so much that . . . when I see those young girls who think I'm a mentor, and I

can't believe how mature those people are.

There's a 14-year-old girl who just sent me a letter about why she admires me. I feel like there's no way I would have ever written anything like that as a 14-year-old. I would have never cared to have a mentor. I would have never cared of a science degree. Just all those things that I think, "Wow. Those people are so much more aware of themselves than I was at that age." So maybe I was. I just can't remember how I was. Or maybe I was slower developmentally, or who knows what it was.

ROBERT GREENE

You had to find yourself.

YOKY MATSUOKA

Yeah. So it's very interesting that . . . I feel like how I used to perceive myself was a very insecure person who didn't know anything about where I was placed. That's sort of how I perceive myself anyway.

ROBERT GREENE

[inaudible 28:04]

YOKY MATSUOKA

Okay.

ROBERT GREENE

Does the intuition then . . .

YOKY MATSUOKA

The mastery-based intuition, we didn't talk about too much.

ROBERT GREENE

Yeah.

YOKY MATSUOKA

So yeah, I totally believe it. So, the way I described it was with my current work. So, I love the feeling of really feeling like I grasp the whole problem. The moment I feel like, "Ah. I grasped it. I can look at it from all points of view, and I have answers for those things." When that moment, you can really have confidence and intuition that comes out of there. It takes a while to get to the point where you feel like you have a grasp on something. So it depends on the complexity of the problem of course.

ROBERT GREENE

There's a very interesting idea that the guy [inaudible 28:50] talks about, where you can synthesize the whole thing in an intuition. Do you follow?

YOKY MATSUOKA

Synthesize everything.

ROBERT GREENE

Like, it's hard for us to think in terms of a whole picture. It's hard for the brain. Say if you were composing a symphony, to feel the whole symphony in your head, the whole movement. But a Mozart or a Beethoven would have moments where they could see the whole thing. And so a mathematician would almost have the whole equation and solution come to him or her in a flash.

YOKY MATSUOKA

I see.

ROBERT GREENE

See the whole thing.

YOKY MATSUOKA

Interesting. I'm probably not that person, but that's also different. That comes from . . . Mozart did this because he understood music already. He had the full grasp on how all those intricate details mixed up, so therefore, he could now spin off this brand new cloud of intuition which is just the whole music. But it's not that it didn't start from anything. To me, the whole idea is the first grasp this whole thing, happened for them as well at first. Same thing with mathematicians. They have to have grasped full ideas, or else this new thing wouldn't have bubbled up.

ROBERT GREENE

Yeah. So that's happened to you?

YOKY MATSUOKA

Not at the level that you just said, like composing a symphony. But yeah. So I think to me, I feel like I kind of do those things at work. Again, those four things I can clearly remember that I really grasped so well. I was 24/7 immersed, thought about it in the

shower, dreamed about it. Those things, dreaming about it in a complete abstract sense, and I feel like I'm coming up with a solution. That's something. That's sort of almost like the aha symphony creation kind of thing. So in a way, on a small scale, I do that. But again, the way I describe it is slightly different, because I really feel like . . . when I started working for this company, when people asked me for almost like an intuitive level, like, "Should we go this way, or should we go that way?" And I said, "I can't answer. I haven't held the whole problem yet." And then they ask me a little bit later, and now I've reached that point where I've held the whole problem and really start dreaming about it. I feel like whenever people ask those questions, I have pretty strong feelings about them. And then I also come up with ideas that have not . . . this product clearly has to have this, and nobody has talked about it. But boy isn't this important? Those things come

now because I sort of think about it on an unconscious level.

ROBERT GREENE

You studied neuroscience. Do you have any idea . . . because I'm going to be asking Ramachandran about this next week. Do you have any idea why the brain is wired that way where we get a form of intelligence that's suddenly deeper? It can't even be really explained once you have immersed yourself so deeply in something.

YOKY MATSUOKA

Yeah. So that's a question for him. But I really think it's all about the formation of memory.

ROBERT GREENE

Yes, you said that before.

YOKY MATSUOKA

Yeah. I really think that how you process things in the short-term memory and when the memory gets consolidated, consolidated really just means it's embedded as more permanent information, the path that it takes

to retrieve that information and the structure that it's stored at is different. And you kind of have to let it soak. It's almost like making bread. You have to let it sleep in the fridge overnight. So that's sort of the feeling.

ROBERT GREENE

They talk about that in chunks. Do you know about that?

YOKY MATSUOKA

Mm-mm.

ROBERT GREENE

The chess players who are grand masters, they don't think in terms of individual moves.

YOKY MATSUOKA

Ah, interesting.

ROBERT GREENE

They see like six moves at one time, and it's called a chunk of information . . .

YOKY MATSUOKA

Makes sense.

ROBERT GREENE

. . . that they can access like that in their head.

YOKY MATSUOKA

Tennis for me was like that, so it makes sense. It was a strategy. It wasn't all about one shot at a time. It was more of a global strategy.

ROBERT GREENE

So you had that in tennis. Do you ever get that in your work at all?

YOKY MATSUOKA

Interesting. I mean I have a lot of funny global strategies, more at the very high level of how I operate, but it's very different from scientific discoveries or something. It's more of . . . we talked about this a little bit, about the methods, right? Like how do I do certain discovery. So yeah, it's more of a cookie cutter than . . . chunks to me is a certain way that I learn that this chunk, combination of things, works pretty well, and it's easier to retrieve that as a single string.

ROBERT GREENE

Right. I see.

YOKY MATSUOKA

Yeah. No, I don't know. It's funny. It's a great way to think about it. I don't have any good example.

ROBERT GREENE

Well, they discovered with pianists and studying how their brain works that they're not thinking in terms of notes. They're thinking in terms of a whole bar at one time. The relationship . . . I don't know if you've studied the relationship of pianists and how their memory is of a different order.

YOKY MATSUOKA

Yeah. I've experienced this myself. I studied classical piano for quite a long time. I have many pieces that I can suddenly play if my hands are in the right part of the piano. And if I play dee dee, and then somehow I play two notes in a certain funny combination, and my hands will keep going. But if anybody stops, I cannot replay from that point on again. So there is some funny sequential chunk that is stored up that I can play. But

there's no way I can play from the middle.

Somebody said, "Can you sit down and play this?" I can't play it. It's really funny.

ROBERT GREENE

I wonder what that comes from.

YOKY MATSUOKA

It's just some sort of sequential . . . it's like what you say. It's like a string that you pull, and everything is attached in a sequential way. That's how memory . . .

ROBERT GREENE

I think our memory is designed for sequencing, for making tools and things.

YOKY MATSUOKA

Phone numbers are sometimes like that too, right? Right now everything is stored, but it used to be that you'd say, "Do you remember grandma's phone number?" And they say, "Wait. I can't remember, but let me just look at my phone pads." And when you move your finger, it's like, "Oh, yeah, yeah, yeah. Here it is." So it's the same kind of thing.

ROBERT GREENE

We should probably stop.

YOKY MATSUOKA

Okay. So how long do you have? Do you feel like you have an hour?

ROBERT GREENE

Definitely not more than an hour.

YOKY MATSUOKA

Okay. Why don't we try to see if we can finish tonight.

ROBERT GREENE

You're more of a mystery, because I don't know as much about you. I only have these articles in here.

YOKY MATSUOKA

I see. That's funny.

ROBERT GREENE

I've only read about four or five articles, so it's a little hard for me to do the questions about everything. So no, did you find out anything about the disclosure stuff? Did you want to do that?

YOKY MATSUOKA

How much do you want to talk about it?

ROBERT GREENE

I'm curious, so I wanted to find out about what the involvement with Google was.

YOKY MATSUOKA

Yes. So, the Google thing I can tell you a very surface level story that I'm allowed to say.

ROBERT GREENE

Okay. And then the startup, I guess I wanted to be able to present you in a light of one of the geniuses that I'm interviewing.

YOKY MATSUOKA

I think it being in is great. It makes the story more whole because so that's me. By the time you're actually writing this, this company will be pretty well-known in one way or another. I guess I shouldn't lean back too far.

ROBERT GREENE

That's all right. It came out really clear yesterday.

ROBERT GREENE

Okay. So then let me first ask you what did Google bring you over for? What was that all about? You can lean back if you're more comfortable.

YOKY MATSUOKA

Okay. Sounds good. Oh, that's perfect. Let's do that. So Google basically was . . . maybe you know . . . so Google is just the top of the mountain, but they're being criticized for doing really well with search and ads, but what's next? So maybe six months ago, lots of articles came out like, is Google falling apart, what's Google going to do next, kind of things. And Google internally was thinking that same thing. What's going to be next? And they decided to have a new group which is going to be looking at the next big thing for Google, as well as sort of the . . . it doesn't have to be the replacement. It's not going to be the replacement, but it's just sort of looking for different things. And this sits somewhere between possibly products and research, and

maybe the model might be like a Xerox Park or something like that. That's where a lot of things that we currently use came out. So that was sort of the general idea. When I got recruited, the idea was pretty vague in terms of how it was defined. It was up to three founders to define it, and I was one of the founders for this group.

ROBERT GREENE

To create sort of an industrial park like Xerox was, where it's a think tank then?

YOKY MATSUOKA

It's a think tank, and it's . . . now, after we were there for a while, we defined with Larry and Sergey to basically be a group that spins off projects which are outside of Google's core mission. The core mission is search and ads and organizing information on the Web. So outside of core mission, yet something that takes strengths of Google to make it happen. So, that autonomous car driving project, if you search back in New York Times, you'll see an article about a project that's out of

Google. Google now has a project driving autonomous car on the highway or local roads. We can go from San Francisco to L.A. and back autonomously.

ROBERT GREENE

What does that mean, autonomously?

YOKY MATSUOKA

Autonomous meaning no driver. Robot car. And can look for pedestrians, can look for lights, can change lanes, all those things. So that's a Google project that came out of our group, yet it was sort of an inherited project, because it was already going on before we started this group. But that's a good example. It's a car. Google and cars, people don't necessarily imagine that, yet if you think about it, we're not inventing a car. We're inventing programs that run a car efficiently. We're already running lots of cars for Street View.

ROBERT GREENE

Street View?

YOKY MATSUOKA

Street View is like the map you go to, and then if you actually click on this thing called Street View, you get the view of that intersection. That's because Google drives cars everywhere in the world to take pictures.

ROBERT GREENE

How is this car powered? Gas or electricity?

YOKY MATSUOKA

It doesn't matter. It doesn't matter.

ROBERT GREENE

So you were one of the three founders.

YOKY MATSUOKA

Yes. So I was one of the three founders for that group, and there are maybe five or six various projects that are going on, and some of them are going to be Google's product. Some of them are going to be incorporated into an already existing Google product, and some of them are going to not fit and it's going to be a spin-off.

ROBERT GREENE

So these are things that have nothing to do with search engines.

YOKY MATSUOKA

That's right. That's right.

ROBERT GREENE

Okay. And why did they recruit you?

YOKY MATSUOKA

I don't know. They just decided to . . . they really wanted to get people who think out of the box. So, I don't know. I didn't specifically ask, "Why me?"

ROBERT GREENE

I think I know. So, can you talk about any of the projects you're working on?

YOKY MATSUOKA

So I can't talk about any of the projects that haven't been public. So the only one that I can talk about is autonomous driving.

ROBERT GREENE

[inaudible 0:08:24]

YOKY MATSUOKA

Autonomous driving. And it's possible, again, before the book gets published, that there might be other projects that become mature enough to become more public. But there are a couple of other projects that are on the way.

ROBERT GREENE

This was sort of the upper level where you're thinking of what would the project be?

YOKY MATSUOKA

That's right.

ROBERT GREENE

What was the creative process? [inaudible 0:10:08] project, but was it something totally different for you, or was it similar to things that you'd done before in the past as far as thinking of ideas?

YOKY MATSUOKA

It's very different. That's why it attracted me to take the job, because it was . . . I knew that it was going to be a brand new learning experience that I would never have and could not get from most places with the kind

of resources that Google has. So basically, Google was willing to throw an amazing amount of money just to risk . . . basically, it's almost like, if we had 10 great startup ideas, but we just didn't have enough money to start, this would have been it. So that's sort of the way of thinking. What are the next waves of technologies that would really transform the world? So I think that's where the thinking process was.

ROBERT GREENE

Can you share the creative process or lessons that you learned as far as things that you can now adapt in your own projects?

YOKY MATSUOKA

Interesting. I think the decision making process is quite different for companies as to research. So, I was pretty surprised to know, when they say, "Let's do it." In research, to get to a point where we say, "Let's do it," it requires hard evidence why this is going to work.

ROBERT GREENE

Right.

YOKY MATSUOKA

And in companies, “Let’s do it” has a lot to do with when they want to ship or when . . . on sort of the marketing side, if it sounds kind of good, it’s just like, “Yeah. It sounds like it would sell. Okay, let’s do it.” The tipping point is quite different, which sometimes makes people very productive. Rather than, “Let’s think about it for three more days,” which is what we do in research. Or, “Why don’t you look a little bit deeper in this data to see if you find a little bit more before you really commit to do this.”

ROBERT GREENE

That’s not what Google does?

YOKY MATSUOKA

That’s not what Google does at all, right. So, I’ve learned a little bit, and I’ve probably adapted a little bit of that into my research, to move a little bit faster. And it’s interesting. It’s actually positive for my students, I think.

Whether it’s the right thing to do in research, I don’t know, but I feel more excited sooner than to say, “Mm, I don’t know. Maybe it’s not good enough. Maybe let’s just go a little deeper.” I just say, “You know what, this might be good. This is a great step. Let’s just publish this and then move on later.” So maybe there’s a little bit of a change because of it.

ROBERT GREENE

Being more open to experimenting with things that . . .

YOKY MATSUOKA

To me, it’s all about the decision process of how certain things have to be. I’m a very intuition driven person.

ROBERT GREENE

We’re going to be getting to that.

YOKY MATSUOKA

But in research, sometimes I have to hide that a little bit. I feel like intuition cannot be everything. Evidence is a lot. And so I start the seed with intuition, and then I really try

to dig deeper. In industry, it’s amazing how much is intuition driven, and decisions are made by intuition. So I sort of let go a little bit. That’s sort of more of a stylistic thing than anything else.

ROBERT GREENE

I guess you can’t share any of your intuitions about anything at Google, because that would reveal what the project would be, correct?

YOKY MATSUOKA

Yeah, I can’t. Yeah.

ROBERT GREENE

But what’s interesting is that you’re open to changing your style a little bit, your creative style or how you do your science. That’s a bit unusual.

YOKY MATSUOKA

That’s the whole point, right?

ROBERT GREENE

That’s what attracted you to Google in the first place.

YOKY MATSUOKA

Yeah. I think doing research is great. When I'm 70, I want to be a professor. But I don't want . . . I need a little more bumpy ride to get to that point, because just doing that in the same way for the next 40 years or 30 years . . . how old am I? 39. 70 is . . . 30 years? Yeah. So, it's not interesting. So I think definitely, to me, this is spicing up my life. It's just very different. And if this is absolutely fascinating and this is it, then I would ditch whatever I was doing and then move on.

ROBERT GREENE

It seems like you're very interested in having things that are actually done as opposed to just researching.

YOKY MATSUOKA

Yeah. Because it's all tied into changing how people live. So, research sometimes . . . and especially, I do research specifically thinking that it's a researcher's right to do things that's never going to become products. We can do

it. We're the only people who can do such things. So I purposely . . .

ROBERT GREENE

Say that again?

YOKY MATSUOKA

If I was working for a company, it has to generate income. And if you're a researcher, researchers are the only people who can actually think innovatively without ever worrying about whether it's going to become a product or not.

ROBERT GREENE

You mean like a university researcher.

YOKY MATSUOKA

Yeah, university research. Or even Microsoft research. They don't have to worry about that. Their product measurement is publications.

ROBERT GREENE

Really?

YOKY MATSUOKA

Yep.

ROBERT GREENE

Interesting.

YOKY MATSUOKA

Yeah. So I think that's something that I've taken quite seriously. So whenever I get in my research mode, I don't think about something that a company would be interested in just acquiring right away. But I want to do something that people 30 years from now would benefit. How can I change the direction of research? So that's how my research mode is, but that's not satisfying sometimes, because I'm not affecting people right now. So that's the result of my multiple spin-offs. So my non-profit addresses people now and building devices for them now, and then Google is the same thing, and then this company is the same.

ROBERT GREENE

Just for official . . . do we have a title for you in Google or anything like that? What did they call you?

YOKY MATSUOKA

At Google, my title was Head of Innovation.

ROBERT GREENE

Head of Innovation. And there were three of you that were . . .

YOKY MATSUOKA

Right. We all had some random name very similar to that.

ROBERT GREENE

So what about the startup? What can you talk about with the startup?

YOKY MATSUOKA

Yeah, so startup . . .

ROBERT GREENE

So you worked at Google for six months you said?

YOKY MATSUOKA

I was at Google for, maybe even longer. Eight months, maybe nine months. Somewhere around there. Not enough to quite cash in on the whole year. I just made the decision that I'm going to leave. I'm not going to wait.

ROBERT GREENE

It's not about money.

YOKY MATSUOKA

It's not about money. But yeah, so startup was almost like a very . . . so the Google experience was great. It was very diffused. So I'll talk about some area. Say I'm looking at transportation to real estate to medicine. Just a very, very wide area of coverage and different projects come out of different places. And somebody said so, and this person's important, so we'll take that as a project. Then, I definitely felt that desire to focus a little more, because I had that diffused primary job plus professor job plus running the center plus . . . all those. And then I had a non-profit. I had another startup on the side. So it was just like my brain was about to go crazy, and I really reached the point where I tossed all the balls up in the air, and then I basically said, "I can't catch it. I don't know what to do." So, I really sought for a big focus, and it could have been any

of the projects that we started at Google as well, just if I became the head person of that project, it would have been a similar thing. But I ran into an opportunity and got recruited by a company that was doing very focused technology. It's a consumer product technology that was basically one of the highest hyped Silicon Valley companies right now. So, we have consumer product. A lot of people are from companies such as Apple, who knows how to make beautiful consumer product. We are in the green energy space, which is very different.

ROBERT GREENE

Are you working on a specific project?

YOKY MATSUOKA

I am VP of Technology, so just sort of I oversee a lot of things, but specifically in the intelligence of the device.

ROBERT GREENE

In what?

YOKY MATSUOKA

Intelligence of the device. So this consumer product is . . . I can't tell you a whole lot of details, but it's very concrete, yet there's a lot of innovation that I could do to steer the product. I've never been in a situation where consumers, us, will be holding this product in six months time.

ROBERT GREENE

That's right. You've never had . . .

YOKY MATSUOKA

I've never done anything like that. Just feeling like, "Wow. People could be . . ."

ROBERT GREENE

You had your prosthetic, but that's not quite the same.

YOKY MATSUOKA

It's not the same.

ROBERT GREENE

No one's using it.

YOKY MATSUOKA

That's right. That's correct. So there's the feeling that every day, my mom, anybody,

right, those people can buy this thing and enjoy it, benefit from it, and save energy.

ROBERT GREENE

So you can't tell me what it is. Can you say the name of the company?

YOKY MATSUOKA

Nest.

ROBERT GREENE

Nest?

YOKY MATSUOKA

Yep.

YOKY MATSUOKA

It's been formed last year. It's very, very new.

ROBERT GREENE

Well, you didn't do this for the money, although there could be a big payoff at the end.

YOKY MATSUOKA

Yeah, it could be. Right now, it's just like no benefits, no nothing.

ROBERT GREENE

You're a risk taker.

YOKY MATSUOKA

Apparently so.

ROBERT GREENE

You came to stay in the United States without any benefits. So can you talk at all about the creative process there? Would you be able to without mentioning the product itself?

YOKY MATSUOKA

Sure. It's really satisfying. I just really love it right now. It's a group activity, yet individuals . . . because there are so few of us and also in the higher management level, too, we make pretty significant decisions ourselves. We talk about it in the group, and every meeting . . . often people say, "Oh, here's another meeting. It's going to waste my time." No meetings are ever a waste, because we actually make significant decisions every meeting. And then once the decision is made, we implement. And then we put it into a trial product and play with it. It's really exciting.

ROBERT GREENE

So you get to see the results really quickly of some of your ideas?

YOKY MATSUOKA

Yes. So, we make big decisions about how we're going to implement a certain thing. It takes me maybe three days of just abstract thinking plus another maybe five days of really writing it up, and then come up with an idea, talk about it in the group, maybe spend three of my engineers to implement it in the following week. So that's sort of the time. Very quick turnaround time.

ROBERT GREENE

You can sort of sometimes do things without being sure it will work out?

YOKY MATSUOKA

Yeah, that's right.

ROBERT GREENE

And you see if it doesn't work.

YOKY MATSUOKA

Yeah, to a certain extent, what I'm doing, which is make the device more intelligent,

there's quite a lot of uncertainty. It's a consumer product where consumers will interact with it. We can't predict everything about how people are going to interact with it. We have simulation to model that, but there's only so much we can do.

ROBERT GREENE

I know your title was . . .

YOKY MATSUOKA

VP of Technology. It's kind of meaningless.

ROBERT GREENE

But you're in charge of making it more intelligent, or the intelligence better.

YOKY MATSUOKA

Yeah. So, just sort of . . . yeah.

ROBERT GREENE

What part of your experience and your knowledge from the past is this drawing upon? Your knowledge of AI, of electrical engineering, robotics, the whole thing?

YOKY MATSUOKA

It's kind of the whole thing. It's not very specific yet. Of course specific math and

courses I taught, like controls to machine learning. All those specific details are extremely useful, but it's more . . . and sort of coming back to intuition a little bit, but I have a pretty good feel. If this is the only task I'm working on, my brain is working on this problem 24/7, and I really wrap my brain around it, and I get to a point where I say, "I got it. I have a full grasp on it." Then I have lots of good intuition, and those intuitions drive me to a place, and then now I'm in a position where I can let intuition be written up and then be executed into a product. So that process is really exciting.

ROBERT GREENE

But it's drawing upon all of your past knowledge in science and technology.

YOKY MATSUOKA

Yeah. That's right.

ROBERT GREENE

Okay. That's kind of what my next question was. I'm sort of following up on something you said yesterday. When you were a little

bit younger, and you were so focused on one thing, just doing one thing, you dream about it and think about it constantly. I just wanted to go into that a little bit more, because I think that's sort of when often the most interesting ideas come. Can you remember any specific instances of a particular project and that feeling of being so immersed in something that ideas just come to you out of nowhere?

YOKY MATSUOKA

Yeah. So, I can think of one, two, four instances already of that right now, only since grad school right now. I wonder if there are things like that as a kid. I'm sure there were. But so the four things since grad school. My master's thesis was like that. I had a notebook on the side of my bed, and basically I just thought about it constantly. It was the one thing I was working on. It was really exciting, and I'd jot it down. Same thing with . . . between master's and Ph.D., I actually worked for a startup as well. It was a small

robotics company. I was basically number two at the time, besides the guy who started it. He couldn't afford anybody else. He pretty much was shedding everybody, and when I interviewed, he basically said, "Look. I can't pay you, but can you start tonight?" [laughs]

ROBERT GREENE

You took it?

YOKY MATSUOKA

I took it.

ROBERT GREENE

Just for the experience?

YOKY MATSUOKA

Just for the experience, and then also I turned around the company.

ROBERT GREENE

Really?

YOKY MATSUOKA

Yeah.

ROBERT GREENE

What company? You can tell that name?

YOKY MATSUOKA

Yeah. And they were very grateful. It's called Barrett Technology.

ROBERT GREENE

Barrett Technology.

YOKY MATSUOKA

B-A-R-E-T-T.

ROBERT GREENE

Are they back in Boston?

YOKY MATSUOKA

Back in Boston. In Cambridge. And you're more than welcome to interview them. They're all family friends. They're just very dear.

ROBERT GREENE

And what kind of things do they make?

YOKY MATSUOKA

They make robotic arms and hands, which was perfect. It was an MIT spin-off. So a guy who got a Ph.D. . . .

ROBERT GREENE

Was this prosthetic or for industry?

YOKY MATSUOKA

Industry. Industry. Basically it became a research standard right now. So basically, if you're doing research with robotic arms, they usually own one of those things, which is pretty good. DARPA recently took it as the winner of all the robotic arms, so now DARPA ended up buying tons . . .

ROBERT GREENE

DARPA?

YOKY MATSUOKA

DARPA is Defense Army Research something, whatever. They're the ones who came up with Internet.

ROBERT GREENE

Internet?

YOKY MATSUOKA

Internet.

ROBERT GREENE

Who came up with that? Barrett?

YOKY MATSUOKA

DARPA.

ROBERT GREENE

Oh, DARPA.

YOKY MATSUOKA

Yeah. And also, have you heard of this thing called Grand Challenge, which is a drive across the desert? An autonomous car drove from L.A. to Vegas. Okay. So they basically invested . . .

ROBERT GREENE

I'm sure I have.

YOKY MATSUOKA

. . . in brand new technology that seems impossible sometimes.

ROBERT GREENE

DARPA.

YOKY MATSUOKA

DARPA. So, they are pushing the envelope of robotic arms, and so they're now having competitions of who can write the best program to get the robotic hands to do the most intricate things. And in order to do that, they wanted to provide a platform. So they chose this arm as a platform, so now DARPA

is giving this arm to all the people who are going to be in competition to . . .

ROBERT GREENE

This was something that you helped design or really did design?

YOKY MATSUOKA

Their hand is my product basically.

ROBERT GREENE

Okay. So you kind of turned the company around. You were a Ph.D. student.

YOKY MATSUOKA

I was a finished master's student and was about to go into the Ph.D., between my switch from robotics to neuroscience. So I did robotics, and I went to startup . . .

ROBERT GREENE

For your master's.

YOKY MATSUOKA

Yes.

ROBERT GREENE

And then for your Ph.D. you did neuroscience?

YOKY MATSUOKA

Yeah.

ROBERT GREENE

Oh, I didn't know that.

YOKY MATSUOKA

Well, not as a degree. If you read my degree, everything is electrical engineering, computer science, so you can't tell.

ROBERT GREENE

Okay.

YOKY MATSUOKA

So I didn't reapply to a new program, but I changed my advisor basically, and then the lab that I was working in and the subject that I was working on.

ROBERT GREENE

Okay. So, how long were you at Barrett?

YOKY MATSUOKA

Full time for six months, and then after that I've . . . basically, that's when I entered a crazy life where I was basically what's called part-time . . . when I was full-time, I was putting in 80, 90 hours to the company, and

when I went back full-time to grad school, I was still putting in 40, 50 hours to Barrett as a part-timer.

ROBERT GREENE

That's a pretty amazing story.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

It's amazing that these things aren't in any of these articles that I've been reading.

YOKY MATSUOKA

[laughs] That's true. Yeah. That's true.

ROBERT GREENE

There's much more that's not covered in these articles.

YOKY MATSUOKA

Maybe so. Maybe so, yeah.

ROBERT GREENE

So, let's focus a little bit on Barrett then. You were very young.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

23, 24?

YOKY MATSUOKA

24ish, somewhere around there, yeah.

ROBERT GREENE

And you were completely immersed in this, 90 hours a week. You had never developed anything like this before.

YOKY MATSUOKA

No.

ROBERT GREENE

No track record really.

YOKY MATSUOKA

Well, a robotic hand is something I did for my master's thesis. And then I got thrown into here where they said, "We're shipping product that doesn't work, and we know it doesn't work, and we're about to die. Please help."

ROBERT GREENE

Okay. So first of all, what is it exactly . . . your product, how was it that much different? I know a little bit about the hand that you

developed, but I guess I want to know much more.

YOKY MATSUOKA

So there are multiple hands. I probably could take ownership of maybe three robotic hands that have ever been built. One is my master's degree hand which is in a museum.

ROBERT GREENE

This was the Cog?

YOKY MATSUOKA

Cog. The second one is the Barrett hand. The Barrett hand is again this industrial robotic hand that has three fingers. Basically, they got a patent from UPenn, but they couldn't really make it work. But they had already promised some people that they would sell it, so they sold it, and then basically they were like, "Sorry. We're selling stuff that we know that it doesn't work." So I sort of went from all the mechanical systems to an electrical system and computers and just everything, just restructured everything and made it work basically.

ROBERT GREENE

And what was the third hand that you came up with?

YOKY MATSUOKA

The ACT hand, the anatomically correct hand that is most publicized.

ROBERT GREENE

So this was an instance of being completely immersed in something, night and day, dreaming about it. Can you think of any wild ideas that came to you in the process?

YOKY MATSUOKA

It's kind of the same thing as what I've been saying before. I don't dwell on things that have already been pounded on. I try to start fresh. I like starting from an entirely fresh perspective. So also coming from outside, it's much easier to do that as well. So there are many problems that they couldn't solve because they were in it so deep. I was able to start chewing from somewhere else and really solve the problems.

ROBERT GREENE

I see. Does it ever get to a point where you're also trapped in seeing the thing a certain way and you have to get out of that?

YOKY MATSUOKA

Even now in the current company, sometimes I feel like I know so much that I'm not thinking out of the box sometimes. I wish I knew less.

ROBERT GREENE

How do you change it?

YOKY MATSUOKA

It's pretty hard. So now I do it within my capacity, but it's not the same as when I didn't know.

ROBERT GREENE

It's a very interesting problem. I'm going to be trying to describe how other people have managed, like an Einstein or something. How he would completely shift focus and get back some of the outsider . . .

YOKY MATSUOKA

Yeah, that's so true.

ROBERT GREENE

It's very difficult.

YOKY MATSUOKA

It's hard.

ROBERT GREENE

Do you have any tricks for that?

YOKY MATSUOKA

I usually start with a blank sheet of paper, and I actually write down from a very high level about what this is all about. And I try to take different branches from where I am.

ROBERT GREENE

I see.

YOKY MATSUOKA

And really, I can't do this on the computer. It has to be paper and pencil.

ROBERT GREENE

Good, yeah. I agree.

YOKY MATSUOKA

Yeah. It's just very . . .

ROBERT GREENE

Do you know why it can't be on a computer? I think I know why for me.

YOKY MATSUOKA

To me it's the space, the visual.

ROBERT GREENE

Yes. And you can see different things . . .

YOKY MATSUOKA

Relationships that . . .

ROBERT GREENE

. . . more pages in the same time.

YOKY MATSUOKA

Yeah, precisely. So I have a 30-inch computer screen, trying to get closest to that, but it's just not the same.

ROBERT GREENE

It's not the same.

YOKY MATSUOKA

No.

ROBERT GREENE

When I research for my books, I read a book or interview, and as I read like a transcript of your interview, and then I put notes on the side. I put it all onto these cards, and for one book I'll have like 2,000 cards.

YOKY MATSUOKA

Oh, cool.

ROBERT GREENE

All organized with categories.

YOKY MATSUOKA

Great.

ROBERT GREENE

But people say, "Why can't you do that on the computer?"

YOKY MATSUOKA

[laughs]

ROBERT GREENE

You know?

YOKY MATSUOKA

No, can't.

ROBERT GREENE

You can't do it with a computer. There's no way.

YOKY MATSUOKA

Yep. I totally agree.

ROBERT GREENE

So, you force yourself to get outside and think differently. I don't know what I was going to

say. Give me a second here. All right. I forgot what it was.

YOKY MATSUOKA

I think we were talking about the startup and thinking outside of the box.

ROBERT GREENE

No, but I was interested in this idea . . .

YOKY MATSUOKA

. . . Einstein. A lot of people try to.

ROBERT GREENE

It'll come back to me.

YOKY MATSUOKA

Okay.

ROBERT GREENE

But one thing I've read, let's say mathematicians who face this problem, is they leave it alone, leave the problem that's driving them crazy, because they're too immersed in it. Then, two months later . . .

YOKY MATSUOKA

Oh, purposely.

ROBERT GREENE

. . . when they're not thinking about it, they get onto a bus or they're taking a shower, suddenly an idea comes to them. Is there ever anything like that?

YOKY MATSUOKA

I basically sleep on it, because I believe in memory consolidation.

ROBERT GREENE

What do you mean by that?

YOKY MATSUOKA

Meaning that the brain processes the information in a different way from just actively thinking about it and stores it in a local memory space. And I think once I sleep and then let those things process somewhere else, then when you think about it, it's a very fresh thought. So, it's always good to sleep on it.

ROBERT GREENE

If you want . . . you don't read much anymore.

YOKY MATSUOKA

Unfortunately no, but I like reading.

ROBERT GREENE

I have a very short book, not my own, written by a mathematician about these problems and everything I'm talking about. His name is Hadamard, a famous mathematician, Jacques Hadamard.

YOKY MATSUOKA

Okay. Yeah. If you can give me a reference, that's great. Because my husband is basically a mathematician. We always try to decode what it means to have a mathematical brain a little bit.

ROBERT GREENE

That's a whole other subject.

YOKY MATSUOKA

[laughs]

ROBERT GREENE

This is more about the heuristics part of solving problems. He draws upon this other mathematician named Poincare, very famous. And it's all about how sometimes you have

to use . . . mathematicians often are the ones that use a lot of their unconscious and the right hemisphere . And the math and music parts of the brain are very interconnected.

YOKY MATSUOKA

That's right. Yeah. That's very interesting. These days, some preschools play classical music constantly as a way to stimulate mathematical thinking, which is pretty funny.

ROBERT GREENE

I believe in it.

YOKY MATSUOKA

Yeah, and that's great. That's very good.

ROBERT GREENE

So in this immersion in Barrett, I guess I'll just ask you one more time, can you think of any kind of crazy, wild unconscious dream, like ideas that came to you out of nowhere?

YOKY MATSUOKA

That's all the phase when I used to have a notebook next to my bed, and without turning on the lights, I'd scribble my ideas. And sometimes I could read it, sometimes it

didn't make any sense when I woke up. But some of them were very easy to implement, and it solved a lot of problems. I can't remember anything concrete though.

ROBERT GREENE

That's fine. That's pretty amazing. Have you pondered that? How you're waking up from a dream and the problem was solved in your dream.

YOKY MATSUOKA

Yeah. Isn't that great? I even still do that, and it's often more of a . . . this company put me in the same place, which I'm really happy about, because . . .

ROBERT GREENE

Being more immersed.

YOKY MATSUOKA

Yeah. Just clearly, my brain is less busy with too many things. So I just finally have something I'm super excited about that the more I can grasp on it, the more ideas that I get . . . and the idea is rewarded, because it goes into product. So I think that

whole process has been great. And now this pregnancy, hormonal juice is flowing, I worry about all kinds of other things at the same time. But until that moment, it was every night, every shower, to the point that it was kind of funny, because I was so good at going home and completely not worrying about work and spending time with the kids. Then I started to get worse again. I realized that I could be sitting in front of my kids and thinking about work.

ROBERT GREENE

But that's when the best work is done though.

YOKY MATSUOKA

Possibly.

ROBERT GREENE

Unfortunately.

YOKY MATSUOKA

Yep. And my husband is like that. His brain never leaves work.

ROBERT GREENE

Yeah, I'm like that, too.

YOKY MATSUOKA

[laughs]

ROBERT GREENE

It's not good, but it [inaudible 0:44:34]. It comes with a price.

YOKY MATSUOKA

That's right.

ROBERT GREENE

It was interesting, because you saw that working at Google, sort of the person generally in charge of larger ideas wasn't really what you wanted. You like more of a hands on, making something kind of detail . . . no?

YOKY MATSUOKA

I think it was potentially more of an ownership thing as well. I felt I wanted to own it and then just really make a difference because of my daily technical thoughts or whatever it might be. I still like the idea of managing multiple projects and all those things. It's totally fine.

ROBERT GREENE

But this is sort of more your . . . suited to you.

YOKY MATSUOKA

Right now, it's totally fun. But I'll also, by looking at this guy, even though he is in the CEO position, he has done a good job basically doing the fun part of it. So, he does all the fun thinking. He puts the headset on and just thinks a lot on the paper and brainstorms, and then he didn't let that part go to somebody else. So he's not just the manager, but he let other people manage, and then he does creative thinking, which is really cool. So if I was ever a CEO, I'd like to be like him in a way.

ROBERT GREENE

The person that I'm writing about historically who's like that is Thomas Edison. He's sort of the icon.

YOKY MATSUOKA

Interesting. I just bought my kids a Thomas Edison book. It's really funny.

ROBERT GREENE

A book about him?

YOKY MATSUOKA

A book about him.

ROBERT GREENE

Yeah, he's an amazing character. Just typically American. Not educated at all, no degrees, nothing. Taught himself math, but he was an inventor that was very much involved with electricity and with Morse code, telegraph. And he ended up starting the first industrial park in history. No one had ever done it. Menlo Park in New Jersey. And all he did was think of ideas and come up with ideas and work on them like a mad man.

That's all he did. He created the light bulb.

He created the first movie camera.

YOKY MATSUOKA

That's so cool.

ROBERT GREENE

He was an insane genius. That's sort of what you would end up being.

YOKY MATSUOKA

That would be fun. Steve Jobs is another pretty amazing person. I learned about how he was an orphan, and he was adopted and he didn't get a college degree. But he's sort of taken a very interesting path, and he still in full control of the details of all his products.

ROBERT GREENE

Yeah. He would be somebody to interview, but I'd never get to him.

YOKY MATSUOKA

I see him pretty often, because he happens to come to the bakery in the Town and Country like every other day or something. I see him.

ROBERT GREENE

Does he know you? Do you talk?

YOKY MATSUOKA

No, but he's looking pretty sick these days.

ROBERT GREENE

Yeah. That's a shame.

YOKY MATSUOKA

Yeah. But anyway.

ROBERT GREENE

So there's this other idea in the book. It's a little bit hard for me to explain, but I'm going to try. And it's where I'm trying to connect the idea that what I call dead thinking and live thinking, thinking that's more organic and more related to life processes. And then there's kind of dead thinking, and dead thinking, using vague, abstract concepts that other people give you. They're not absorbed through your own process, through your own experience. They come from the outside. They have no life from within. And people [inaudible 0:48:36].

YOKY MATSUOKA

That's okay.

ROBERT GREENE

Do you get a sense of what I'm talking about there?

YOKY MATSUOKA

I don't have a concrete feeling, but keep going.

ROBERT GREENE

Well, one you get to know something really well and you're inside it and you study it very deeply, then you get a feel for it that's different from the outside, and it almost comes alive inside of you. It's more organic. Your connection to it is more like life is, which is indeterminate, chaotic, it changes, etc.

YOKY MATSUOKA

Sure. Okay. Makes sense.

ROBERT GREENE

Okay. So I'm thinking that your work with the hand is a little bit like this.

YOKY MATSUOKA

Sure.

ROBERT GREENE

So I wanted to talk a little bit about this. First of all, your interest in the hand, where does that come from? Does it come from something deep inside? Is it from tennis? Why did you choose, when you had the chance, you chose the hand? Was there any reason?

YOKY MATSUOKA

It's kind of many reasons in a way. One is, yeah, because it's related to tennis, but that's a very high level thing. The second thing is it's philosophically tied to humans. Humans are humans because of the way our thumb is attached in a certain way. And we perceive the way we do because we have hands with a sensation, and we can interact with objects. We can use tools, and we built this society because of our hand. So all of those things . . . yet it's so complex, yet we don't have any problem controlling them. So there's this . . . besides the brain, brain and hands are the biggest mystery part in the human body to me. So for that reason, it just seemed like a very interesting problem. I knew that I could keep digging all my life, and I might not get to the end even.

ROBERT GREENE

You mentioned yesterday that one-third of the brain is devoted to the connection to the hand?

YOKY MATSUOKA

The part of the brain that controls motion, one-third of it is controlling the hand.

ROBERT GREENE

What part of the brain is that?

YOKY MATSUOKA

Motor cortex.

ROBERT GREENE

The motor cortex?

YOKY MATSUOKA

Mm-hmm. Yeah. So it's quite a lot of the brain is devoted to the hand.

ROBERT GREENE

So, in your studies, have you come to understand something more about the hand than you've understood in the past? Do you have a greater feel for what makes the hand such an incredible feat of engineering? It's probably the most remarkable feat of engineering in nature almost.

YOKY MATSUOKA

Yeah. I think I definitely have the combination of the biomechanical to

materials to controls to neural controls and then object interaction and sensing. All of that knowledge is very rich. Yeah. I think I've definitely reached the point where I always feel like I know more than other people about hands.

ROBERT GREENE

About the hand?

YOKY MATSUOKA

Yeah.

ROBERT GREENE

Can you tell me anything exciting that you've discovered about the hand?

YOKY MATSUOKA

One example is we look at bones. Bones have bumps and grooves. Everybody's bumps and grooves turn out to be different.

ROBERT GREENE

On the knuckles?

YOKY MATSUOKA

All of them. So you take any bones. It doesn't matter. You could take chicken bones or whatever the bones. You eat one chicken,

and you eat another chicken, and put it next to each other. It's never the same. They're always different. Same thing with human hand bones, human any bones. Then you just have to wonder, what's the meaning of any of those bumps if they're always very different from one person to another. And it's such a detail that not a lot of people study about it. And as we were building an anatomically correct robotic hand, we weren't sure . . . we first built it with a simple cylinder, because it was the easiest, cheapest way to go. And the hand didn't work very well, because we built very realistic tendons that's guided by the surface shape, for example, of the bones. And then we found that, well, if we guide it on the cylinder, it just doesn't work. So then we started mimicking more of the realistic shape of the bones, realistic shape of the tendons, found some meanings to some of the bumps and grooves.

ROBERT GREENE

Like what?

YOKY MATSUOKA

Like the index finger, this bone, on the top, the knuckle actually has a bigger bump on this side than this side. And then that's actually a different shape, but everybody has it bigger on this side than this side. And that consistently gives . . . it's a bigger moment arm.

ROBERT GREENE

A bigger what?

YOKY MATSUOKA

Bigger moment arm. So it's like a pulley. If you're pulling something, and if the pulley is bigger, you can get a whole lot more power. It's the same thing. The bump is bigger on this side, so therefore, you can grasp objects in the middle of the hand more strongly. So with the same neural energy or muscle strength, you can grab objects easier in the middle of your hand than on the side of your fingers or other places. So it's optimized to grab objects in the middle of your hand.

ROBERT GREENE

Interesting.

YOKY MATSUOKA

Yeah. And that doesn't come from the fact that the brain figured out, "Oh. We all seem to grab thing in the middle, so the brain should have more neurons dedicated to that." It's not that. But the actual shape itself already accommodates for those things.

ROBERT GREENE

Yeah. What was I reading about recently, there's a writing about that from an evolutionary perspective. That the shape of something sort of determining how the brain responds to it. So, is that something that you . . .

YOKY MATSUOKA

Yeah, we found out from building it.

ROBERT GREENE

From building it or from studying?

YOKY MATSUOKA

Building it. Because we just didn't know. Because there are so many bumps and

grooves, which one do we study? How do we study it? What's the meaning of studying it anyway? So, we said, "We don't know. So let's just print it out, make it into a replica of a human bone shape," and there are several different ones.

ROBERT GREENE

You mean you discovered this through the robotic arm or through studying the hand?

YOKY MATSUOKA

Robotic hand.

ROBERT GREENE

But it ended up being true for the human hand?

YOKY MATSUOKA

That's right. Because we replicated the bone shape precisely as human.

ROBERT GREENE

Nobody had ever done that before, because no one's every tried to figure out exactly the reason for figuring out why the hand moves that way.

YOKY MATSUOKA

Mm-hmm.

ROBERT GREENE

That's interesting. So you've made all kinds of discoveries about the hand through this process.

YOKY MATSUOKA

Yeah. And many of the things that we said, cool, but we didn't necessarily publish. And then maybe some have huge significance in evolutionary biology, but we just didn't really go that way sometimes. And some of them we published.

ROBERT GREENE

And it's just because of the detail of the work that you have to do, where you're paying attention to things that other people haven't paid attention to. Is that more or less it?

YOKY MATSUOKA

Yeah. Building is a process that allows us to bump into problems that many people don't have to think about.

ROBERT GREENE

I see. That's an interesting idea. Have you discovered that in other things as well? When you have to build something, do you learn something about . . .

YOKY MATSUOKA

Yeah. Simulating or thinking or solving theory is never ever the same as actually building the real thing. Things in the world are condensed in a continuous world, and it's very, very different.

ROBERT GREENE

So this is what I mean about something coming alive. Now you're discovering what the living hand is like as opposed to an idea from the outside that isn't quite as organic.

YOKY MATSUOKA

Yeah, so many people . . . this is something actually that Rodney Brooks has believed very strongly and argued very strongly against Marvin Minski about, too. He calls it embodiment, and embodiment is extremely

important for solving problems, and I'm a true believer of that.

ROBERT GREENE

That's sort of what I'm talking about here. Okay, go on.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

Embodied knowledge.

YOKY MATSUOKA

Yep. You've got to do it physically. But I still find a lot of people, they say, "Oh gosh, Yok. You waste so much time building these things. You spend years and years and only got this far. In simulation, we could have gotten this in six months." And I say, "Well, that's great."

ROBERT GREENE

But what is Rod's idea of embodiment?

YOKY MATSUOKA

He thinks that . . . his idea against Marvin Minski was that if you don't . . . like AI, they were talking about consciousness and so forth,

right. So AI, if you give a computer program that sits there, not embodied, but give enough complexity, then just like humans, it should evolve its own consciousness. And Rod is saying, "It's not possible without having actual embodiment that realizes movements and sensing and experiencing life."

ROBERT GREENE

That's very interesting. Has Rod ever published anything that I could read about this?

YOKY MATSUOKA

I'm sure. It might be called "Embodied Intelligence" or something. It might be.

ROBERT GREENE

This is precisely kind of what I'm talking about. Embodied . . .

YOKY MATSUOKA

Embodied Intelligence. You can search for that. You can search for Rodney Brooks, Marvin Minski, argument. It's pretty famous for a lot of things. Consciousness.

ROBERT GREENE

And you're a Rodney Brooks student.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

And this is an example of it.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

As opposed to a simulation on a computer . . .

YOKY MATSUOKA

It's slightly different from talking about consciousness, which is more a philosophical aspect. So you need to actually experience through having physical being. And then that's one way. Another way . . . what I said is more scientific than that. There are many things that you can hypothesize through simulation, and maybe there are lots of things you can find much faster, and it would be a waste to do it by hardware. But there are plenty of things that you can only do in hardware that you cannot get . . .

ROBERT GREENE
By hardware, you mean actually building the model.

YOKY MATSUOKA
Mechanical, embodied, robotic system. Because those bumps and grooves, if you think about it, of course you can simulate it, but you won't think about it if you're starting as a simulation.

ROBERT GREENE
So for instance, this is an aside. One of the people I interviewed is an architect. I think he's probably the most interesting architect around right now named Santiago Calatrava. He's also an engineer, so he makes buildings that move, change shape, and things like that. He's one of the few architects, maybe the only one, who draws everything. He doesn't use the computer. And in drawing it, he discovers things about the building process, and he comes up with ideas which you could never possibly have known.

YOKY MATSUOKA
Yeah. That's interesting. It's interesting. I wonder as the generation moves on to our kids' age, who even in school, didn't even get to practice drawing as much, but all on the computer. When those people are innovating, things could be different.

ROBERT GREENE
What do you mean?

YOKY MATSUOKA
Like the kind of subtle details that we are talking about, they might not even care.

ROBERT GREENE
But they're losing a sense of the hand. Because the architect, Calatrava, the distance between the mind and the hand is much smaller than the distance between the mind and the computer screen. So, he gets a feel for things, and he uses his hand.

YOKY MATSUOKA
Interesting.

ROBERT GREENE
And the tactile sense is what the brain was designed for. It wasn't designed for sitting there, coming up with ideas.

YOKY MATSUOKA
Yeah. Yeah, that's pretty cool. Makes sense. I totally agree. Most recently I was touring a school, and then I heard that, "Well, modern math should not have to teach things calculators can do." And I felt really sad.

ROBERT GREENE
That's another argument in my book.

YOKY MATSUOKA
Really?
ROBERT GREENE
Well, because you need your brain to make mathematical . . . I always multiply large numbers in my brain just to exercise it.

YOKY MATSUOKA
Yeah, precisely.
ROBERT GREENE
[inaudible 1:01:40]

YOKY MATSUOKA

I agree.

ROBERT GREENE

We'll get to that a little later.

YOKY MATSUOKA

They exercise by texting seven people at the same time instead.

ROBERT GREENE

That's not the same.

YOKY MATSUOKA

[laughs] But it was funny, on the way here I was listening to NPR which was talking about young minds which are starting to work differently, because they are so into Facebook, Twitter, all those things that they can't even think without typing first. They can't be alone, because alone means they're trying to share their life through some other means. It's very interesting.

ROBERT GREENE

That's scary.

YOKY MATSUOKA

Yep. That's very different.

ROBERT GREENE

It's on my last card, because you had mentioned about making science cool for young girls and stuff. It's sort of related to an idea of mine. I'm going to get to that on the next card.

YOKY MATSUOKA

Sounds good.

ROBERT GREENE

So you've discovered things about the hand. Have you discovered things about the connection between the mind and the hand? The signals that go on? Or is that something that's just way too complicated to even talk about?

YOKY MATSUOKA

Yeah, it's pretty complex. We sometimes bump into these fields as we're doing . . . where students and I are discussing about things, and we start saying, "Whoa. This is like an entirely new field that we haven't even thought about." Suddenly start touching evolutionary biology. We didn't even think

we'd go that way. We're like, "Let's read about it. We don't know it." And we dig, and sometimes they say, "Oh, we found a ton of things. Lots of people are studying this." Or sometimes it's more like, "We could not find anything." It's either it's not interesting or it's just not there. Who knows? Or maybe it was interesting in the 1950s, but it's not archived very well. So in that sort of way, sometimes we bump into more philosophical side. We're actually studying how people manipulate objects. So if we close our eyes, with the hand, we actually manipulate objects and we immediately know what it is. And sometimes when we give some ambiguous objects, people do certain patterns of exploration, and then they sort of have some landmarks that they use. So we're studying that right now in our lab in terms of how do people explore objects? What are the landmarks people use? How do they reconstruct the objects by a combination of motion and sensing?

ROBERT GREENE

That's interesting.

YOKY MATSUOKA

Yeah. Again, I can't remember what we bumped into, but through that, we kind of realized that there's some philosophical thing that is merged with this whole way of exploration.

ROBERT GREENE

With the hand?

YOKY MATSUOKA

With the hand.

ROBERT GREENE

You're trying to decode the process of the signals being sent from the brain to the hand so you can kind of recreate them electrically [inaudible 1:04:57]. Have you made any interesting discoveries in that area as far as . . . or it is just simply numbers and equations?

YOKY MATSUOKA

Well, no. It's not all equations. Actually, I'm a very intuitive scientist. If I can't describe it in a very intuitive way, then it's not good

enough. If it requires 50 math equations, then it's not a discovery. That's sort of how I am.

ROBERT GREENE

You're like Einstein and Faraday and all of these great scientists.

YOKY MATSUOKA

[laughs] Well that's nice. So, we try to go for the simple explanation, but . . . we might have to come back to that separately.

ROBERT GREENE

I'm thinking of the other neuroscientist, Ramachandran and how they're trying to figure out the codes that the brain uses for various operations, almost like if you could figure it out, maybe 200 or 300 years from now, you would have some computer to kind of simulate things.

YOKY MATSUOKA

Sure.

ROBERT GREENE

But we're not near that point.

YOKY MATSUOKA

No. Yeah. For hands, yeah. I don't have a very clean example, but we actually turned out to do both what we called position control, so we care about where the fingers are, to force control, where we don't care about the position so much, but we care about the force of the finger. In theory, it turns out that going from position control to force control is a discontinuous space. You can't go from one to another so easily. But it seems like people are obviously doing it.

ROBERT GREENE

Say that one more time. The difference between what and what?

YOKY MATSUOKA

Position control . . .

ROBERT GREENE

Which is . . .

YOKY MATSUOKA

It is caring about where the tips of the fingers are, or if we're playing piano, we didn't care

about the force, but where the placement was. That would be like position control.

ROBERT GREENE

Okay.

YOKY MATSUOKA

Force control would be like, when you're playing piano, how strong to press the key. When you're holding an object, maybe where the fingers are is not as critical, but how hard you're holding is critical, because you would drop the object.

ROBERT GREENE

So what were you saying? That the mind can't process the two at the same time?

YOKY MATSUOKA

No, no. So, it turns out if you try to do all this math and the position control and the force control, there's discontinuous space. You can't go from one to another very easily mathematically speaking. And this has actually been a problem for the last 30 years that people have thought about. But humans seem to do this very elegantly, no problem,

and we're sort of one of the groups that's coming close to solving that problem.

ROBERT GREENE

Oh really?

YOKY MATSUOKA

Yeah.

ROBERT GREENE

Do you have any insights yet about that? So it would be like that . . . piano would be the perfect example, because there your position and your force, and obviously great pianists can do both brilliantly at the same time.

YOKY MATSUOKA

Mm-hmm.

ROBERT GREENE

You're trying to figure out how that works so that you can mathematically compute?

YOKY MATSUOKA

Yeah, basically.

ROBERT GREENE

Wow. Okay.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

Can you tell me anything more about that?

YOKY MATSUOKA

I don't know. Without . . .

ROBERT GREENE

You're not there.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

Okay. It's almost like you're going into things about life itself and how the body operates.

Are you uncovering any secrets or ideas about life itself?

YOKY MATSUOKA

[laughs] I have no idea.

ROBERT GREENE

In an Einstein kind of way?

YOKY MATSUOKA

Probably not. Not right now. But there are some . . .

ROBERT GREENE

Do you ever think about it? Do you theorize about . . .

YOKY MATSUOKA

Can we live forever, the mind can live forever kind of way?

ROBERT GREENE

No, no. Where you're kind of discovering something elemental about how life itself evolves or how things . . . because for instance, the hand is something that evolved . . . so six million years ago, we were basically living in trees, arboreal primates using our hands and our thumbs to climb, etc. And at some point, we left the trees and were living in the savannah, started hunting large game, and the hand came in use for . . .

YOKY MATSUOKA

Flipping rocks.

ROBERT GREENE

. . . tools and rocks. And for then three million years, this thing was evolved to where we have it now. Can you think of something where you're kind of uncovering something about that bit of history?

YOKY MATSUOKA

You know, it's pretty random. I'm not uncovering anything, but one of the feelings we have is that in order to be able to do the kind of things that we do, maybe there are other ways that the hand shape could have changed, and we still would have done just fine. But just that one mutation that allowed . . . like the fatness of the hand. Actually, the hand became more plump, and that actually alone allowed us to sort of be able to grip things better. Or just the differential of the finger length. It just seems so random, yet those things ended up sticking. And maybe there could have been totally different things that changed that might have reached the same point. So in a way . . . when I give talks, people ask questions like that and say, "Evolutionarily speaking, why don't we have six fingers instead of five? Why are you so fixated on imitating humans? Why aren't you trying to find the next step that is the ultimate manipulator that can do far better

than humans?" People ask these questions. I have my answers. I don't have necessarily good answers. But whenever people ask, "Why don't you build a human superior manipulator?" And I basically say, "That's not what I'm interested in. I'm interested in understanding humans. And also, objects in the world are built for humans to be able to manipulate the best. So there's no reason for me to develop superstructure."

ROBERT GREENE

What about the palm? Some discoveries about the palm.

YOKY MATSUOKA

Yeah. So basically, this is something that people like to really talk about, about my palm discovery. It was just, again, a random fluke. The field of robotics, before I really delved into it, had been building robotic hands for many years. In 1983, there was the first extremely sophisticated hand that doesn't look that different from my current hand that came out. But if you look at all those other

robotic hands, until very recently . . . now people are starting to mimic mine, so they're changing. But the palm part was always rigid, and the reason for building it that way . . . I did it exactly the same way the very first hand I built, too, because as I started designing it I said, "Okay. It's going to have fingers. The fingers are going to have multiple joints, and multiple joints have to move. So they have to either move by having a motor right there or have some cables that's wrapped around and a motor somewhere else." And when you start to do the actually mechanical design, the most obvious place for electronics and motors is right here. This is the first place you have space. So if you start putting it, you can't . . .

ROBERT GREENE

She's pointing to her palm right now.

YOKY MATSUOKA

Yeah. To the palm. And then basically, so, in order to put electronics and motors, you've got to have this part pretty rigid.

ROBERT GREENE

The palm.

YOKY MATSUOKA

The palm. So then the palm basically ends up being a little square rigid metal that has fingers growing out of it. And then finally, this mechanical hand, after they spent millions of dollars building it, they gave it to software engineers, and say, "Okay. Use this hand. Do something clever." And the software engineer tried to move it, and it's like, "Well, my pinky can't even touch my thumb." It's pretty hard to get this to do really clever things, so all they end up doing pretty limited things. Then they go on the shelf and they collect dust. So, I think it's sort of funny that often, the way that engineers think about problems doesn't allow you to go and say, "What's the real salient features of the human hand that allows us to be able to do the kind of things that we do?" So that's the way we start our design.

ROBERT GREENE

So most engineers think in terms of what?

YOKY MATSUOKA

Just sort of . . . so DARPA came up with this challenge a while back, and they said the team who proposes the best idea will win . . . at the end, they spent probably \$70 million on this. And then here's what we're going to build. 19 degrees of freedom, 19 different moving parts in the hand. Have to have five fingers, have to have this many joints, have to weigh this much, have to be this strong. That's how engineers think about it. But if you think of it from that point of view, it always ends up in a place that's different from how human hand's salient features are.

ROBERT GREENE

How is your approach different?

YOKY MATSUOKA

I didn't constrain the hand to have to have five fingers. I didn't constrain the finger to have to have so many joints. But I needed to know what makes the human hand more

dexterous, and I'm still decoding that thing. But one of the things that's pretty obvious is it has to have a flexible palm.

ROBERT GREENE

Flexible palm.

YOKY MATSUOKA

Flexible palm. So the palm cannot be the place where we place all the electronics, because doing things like this, clearly the palm is curved.

ROBERT GREENE

She's putting her pinky and thumb together and curving her palm.

YOKY MATSUOKA

Yeah. And then those things are very important. So we're basically trying to find out . . . if we had to come up with the top 10 most salient features that we have to mimic in the human hand, what is it? We don't have the answer, but we feel that that's the right 10 things to mimic. And then at the end of the day, if somebody said, "We can only have five moving parts," I can guarantee you it's not

going to be one per finger. It's likely going to be a lot more for the thumb.

ROBERT GREENE

I see.

YOKY MATSUOKA

And then maybe only a couple more fingers with one each or something.

ROBERT GREENE

You wanted to get more of how the hand itself actually operates.

YOKY MATSUOKA

Mm-hmm.

ROBERT GREENE

As opposed to the engineering idea of how many parts.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

To me, it's more like you're looking at it more from an organic point of view than a functional outsider point of view, just like it's a machine. You want to see how it actually lives.

YOKY MATSUOKA

Yeah. Engineers tend to care about what the end product is, and I care about discovering things along the way of building things.

ROBERT GREENE

That's exciting. What is your relationship to your own hands? Like tennis, are you somebody who likes . . . do you like building things?

YOKY MATSUOKA

I like building things. I like building things a lot, and people just pretty much blame that because I like building things, I'm building it. Because only crazy people would go this far to build such an intricate, crazy system. I definitely like designing mechanical systems and building them. It's definitely fun. At Barrett, one of the skills I had was I could solder the smallest things that only other Russian technicians could solder.

ROBERT GREENE

Oh really?

YOKY MATSUOKA

Yeah.

ROBERT GREENE

You do your own soldering.

YOKY MATSUOKA

Not anymore.

ROBERT GREENE

But you used to.

YOKY MATSUOKA

But I used to do everything when I was at Barrett. I used to do marketing to soldering to ordering to whatever it is. So I have this sort of dexterity level . . .

ROBERT GREENE

Where does the dexterity comes from? Because in tennis, you don't need a dexterous hand like that. It's more your grip.

YOKY MATSUOKA

I don't know. A lot of people blame that I grew up in an Asian country where they teach a lot of dexterity, but I think it might be genetic. My mom is very dexterous as well.

ROBERT GREENE

You play the piano?

YOKY MATSUOKA

I play piano. I knit.

ROBERT GREENE

Is this something that a woman is also better at as far as . . . I know my girlfriend is better at doing fine work with her hands that I can't do.

YOKY MATSUOKA

Well, looking at all those Russian technicians . . .

ROBERT GREENE

Their big giant claws . . .

YOKY MATSUOKA

Yeah. And they still do just fine.

ROBERT GREENE

Oh, they do fine? I see.

YOKY MATSUOKA

Yeah. So I think there's some precision training plus some genetic plus the shape of the hand, or who knows what? And also neural control as well. Like if you have a tiny

little tremor, you can't do that. So, I should have been a surgeon.

ROBERT GREENE

Well, don't you have time?

YOKY MATSUOKA

[laughs] Yeah. That's all right. I don't want to go back there.

ROBERT GREENE

So a theme in the book is the concept of craftsmanship, which seems kind of old-fashioned and fuddy duddy, but I don't want it to be that way. So the idea that for humans, the idea was to make things well. You had to go through your apprenticeship. You had to learn the information.

YOKY MATSUOKA

Interesting. Yep, yep.

ROBERT GREENE

And I want to apply that to the computer age. Not let this idea that I think is so brilliantly human and so important die out. Even a book or anything has to be crafted well. Do you feel that . . . I know there's a lot of science

and experimenting going on, but in actually making something that's really well made.

YOKY MATSUOKA

By hand? Can you actually sort of be more concrete about what you're asking?

ROBERT GREENE

Do you feel like it's a sense of craftsmanship in building your actual prosthetic hands? Is there an aesthetic element to this at all?

YOKY MATSUOKA

Aesthetic.

ROBERT GREENE

Aesthetic.

YOKY MATSUOKA

There's aesthetic, and then there's a slightly different craftsmanship thing, which is that because for something like hands, details matter so much that if you let people who don't pay attention to detail do some parts . . . like we had some undergrads who just wanted to get stuff done and get out. Things just didn't work, and it just really was poor craftsmanship. So that kind of things really

happened. But in terms of aesthetic . . . yeah. I mean, we're at the point where it's almost spooky. It's like a human hand without skin. So, during my talk I always give a dry joke basically saying, "You know, this hand, yada, yada. When you go home, just peel off your skin and take a look. It looks really similar."

ROBERT GREENE

Well eventually, are you going to put flesh on it or something?

YOKY MATSUOKA

Yeah. So we have a blue flesh right now. [laughs] It doesn't look any more human. But that's just the color . . .

ROBERT GREENE

I didn't mean aesthetic in the sense of how it looks. It's more in the sense that it's well made and it has the feeling of something that's put together well. Like a Mercedes as opposed to a Yugo.

YOKY MATSUOKA

It makes a seriously dramatic difference in terms of . . . unfortunately, I feel like I'm

not controlling it. I shouldn't be. I'm not controlling it as well, because I have to let my grad students build it. But that's one of the things that was critically important when I was building things myself. When I was doing my master's thesis and building a robotic hand, I could not let anybody else touch it, because I knew that I felt like I wanted to control it. Maybe it was a control freak thing, but I also felt like I could do better aligning things. I knew that little things like friction makes a big difference in controlling. Same thing when I started working for Barrett. I just controlled a lot of things, and I was the only person who was allowed to touch most of the things.

ROBERT GREENE

When you first worked on robots, I guess it was at Berkeley, had you ever made anything with your hands before?

YOKY MATSUOKA

Hmm. What do you mean by that? Making a sweater doesn't count?

ROBERT GREENE

The skill that you have of doing this, is this just something that you developed later in your life, or does it come from things in childhood?

YOKY MATSUOKA

I'm not sure. I'm sure I made a lot of things as a kid. I remember doing a lot of different art projects.

ROBERT GREENE

Origami?

YOKY MATSUOKA

Origami. Yeah.

ROBERT GREENE

I guess in the Asian culture, there is more use of the hands, isn't there?

YOKY MATSUOKA

Maybe. And then there's an encouragement of all those older toys. You have to do fine manipulation to be able to play.

ROBERT GREENE

One more questions about this hand stuff, and then I'm moving on. There was a thing,

you did an experiment I read about where you were testing the distortion people have who have lost a limb.

YOKY MATSUOKA

Oh, yeah.

ROBERT GREENE

I wonder . . . I asked you about if you had made any discoveries about the connection between the mind and the hand. I was thinking sort of more on that level, where our connection to our hand mentally . . .

YOKY MATSUOKA

You know what, if I can make an assumption about what you're going to say . . .

ROBERT GREENE

Yeah, yeah. Please.

YOKY MATSUOKA

We're getting back into it a little bit, meaning that . . . humans are amazing in that if we show you a virtual image of a hand, and as you move your hand, this hand also moved at the same time, you start to develop this feeling that this is your hand. And you poke

at it, and you actually feel the pain, even though it's not your hand at all.

ROBERT GREENE

So mirror neurons.

YOKY MATSUOKA

Yeah. Mirror neurons, and also it's called the rubber hand effect, so they call it. So one of my students, we were talking quite a lot about how to sort of incorporate all of that into our hand as well. So, just even from the belongingness of a certain thing, and then if that allows certain control to be much better. So if we can get to a point where we hook up people's muscles, and then they can control our robotic hand. But if they actually thought that it was their real hand, would they be able to control it much, much better?

ROBERT GREENE

I see. So you want to be able to maybe mimic those signals that give the sense that it is the actual hand?

YOKY MATSUOKA

Yeah. So start tricking them and start blurring those boundaries over time. There may be something that we can discover that we would never be able to discover if they consistently always thought that, “I have my own hand that’s controlling somebody else’s hand.”

ROBERT GREENE

This is very interesting. I should put you in touch with Professor Ramachandran, because that’s what he studies. It would be very interesting. You guys would have a really interesting discussion.

YOKY MATSUOKA

Yeah. Did he also study some childhood neuroscience related to how the brain develops? Anyway, I’m sure I’ve read his stuff.

ROBERT GREENE

He does mostly about phantom limbs.

YOKY MATSUOKA

Okay.

ROBERT GREENE

His first book was called “Phantoms of the Brain” I think. So he’s interested in the really, really strange neurological disorders and what they can tell you about the brain. So he started off studying people who have limbs missing and why they still feel pain as if the arm was there. And he’s done some marvelous experiments with mirrors where they actually see in the mirror their real hand in the position of their missing hand. And they can now move the missing hand, and they no longer have pain. He does these great experiments with it. He does things about what you were just talking about. He has an experiment where he can make you feel when you hit the table that it’s actually your hand.

YOKY MATSUOKA

Yeah. So maybe it’s his paper that we were reading . . .

ROBERT GREENE

Could be.

YOKY MATSUOKA

. . . that we thought of rubber hand.

ROBERT GREENE

I’ll get you guys in touch. You look tired. Should we take a little break?

YOKY MATSUOKA

I again have 3:00. So, for today, I only have about 45 minutes.

ROBERT GREENE

Okay.

YOKY MATSUOKA

How are we doing?

ROBERT GREENE

How are you feeling?

YOKY MATSUOKA

I’m okay. I can just keep going for 45 more minutes, but it’s sort of . . .

ROBERT GREENE

I probably won’t reach the end, but I’ll get very close.

YOKY MATSUOKA

Okay.

ROBERT GREENE

How do you feel about that?

YOKY MATSUOKA

So . . .

ROBERT GREENE

Or I can hurry and try to finish.

YOKY MATSUOKA

No. No, no, let's not hurry, but I don't need a break. Do you need a break? I'll stand up and I'll walk around two minutes so that my butt feels better. Blood circulation for all those things.

ROBERT GREENE

I can see what you're like . . .

YOKY MATSUOKA

It gets me. That's the only thing it gets. You know what, I'll go get that and I'll come back.

YOKY MATSUOKA

I hope you're not erasing.

ROBERT GREENE

Huh?

YOKY MATSUOKA

I hope you didn't erase the past.

ROBERT GREENE

No. Always a fear. That's why I have a backup.

YOKY MATSUOKA

[laughs]

ROBERT GREENE

The reason I did this is years ago, I worked in television in London. I moved to London, and I was like a trainee, and this company never had enough money. So the woman who ran it decided that I would pretend that I was the sound recordist for this television interview because she didn't want to pay for one. So she quickly trained me how to use the recording device and everything. Then we went to do this interview, and it was in her house. And I just acted like I was an engineer and did the recording. It was like five hours. Then we got back, and only the first tape came out. Everything else was completely blank. We had flown this man in from Hungary to do the interview. Because I didn't know I had the tape on backwards, I had to reload it.

So ever since then I've been paranoid about something like that.

YOKY MATSUOKA

Yeah. I would be, too. So, just a warning.

ROBERT GREENE

You have to go.

YOKY MATSUOKA

I have to go to a 5:00 meeting.

ROBERT GREENE

What time is it?

YOKY MATSUOKA

4:00.

ROBERT GREENE

Okay. One thing that I've noticed in my research, particularly people like Charles Darwin and others, is that it's not so much necessarily about IQ that makes people very successful or brilliant or creative. A lot of it has to do with some emotional qualities, like will power and persistence, determination, patience. You seem like a very determined person. Nothing will stop you. You want to get to where you're going with no particular

road in mind. Is that fairly accurate about you?

YOKY MATSUOKA

I don't feel that way. Internally, I feel like a softy.

ROBERT GREENE

You feel like a softy?

YOKY MATSUOKA

Yeah. I feel like I get influenced by little criticisms and things like that pretty often. But when I step back a little bit, I have always gone in a very stubborn direction.

ROBERT GREENE

So you're not easily discouraged.

YOKY MATSUOKA

I think I am, again locally. It's really funny how I feel and how I think I act to certain things doesn't necessarily reflect on the larger picture of the road that I'm on, if that makes any sense. So maybe it's an insecurity. But I don't feel like I'm determined. I have a path that I'm walking on.

ROBERT GREENE

You don't feel that way.

YOKY MATSUOKA

I don't feel that way.

ROBERT GREENE

Really?

YOKY MATSUOKA

Yeah. I'm really happy with the path I'm on, and I don't know where it's going to a certain extent. But so far, everything has come together, and I'm very lucky and I'm happy. It maybe sounds funny, but I don't feel like I describe myself as a very determined person.

ROBERT GREENE

I guess I would disagree with that, but you know yourself better.

YOKY MATSUOKA

No, no. I think what's perceived of me is different from how I perceive myself I think. And that's one place that somehow I don't feel like I'm very determined. I bet most of the people disagree with me.

ROBERT GREENE

When you want something, you seem to be pretty energetic and pretty focused in getting it.

YOKY MATSUOKA

I understand why you're saying it, because usually if I want something, I seem to eventually get it. But when I'm getting it, I don't feel like I'm determined to get this. It's kind of like, "I want it. Maybe I'll go a little longer. I want it. Maybe I'll go a little longer. Oh, I got it. Cool."

ROBERT GREENE

What's motivating you to keep pushing past these particular points? Do you ever get frustrated? Were there ever moments where you're not like learning or getting the results that you want?

YOKY MATSUOKA

Yeah. When those moments come, I sit and restructure my life. So, you asked another question right before that which is . . . you said, "What motivates me to get what I

want?" I think that comes from, potentially, the fear of death or wanting to . . . I feel like I'm here because I want to really change something because I existed in this world.

And that feeling is very strong. And now I feel like with a collection of things I've learned and gathered and can do, there are unique things that I can contribute that other people can't. That's where I look for.

ROBERT GREENE

Tell me what it is that you're . . . explain that a little more.

YOKY MATSUOKA

So . . .

ROBERT GREENE

It almost sounds like the initial idea of destiny that I was talking about.

YOKY MATSUOKA

Maybe, but I don't spin it that way in my head. Yeah, so now I feel like I might have more of a destiny. As a kid, it was like a big blob of who knows, this thing. But I definitely

feel like I'm now here because I'm going to make some impact that . . .

ROBERT GREENE

That's you're going to what?

YOKY MATSUOKA

I'm going to make an impact. And that impact is related to how other people live, and that could be through prosthetics. How people who might have daily difficulties in doing something, because I was here on this earth, those people are able to do something easier. All the way to encouraging younger girls who can make those differences in the world. There's a multiplication factor. If I can make people who think like me change different things, then that's great.

ROBERT GREENE

How long have you felt this way? How long has it been?

YOKY MATSUOKA

I don't know. It's hard to know when this shift has occurred. There's definitely a shift of, "I want to know more. I'm doing it for

me. Me, me, me, me," to eventually the shift occurred. There's no single event that I remember, but maybe in the last 10 years.

ROBERT GREENE

You have a sense that your time is short, and yet you want to accomplish as much as possible. Is that sort of a little bit of it?

YOKY MATSUOKA

Yeah. I think I want to live for a long, long time.

ROBERT GREENE

Because you talk about the fear of death.

YOKY MATSUOKA

Yeah. And also, productive time is short for everybody.

ROBERT GREENE

It is.

YOKY MATSUOKA

So, it's sort of one of those things that as much as I like to think my dad is extremely productive now, he's in the 70s and he's not. So that's not that many years from now. And I sort of think, okay, now I have to trace back

and say, “Okay, by then I’d like to be sitting back and enjoying some of the things.” I still will probably keep pursuing something that I’m very passionate about then, but now is the chance. So yeah, definitely there’s a sense of urgency, is the word I used. But there’s something that I want to make a big splash. Maybe there’s a part of the fame aspect as well, or ambition of something. But also definitely there’s a if it’s not affecting society, then I can’t just be a Hollywood star, because it feels like it’s not . . . some people do. But it’s not really affecting in a positive, scientific, enabling way.

ROBERT GREENE

Why would somebody get into science if they didn’t think that they were going to some day help people?

YOKY MATSUOKA

It’s very different though. Yeah. So if I asked my husband, for example, who is a mathematician at heart. Both of his parents are math professors. If I ask, “Why do you

like what you do?” He would say, “It’s like going to the gym and flexing muscles.” It’s just the satisfaction of what I can do, what I can prove that no other people could prove, gives him the satisfaction.

ROBERT GREENE

I see.

YOKY MATSUOKA

And a lot of people like that in the field.

ROBERT GREENE

But eventually either you lose that or it kind of has its limits. How creative are you with that? You tend to focus on one thing that you’re really good at. Instead of what you do, where you’re bold and moving onto a new field where you ultimately start over and keep expanding. People like, I don’t mean like your husband, but they generally stick to one thing because they want to just have that power that comes from being so good at that one thing.

YOKY MATSUOKA

Yeah. No, I think . . . when I change fields or when I change to different things, I try to keep all those ingredients together. So, again, it’s a puzzle. All those ingredients are little puzzle pieces, and I can fit them in a totally different way to more fit into something else. My startup is not on robotics at all, but I’m still using the same ingredients and making that very successful.

ROBERT GREENE

You’re very excited to talk about that. That’ll be tomorrow. I’m very curious, do you have a hunger for knowledge about new things and challenges and stuff? Studying the same thing over and over again probably would bore you.

YOKY MATSUOKA

Yeah. Definitely. I think so. I usually don’t describe myself as somebody very curious, but I think I really like learning. I think it’s like a lifelong learning. Once I’m older, I just want to still keep learning. That’s one of the things I definitely want to do. So, yeah.

ROBERT GREENE

Do you have a love for what you're studying?

YOKY MATSUOKA

Again, ultimately the love is anchored to the societal impact. So, do I really like building prosthetics? I can let that go, as long as it has the same impact on people who would use those things. So that's where my ultimate satisfaction will come from.

ROBERT GREENE

How about like making mistakes and learning from mistakes that you've made? Are you pretty good at that, or do you get discouraged by it? Are you willing to try things, makes mistakes, and learn from it?

YOKY MATSUOKA

I think, again, it's sort of like, my perception of who I am is that I'm a big chicken. I'm afraid, and I don't try as often as I should. But in the reverse way, I've been told that, "Man, you try so many things." So I think maybe I actually do try things, but I'm constantly afraid of failing.

ROBERT GREENE

So you . . .

YOKY MATSUOKA

Maybe I'll take that back actually. Because I don't regret. It's kind of funny. It's sort of hard to explain. So I'm afraid that maybe this is not going to work, but I still don't feel like going back and redoing something else. But making mistakes, I think I make a lot of mistakes, and then I get really afraid and I stay away for longer than I should and then eventually get back into it, or sort of use it in a very different way.

ROBERT GREENE

What do you mean?

YOKY MATSUOKA

So it sounds . . . I had another PhD advisor in neuroscience who basically told me that I'm a horrible writer, that I should never write. And every publication that I tried to write, he said, "Your science is good, but nobody can understand this stuff." So I got super discouraged, and I thought, "Oh boy.

I'm horrible. I'm horrible. I'm horrible. I'm never going to write." It basically gave me this writer's block. I just could not write anything, and I never went back. When I became faculty, I was very afraid of writing. In one way, it forever affected me, because I don't write publication as much. But I've gotten over the fear, because I had to start writing grants. So I padded up with multiple people. I hire people to read my documents and correct my stuff. And over time, people started saying, "You don't need me. I'm not correcting much. You're doing great." So over time it gave me confidence again. Maybe it was forced to a certain extent, but I just had a bitter feeling that I put it away. I restructured it and then tackled it again, and I was happy that I did it. And now I enjoy that aspect.

ROBERT GREENE

If you didn't have to write, you probably never would have done it.

YOKY MATSUOKA

I might not have, yeah. So I think I feel like maybe I get discouraged easily a little bit in that way.

ROBERT GREENE

Well you look at the history of scientists, like Einstein or more practical people like Edison, etc., they're constantly experimenting.

Einstein had a quote that he knew he was on the right path if his wastebasket was full of thrown away pieces of paper. The more mistakes and errors that he made, the more he felt like he was learning something.

YOKY MATSUOKA

Interesting.

ROBERT GREENE

Do you . . .

YOKY MATSUOKA

Yeah, I feel that way. So there's a most recent example of that. So I work with an executive, and I was super afraid of him, and because I was so afraid of him and intimidated by him, my work was not very good. And so I

rationally knew that he's not a scary monster, but every time I saw him, I just had this feeling of I can't say what I want. I have to have this perfect sentence which is not coming out. I really resented myself, and it was a big mistake and I just hated it. Now, in my startup I work with somebody equally famous and strong and equally opinionated and harsh, and I learned from that experience, and I said, "You know what? If I do the same thing, I'll fail again. I can't do it. So I'm going to be stronger than that." And I'm not afraid of this guy at all.

ROBERT GREENE

So you learned to overcome your fear and not be intimidated. What does that mean? Just talk more or stand up for . . .

YOKY MATSUOKA

I'm just not scared of him. It was a very conscious mistake that I could articulate, and I talked about it at home. I said, "I hate this about myself."

ROBERT GREENE

I see.

YOKY MATSUOKA

And then when I started . . . the startup gave me a new start with a new scary boss. It was like I said, "If I redo it, that's stupid."

ROBERT GREENE

The executive is scary? Intimidating?

YOKY MATSUOKA

It's like Jennifer Aniston. I would be totally scared of her as well. It's one of those famous person factors. Some stupid thing got in my head, and I just got really scared. He's a brilliant man.

ROBERT GREENE

He's probably the most successful person on the planet.

YOKY MATSUOKA

He's a brilliant man, so he asked a lot of hard questions. Again, this guy does, too. No big deal. Many people ask hard questions, and I usually don't worry about it. Something got in my head.

ROBERT GREENE

It's like the tennis when you were competing in the moment. It's your mind.

YOKY MATSUOKA

Yep. It was just like I said all the wrong things and I completely regretted it. I took everything that he said so negatively. I felt like a little ant.

ROBERT GREENE

My first book might help you. Not that you need help, but I'm going to send you the first book as well.

YOKY MATSUOKA

I'm looking forward to it.

ROBERT GREENE

Okay. How about with your science? How about mistakes and learning, experimenting, and finding?

YOKY MATSUOKA

I'm not afraid of making mistakes in science as much. It sounds really funny, but I feel like science is full of mistakes, and I'm not as afraid of it.

ROBERT GREENE

The creation of neuroRobotics, how did you come up with that? How did you end up in that particular area where you're combining these two fields that had never been combined before?

YOKY MATSUOKA

Initially, the reason why I even went to neuroscience at all . . . I kind of stayed away from biological science in general. And when I built this robotic hand that could learn to grasp objects, I sort of took all the current knowledge of AI to put it together, but I felt that there was a limit. I couldn't make the hand to be more intelligent without understanding how our brain controls this hand, which I had read enough literature to know that it's not enough right now. So I felt like, okay. I need to know more about what other people did, and I need to discover it myself. So that's pretty much how I got into it.

ROBERT GREENE

Why didn't anybody else think of that? I guess in robotics, they're not creating prosthetics that are supposed to be connected to the brain. Why were you . . .

YOKY MATSUOKA

Why was I the first to go into neuroscience?

ROBERT GREENE

Yeah.

YOKY MATSUOKA

I wasn't the first. There were plenty of people who studied AI and neuroscience. But it was not quite the same way.

ROBERT GREENE

Right.

YOKY MATSUOKA

Yeah, but my motivation was of course to build . . . study neuroscience so that I could improve robotics, so that I could build this tennis buddy for myself. So there was . . .

ROBERT GREENE

So you could what?

YOKY MATSUOKA

So that I could build my tennis buddy robot. So that was the initial motivation for learning neuroscience. As a way to improve . . .

ROBERT GREENE

Was this at MIT?

YOKY MATSUOKA

Yeah. It's all the way to MIT. All to improve the AI aspect. But in the middle of studying neuroscience . . . neuroscience is fascinating, and it's mysterious. You have a tiny little lesion in your brain, and you can't do many things. Yet some people are missing half the brain and can do tons. It's not an easy puzzle to solve. So I got extremely interested in it. And I started to feel like, maybe this is where I can make impacts easier than changing AI. So who's going to benefit from it? I'm going to benefit from it by having a tennis buddy. But who else? I started to feel like having this self doubt about where I'm going while I felt this incredible satisfaction by thinking, "Wow. All those people, I already have the robotic tools

to build them things that might enhance their lives. So why don't I combine it in a different way? It's still neuroscience and robotics." I was using robotics to help the neuroscience side, rather than the neuroscience helping the AI side. So that's where I sort of . . . because of my nature of wanting to combine all the paths into a single path, I think by the time I studied neuroscience and then had a robotics path, I wasn't going to abandon one or the other. I wanted to combine them. So I remember many days I doodled how I could combine them, in what field would that be possible? So I spent many months doodling in different areas. It could have been medical robotics. Medical robotics in the brain surgery kind of way, for example.

ROBERT GREENE
Do you know Catherine Mohr?

YOKY MATSUOKA
Mm-mm. Why?

ROBERT GREENE

She's here, and she does medical robotics. She's very famous.

YOKY MATSUOKA

Okay. I wonder, is she at a company?

ROBERT GREENE

She and her husband started their own company.

YOKY MATSUOKA

Is it called EmerGen?

ROBERT GREENE

I think so.

YOKY MATSUOKA

Okay. Yeah. I know the company. It's very . . .

ROBERT GREENE

She does laparoscopic . . .

YOKY MATSUOKA

Yeah. Okay. So the company is in San Jose, and it's one of the top companies now. They acquired other medical surgery companies, medical robotics.

ROBERT GREENE

She did robotics, and I can't remember where she was working in the '90s for some people doing kind of remote controlled cars. I can't remember quite what it was. And then she decided to go to medical school and become a doctor so she could combine just like you.

YOKY MATSUOKA

Yeah. That's cool.

ROBERT GREENE

So she could combine the two. Anyway, so what would be the difference between medical robotics and neurorobotics?

YOKY MATSUOKA

Medical robotics, depending on the definition . . . sometimes, when people say medical robotics, it's also including neurorobotics. But medical robotics in pure definition is a tool that's used during medical practice. So it's surgical . . .

ROBERT GREENE

And so what would neurorobotics be. It's connecting the brain to the actual robot?

YOKY MATSUOKA

Neurorobotics is an understanding, rehabilitating, or augmenting or sustaining or even enhancing neural function that, specifically for me, has consequences for moving and sensing. But that spans anywhere from pure robotics and building the fastest moving prosthetic hand to really doing very wet science of neuroscience. Like my closest collaborator, not collaborator, but the guy I sort of run the center with, he studies moths. Moth's brain. So a bug and how they can fly with such a small number of neurons. So they decode different sensor mechanisms that they have. Turns out little things that they poke out of their body, nobody knew what it was, but it's serving as a gyroscope. You know, all those really neat things, and that's connected to seven neurons, and then they're computing the gravity direction. All those really cool . . .

ROBERT GREENE

What would be the application of this to neurorobotics?

YOKY MATSUOKA

Right. So, similar mechanisms exist in humans. So, if you find that there is a certain mechanism that exists in a certain part of the brain, then you can then either correlate that to a certain disease, like Parkinson's, they lose balance because they're lacking this specific area in the brain. Or there are many reasons to study very primitive neuronal activities as a way to infer information about how humans work. As well as, this is sort of part of . . . now, we're defining neurorobotics larger and larger as we go, which is great. One of the areas is brain controlled devices. Not just prosthetics for their personal benefits, but airplanes that are controlled by the brain. So now, they can go to war with no humans in it, but they're not remote controlling. They're immersed from the brain's point of view in this flight, and they're actually . . .

ROBERT GREENE

How does that work? You mean like a drone.

YOKY MATSUOKA

Yeah. It's controlled by the brain completely.

ROBERT GREENE

Whose brain?

YOKY MATSUOKA

The soldier who's not sitting in the airplane.

ROBERT GREENE

So we're talking about like a virtual . . . what do you call it? Virtual reality?

YOKY MATSUOKA

Yeah. Matrix, right. So you plug in your brain . . .

ROBERT GREENE

Is that what this is leading to?

YOKY MATSUOKA

This has a path of . . . so there's a group who's studying fish swimming, autonomous flying for surveillance reasons and then taking some of the knowledge . . . also from the control aspect as well as physiological neural control of sensors and mechanism aspects that go into the mechanism that go and do surveillance.

ROBERT GREENE

What is the connection between the brain and the . . . well, we're getting to technical . . .

YOKY MATSUOKA

There are multiple ways. One is just studying that connection of how neural computation occurs, you can mimic that in an AI sense and then build better devices. So that's one.

ROBERT GREENE

Very exciting.

YOKY MATSUOKA

Yeah. So that's one. As well as neural control, which the military is very interested in.

ROBERT GREENE

What would neural control be?

YOKY MATSUOKA

So, neurally controlled soldiers who are not human beings, so people don't have to die. We can't make robots that move like humans, but humans can control a robot to move like that from their brain.

ROBERT GREENE

I read about an experiment you're doing with a monkey where you have the prosthetic arm, and you're trying to figure out the signals that the monkey [inaudible 27:06] with the computer so he can actually move the arm.

YOKY MATSUOKA

That's right.

ROBERT GREENE

Is that part of the same thing?

YOKY MATSUOKA

Yeah. It's totally the same thing. So in this one, the monkey has a chip in the brain which is recording from 100 neurons. And then the monkey initially is trained to reach with their own arm for food and then eating it. And then we find correlations related to that motion from that part of the brain. Then we tie his arm out, so he can't move his arm, and we get a robotic arm that's placed in the same spot and present food. Then now, the same control is connected to the brain to the robot, and from what we've learned so far, we

can try to control it hoping that he's thinking about reaching with his own arm.

ROBERT GREENE

Has it worked?

YOKY MATSUOKA

Yeah, it works. And he also gets feedback. So as he thinks about it, the robotic arm moves to the right direction, so he gets reinforced that, "Oh, I see." He's not consciously thinking about this, but he activates the brain in the same way that he used to, to control his arm.

ROBERT GREENE

How does it connect to the prosthetic?

YOKY MATSUOKA

It's just electric signals from the neurons amplified, and they go to the motors of the robot.

ROBERT GREENE

Wow. The motor can read these signals.

YOKY MATSUOKA

Sure.

ROBERT GREENE

It can tell the difference between signals.

YOKY MATSUOKA

We encoded for it, but yeah.

ROBERT GREENE

I see. This is a whole other level. So the prosthetic arm that you would be creating, for instance, signals . . . as long as they still have feeling there . . .

YOKY MATSUOKA

It could be an entirely different embodiment.

Now this leads to sending a robot to Mars.

You're on Earth, and you could simply imagine being this robot moving, exploring, picking up a rock. Same thing. It's just that you're creating a set of commands that normally controls your body.

ROBERT GREENE

Did you come upon this field, was this sort of by chance that it opens up into all these areas that are exciting all these people?

YOKY MATSUOKA

Yeah. It just turns out to connect. Thanks to MacArthur, because I'm getting so much publicity, people are getting connected into this train a little bit.

ROBERT GREENE

I see.

YOKY MATSUOKA

So other fields, like this whole neural control of prosthetics, I didn't create that. There were people who were already talking about it.

ROBERT GREENE

There were.

YOKY MATSUOKA

Yeah. But now it's bundled into this field. So it's just sort of, I'm the first ant who's eating a yummy part of the bread, and not other people are like, "I'm eating a very similar part of the bread. Why don't I ride your train?" It seems like I get more publicity that way. So there's a little bit of that.

ROBERT GREENE
Are there any things that you can point . . . we're getting near the end. I want to make sure that you have time to get . . . it's 4:30.

YOKY MATSUOKA
Yeah, that's okay.

ROBERT GREENE
About 15 minutes?

YOKY MATSUOKA
Yeah. It's 10 minutes away, so no big deal. 15 minutes, that's good.

ROBERT GREENE
That you would consider a discovery of your part. It's more like this is something that you created, so I can understand part of your mental process that led to this. You know the word heuristics?

YOKY MATSUOKA
Mm-hmm. Yep.

ROBERT GREENE
I'm trying to figure out, like, what are your heuristics for solving a problem or discovering something or inventing something.

YOKY MATSUOKA
Almost like . . . yeah, okay. It's funny. We use heuristics maybe in a slightly different way.

ROBERT GREENE
I know it's in computer talk.

YOKY MATSUOKA
Yeah, maybe. So, I use it probably 20 times a day in my current occupation.

ROBERT GREENE
For programming.

YOKY MATSUOKA
Specifically meaning we hard code. So, when I say machine learning, there's a probabilistic aspect. So, say the probability that I didn't send you an e-mail, yet you would show up to Palo Alto is 90%, say. So, based on that, there are a lot of actions that I can make based on those probabilities, and that's sort of how we might function. So we can actually let the computer, knowing some probabilities, make its own decision. Or we can actually just hard code it to say, "If Robert shows up, then we will go to the hotel." Just all those . .

. that's called heuristics in computer science. So distinguished from things we just let the computer figure it out.

ROBERT GREENE
The word predates computers.

YOKY MATSUOKA
Of course, of course.

ROBERT GREENE
It generally means a method that a person uses to solve a problem, to figure something out. So there are logically 30 different heuristics that scientists could use.

YOKY MATSUOKA
It's like a recipe sort of.

ROBERT GREENE
Yeah.

YOKY MATSUOKA
Yeah, I knew what you meant. It's kind of interesting that I use it so often for a slightly different way.

ROBERT GREENE
So here's an example. When I asked Ramachandran, he says his greatest

discoveries come from jokes. He tells his students something that he thinks is completely ridiculous, and then he realizes that there's actually something there that's logical, maybe it came unconsciously. Then he tries to figure out if there's something to his joke.

YOKY MATSUOKA

Interesting.

ROBERT GREENE

And then he figures it out. I don't know. Each person has their own method.

YOKY MATSUOKA

I see. Interesting. Yeah, I don't know. I don't know what . . .

ROBERT GREENE

What would be a specific discovery or invention or problem that you solved?

YOKY MATSUOKA

It sounds really funny, but what matters in discovering things is the very high level structure of discovery as well as extremely narrow, specific things, and maybe not in the

middle. So for example . . . it's really hard to articulate somehow. But I'm usually pretty high level, connecting dots, obvious big dots, and then sort of bringing them together. A way of thinking, yet the kind of discoveries I've made so far are related to details that nobody paid attention to, and that makes a big difference in the overall function. So you know . . .

ROBERT GREENE

Can you give me an example?

YOKY MATSUOKA

Yeah, I'm trying to come up with something.

ROBERT GREENE

That's very interesting.

YOKY MATSUOKA

Yeah. Yeah. I don't have very good examples right now. I can give you one not so good example. People are having a hard time trying to understand how the brain controls the hand. People have had a relatively easy time figuring out how the arm moves, it turns out, but not the hand. And no hypotheses

from the arm or leg has transferred to the hand so far.

ROBERT GREENE

Neurologically?

YOKY MATSUOKA

Neurologically. Neurosignals. A third of the brain is related to hand control, or a third of the area that controls movement is related to the hand. So it's a pretty intense place.

So there's something to it. As we start to really delve into the details of why the hand is so different, we're finding a lot of detailed biomechanical differences that don't exist anywhere else in the body. And all those little things. Everything makes sense, like why the brain cannot control the hand in the same way as the arm. That's in the shape of the bones, the way the tendons are routed, all those little details turns out to really matter in how the brain controls this device, the hand. So that's just very detailed, yet it's sort of related to the very high level of why these small details people haven't paid attention to

are the reasons why we cannot generalize the theory.

ROBERT GREENE

So people weren't paying attention to this?

YOKY MATSUOKA

Yeah. If you start from here, you want to delve in a little bit from there and see if you can get there, rather than a bottom up approach and just trying to get there. So anyway, I feel like because I'm starting from an entirely different part, a different way of thinking about it, that I got somewhere where a lot of people couldn't get to.

ROBERT GREENE

And what was the entirely different way of thinking about it? Looking at the hand as opposed to the arm?

YOKY MATSUOKA

Instead of trying to work off existing neural models that other people have shown to work and trying to find derivatives, like small changes of that to see if you can make it work for the hand. I said, forget about that. That

probably doesn't work, because it's an entirely different mechanism. Why don't I start looking from the detailed mechanism and then show that because of those details, why certain models cannot work.

ROBERT GREENE

This is very interesting. Now I understand. So is this something that you do for other things? Is this generalizable? Is this another approach, or is it just sort of an anomaly?

YOKY MATSUOKA

I'm not sure. I have to think about this a little bit, but something that generalizes that I know right away is starting from somewhere that other people haven't started from.

ROBERT GREENE

Exactly.

YOKY MATSUOKA

So whether that's about details or whether it's something else, I don't know. But I always . . . if a lot of people are chewing on it already, I say, "I don't want to go there. Let me start

from somewhere else to see if I can solve their problem faster."

ROBERT GREENE

That's very interesting. I know it's hard, but can you think of any other examples of you doing that, beside the hand? That was a perfect example.

YOKY MATSUOKA

Okay. I'll have to think about that a little bit.

ROBERT GREENE

So, with the connection with the hand versus the arm, most people are kind of following what others have done as far as mapping out other areas that are easier to map out, like the arm and the leg and trying to apply that to the hand. That seems to be a more fruitful area, or it's easier to apply something we already know. You're going to go and look into something that hasn't been looked in before. What makes the hand different?

YOKY MATSUOKA

And I might not get to the right place.

ROBERT GREENE

But that's your approach.

YOKY MATSUOKA

That's my approach. And then that's . . .

ROBERT GREENE

That's definitely a heuristic.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

I just wanted to know if there are other examples.

YOKY MATSUOKA

Yeah. There's another one. There's a company that makes commercial prosthetic hands. They approached me and said that one of the things they're struggling is that they built the most sophisticated moving hand, yet they don't know how to utilize the sophistication. Right now, even the fact that they can do this, they're still only doing this. And can you give us some insights with current . . . not the research way. But given that there's only about one or two muscle

activity ports that they can use, is there a way to maybe tell in advance that I'm reaching out like this? Two fingers versus five fingers to grasp. Is there any way that now they can really start to utilize the fact that they packed in a bunch of motors? They were like, "Can we decode the signals in this way, that way?" And I said, "Well, maybe we shouldn't look at the neurosignal." Everybody looked at that and they couldn't do it. So I said, "Well, why don't we start from an entirely different place. Look at the general pattern. If we paid attention to maybe . . ." So if the approach is like this, can we actually know that there's usually a five finger grasp? If somebody is going like this, is it usually grasping or is it pinching? If they're reaching up for something, is it usually pinching? Sort of that level. And then we run experiments, and it was pretty clear that just observing how this length moved and then observing acceleration, velocity . . .

ROBERT GREENE

Just to say on the recorder, she's pointing to the elbow area.

YOKY MATSUOKA

Between the elbow and the wrist.

ROBERT GREENE

Between the elbow and the wrist, how it moves completely together.

YOKY MATSUOKA

Yeah. So, just simply tracking that position, velocity, and acceleration, it turned out it gives us a nice mapping of what the hand gesture is going to be next. So, they have that in product now. They released it a year ago.

ROBERT GREENE

That's fantastic. That's a great example.

YOKY MATSUOKA

Okay. Good.

ROBERT GREENE

What is this arm used for? What is it used for?

YOKY MATSUOKA

It's a prosthetic hand for people who are missing hands.

ROBERT GREENE

And how are they controlling it?

YOKY MATSUOKA

They're controlling it from the residual muscle activities on their stump. So they have a little stump, and then some muscles that are still around it, they put two electrodes on the surface that gives electrical signals. So then, by sort of flexing their old thumb muscle or old pinky muscle, they get used to it. So they're differentiating and they can grasp objects.

ROBERT GREENE

Wow. But the prosthetic arm you're making is going to be a little more sophisticated than that.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

It's got everything. It could play the piano.

YOKY MATSUOKA

That's right. So mine is targeted for a very different audience.

ROBERT GREENE

But that was an excellent example.

YOKY MATSUOKA

Okay. Good.

ROBERT GREENE

That's a classic scientific heuristic of what they would call reframing the problem. So you look at it in a completely different way from a different angle, which is the same thing as you did with the first example you gave me. So that's a great example.

YOKY MATSUOKA

Okay. Good.

ROBERT GREENE

Have you ever had any aha moments? Like you woke up in the morning, and "Ah, that's the answer," kind of thing? Or is your work too grind out day by day work on things?

YOKY MATSUOKA

I used to have those moments before kids and also serious multitasking started to happen. So in grad school and in post doc time, all those times. The field of neurorobotics, I used

to think really hard, "How can I combine all of these things?" And I remember having dreams about it, thinking about it in the shower.

ROBERT GREENE

You'd wake up . . .

YOKY MATSUOKA

I'd wake up and then, "Oh, I have to write all these things down."

ROBERT GREENE

Can you remember anything in particular.

YOKY MATSUOKA

No, but I remember often in the dream going, "I have to remember this. This is it. I've figured it out." And I would say, "There are three ingredients. I'm going to forget everything but the fact that there were three things." And I even say in my dreams, "Okay. First ingredient starts with M. Second ingredient starts with E. Last ingredient starts with S. Now I go back to sleep and I'll remember it tomorrow."

ROBERT GREENE

And you did?

YOKY MATSUOKA

It's really hard sometimes. Sometimes what I totally figured out in my dream doesn't make any sense in real life. So it happens.

ROBERT GREENE

But sometimes it did turn out right.

YOKY MATSUOKA

Sometimes it's been useful, yeah.

ROBERT GREENE

Did you ever wonder why, how come?

YOKY MATSUOKA

I don't know.

ROBERT GREENE

It's a common theme among mathematicians, particularly mathematicians.

YOKY MATSUOKA

That's probably true, yeah. I used to have a notebook by my bed, and with no lights, because turning on lights would wake me up too much, I would scribble. I probably have

some scribbles that I kept. I used to come up with all kinds of interesting ideas.

ROBERT GREENE

That's part of the reason why scientists generally don't last past their 30s, because when you're younger, your mind is so focused on one thing. You don't have other distractions, and that focus allows you to be extremely productive and creative.

YOKY MATSUOKA

That's true. What's funny though is that my life has been, because I don't close doors and I take on too much . . . so I became basically multitasking. I'm a mother with three kids and a professor, and I have a non-profit, and I have a for-profit. I was just doing way too many, and I couldn't think of anything. So in the dream, I stopped thinking about any of those things, except maybe I worried about my kids or something. I just got to a point where I felt like I tossed all the balls up in the air, I tried to catch them. Sometimes I catch them. I toss them back again, and I go, "Oh

no. This time I'm definitely not going to catch it." So I reached the point where I couldn't catch all the balls. I just definitely tossed way too many balls up. I had to stop many things. So when I moved to startup, I actually made other shifts in my life to be able to really think about my startup issues. Now for the first time in a long time, I dream about this specific problem that I'm working on now.

ROBERT GREENE

So you got rid of all those other distractions, and you're focusing basically on the one thing, the startup.

YOKY MATSUOKA

I gave my startup to my student. I'm letting somebody else . . .

ROBERT GREENE

You gave your startup to your student?

YOKY MATSUOKA

Yeah. My student who graduated who developed quite a lot of the IP, my small company that's doing stroke rehabilitation. I let him run the company now.

ROBERT GREENE

Oh, your other startup.

YOKY MATSUOKA

Sorry.

ROBERT GREENE

Not this other one.

YOKY MATSUOKA

Not the one that I'm currently working on, but yeah, I have too many things. But yeah. So the one that I started in Seattle, I let my student . . . I said, "You know, I'm going to be really hands off. It's your company. You run it." And then, I made dramatic changes in a few things, and it feels good. It feels good to finally, again, go back to the place where my brain is constantly thinking about this one thing.

ROBERT GREENE

We're going to get to that tomorrow. The last question is are you someone who thinks visually? Do ideas come to you as sort of an image or a model? Do you have a dominant way of . . .

YOKY MATSUOKA

It's a fuzz. I'm probably pretty visual. You know what? I might take that back. I see one of my daughters to be far more visual than I am. Ideas, it's almost like those psychedelic color mixes? It's almost like that for me. It's a very fuzzy cloud of a mix of things inside. It's not like a certain visual image, but it's not words either. It usually takes some time to articulate it into words or something very concrete.

ROBERT GREENE

If it's not an image and it's not words, what would it be?

YOKY MATSUOKA

I don't know.

ROBERT GREENE

Is it a feeling?

YOKY MATSUOKA

To me, I always call it the fuzz, because I can't describe it yet.

ROBERT GREENE

And the fuzz is just a mix of . . .

YOKY MATSUOKA

It's just like I figure it out, and I know what it is, but I cannot articulate it for you yet, and I can't write it for you yet either because it's not visual.

ROBERT GREENE

How does this come to you in the fuzz?

YOKY MATSUOKA

I don't know. Just throughout the thought process, which also becomes nonverbal at some point. Yeah, it's weird, but it's often non-verbal, non-visual. There might be actually something visual that's associated with it, but I'm . . .

ROBERT GREENE

So if it's non-verbal and non-visual, I'm wondering whether . . .

YOKY MATSUOKA

But it's like memory. Memory is a combination of smell and visual and sound and all the sensory combinations. It's not just visual. And I'm a very memory driven person. I remember a lot of . . . everybody

says I'm an elephant. I just remember and then connect all those memory events, and all those things are sort of part of my . . .

ROBERT GREENE

A smell wouldn't come much into place as far as your discovery.

YOKY MATSUOKA

For me, I am. But yeah, discovery of science, you're right. But my brain, I'm very smell driven. So my memory has a lot to do with smell, which maybe anybody can relate to, to a certain extent. So to me, it's this funny sensory feeling that I cannot describe.

ROBERT GREENE

As far as Ramachandran in neuroscience, which you know more about than I do, but this is hyperconnectivity. He studies synesthesia and how things cross over. And great artists and a lot of geniuses have a form of synesthesia, and parts of their brains that are connected aren't for other people.

YOKY MATSUOKA

Interesting.

ROBERT GREENE

It has to do with childhood where more parts are connected usually so that we can learn languages.

YOKY MATSUOKA

That's interesting. So one of the . . . I'm sorry. I didn't mean to . . .

ROBERT GREENE

No, no, no.

YOKY MATSUOKA

One of the ways my dad really contributed to how I learn is he told me how to use my brain. So when I was learning geography or different topics, he said, "Treat your brain like drawers."

ROBERT GREENE

Like drawers?

YOKY MATSUOKA

Drawers. And you remember which drawer that you store information in, and then you visualize where it is, and you label them.

ROBERT GREENE

He taught you mnemonic devices.

YOKY MATSUOKA

Maybe. It's really interesting. But you label them, and you remember where you store it, and then you sort of treat it like a storage space. Those little funny ways of utilizing the brain really helped.

ROBERT GREENE

Also, you're really kinetic. Probably a lot of things have to do with motion, right?

YOKY MATSUOKA

Yeah. Kinetic. Yeah.

ROBERT GREENE

Maybe there's something with that as well. I'm wondering, if you are someone with a higher long-term memory than other people, I wonder if it's genetic or if it's something that's developed.

YOKY MATSUOKA

Yeah. I think so.

ROBERT GREENE

But is memory genetic? I don't know.

YOKY MATSUOKA

It must be. I think my dad remembers everything, and I remember everything. One of my daughters remembers everything.

ROBERT GREENE

I just want to make sure you get to your thing.

YOKY MATSUOKA

Yeah, maybe I should get started soon.

ROBERT GREENE

You have nine minutes. You should go.

YOKY MATSUOKA

Oh yeah, okay. But anyway, yeah, I think it has played a significant role in how my memory works and how I learn.

ROBERT GREENE

But we don't know, because he was emphasizing it so much when you were younger and putting such emphasis on it, teaching you about the drawers, that that led to having more exercised memory. It could be genetic.

YOKY MATSUOKA

Yeah. It feels like it's genetic, and it feels like he did it because he already knew that I remember things. But who knows.

ROBERT GREENE

We'll never know.

YOKY MATSUOKA

Yep. We'll never know.

ROBERT GREENE

Okay. So, I'll let you go.

YOKY MATSUOKA

Thanks.

ROBERT GREENE

Trying to make Washington like the Silicon Valley.

YOKY MATSUOKA

A lot of people really want to make this the neuro neighborhood. It's really cool. I might not be able to do everything that I want. Anyway, I'm excited about too many things.

ROBERT GREENE

You have a startup. You have your foundation and teaching, which you're on sabbatical for. What else is there?

YOKY MATSUOKA

I run my research lab.

ROBERT GREENE

In Washington?

YOKY MATSUOKA

Mm-hmm. Then I have the Center. Running the Center is 100 hour per week work job.

ROBERT GREENE

That's the main thing that you don't have time for right now?

YOKY MATSUOKA

Yeah.

ROBERT GREENE

Once the startup is public knowledge, is your time commitment going to be the same or go up or go down?

YOKY MATSUOKA

Same.

ROBERT GREENE

For how long?

YOKY MATSUOKA

As long as I'm willing to stay.

ROBERT GREENE

You have a dilemma. I see what you mean.

YOKY MATSUOKA

Yeah. We'll see. We'll touch base and then let you know how things go.

ROBERT GREENE

Okay. I do consulting work for people and I advise them on things like this where they have time commitments and trying to figure out what they should do. It's an either or. You have to negotiate this or you have to give up something. You don't want to give up the startup.

YOKY MATSUOKA

We'll see.

ROBERT GREENE

Another sort of main concept in the book, I've given you a lot, but another one is this idea . . . it's a little bit philosophical so I'll

explain it. Every person is born completely unique. I don't mean in a mystical kind of way but even scientifically, your DNA will never be exactly replicated by anybody that will ever come or in the past. It's inconceivable. Also, your experiences are completely unique and will never happen again. What the idea of mastery is people who are truly creative who reach the heights of this process are the ones that are able to bring as much as possible to their uniqueness and individuality. They express, they learn, they skill their craft from other people. Then they manage to channel that so that it completely reflects their uniqueness. I chose you for that reason. Everybody that I've chosen is unconventional. First of all, do you have any disagreement with that?

YOKY MATSUOKA

What's funny is I'm accepting an award next week. I can't be there in Seattle to receive it. I'm typing an acceptance message. I wrote precisely what you just said which is really

cool. Here, I'll show you. Can I just show you? This is the draft of it. It's very rough. What you said about the uniqueness is in there. It's just hilarious.

ROBERT GREENE

Yeah, wow.

YOKY MATSUOKA

Doesn't that resonate to precisely what you just said? It's too funny. I totally agree that everybody is unique and that everybody makes unique contributions. Everybody can make unique contributions.

ROBERT GREENE

I forgot to ask you earlier, the way you changed your name to Yoky, that seemed like a telling thing. How old were you when you did that?

YOKY MATSUOKA

When I came to the U.S. After I decoded it, when I moved to California. I showed up and said, "My name's Yoky."

ROBERT GREENE

As soon as you moved to California.

YOKY MATSUOKA

I actually remember doodling. When I was in Florida, this was in the first year, I was doodling and changing my name. In California I changed it. By the time I showed up in California, I never said to anybody that my name is Yoko.

ROBERT GREENE

Yoko, like Yoko Ono. The name Yokky doesn't exist in any form.

YOKY MATSUOKA

No. It used to be that you'd google with a Y at the end. I'm the only person who came up. A hundred searches, it's all me. These days, there are dogs there.

ROBERT GREENE

Maybe named after you.

YOKY MATSUOKA

Yeah, maybe. There are people in China. Who knows what it is? There are sprinkles, very few.

ROBERT GREENE

Can you remember the thought process behind doing this?

YOKY MATSUOKA

Yeah. I was very clear. Just like what you just said. Yoko like Yoko Ono. Every time it was like somebody else. You know me, I don't want to be like somebody else. It just bothered me so much that every American's response is, "Just like Yoko Ono." Eventually it got on my nerves and I said, "I cannot be just like somebody else." I thought about ways to change it. I like the letter Y because it still felt like me.

ROBERT GREENE

That's interesting. I was going to ask you. It would seem more natural to make it an I in Japanese.

YOKY MATSUOKA

The first letter Y. I could have been Jennifer. I could have been a very Americanized name. I thought about all the Y names like Yolanda. None of the Y names, American girls' names,

didn't resonate. Either I'll be somebody with a non-Y name or I'll be a variant of Yoko. I started thinking about the variants of Yoko. I have a very circular signature too. I just wanted my pen to be very fluid. An I was more pointy and it wasn't as fluid. Y was a little bit loopy and more fluid. I just liked playing around with it. That's how I went. I also wanted it to be unique. Yoki with an I in Japanese means happy feelings. It's the same pronunciation. My spelling could still mean that. Basically I thought if I typed Y-O-K-I, in other places I could find the same word. For a variety of reasons, it started to make sense. I never heard of Y-O-K-Y. It's just crazy. The pen worked really well. I knew I wouldn't find it anywhere else. I settled into that.

ROBERT GREENE

What does Yoki with an I mean? It means being happy?

YOKY MATSUOKA

Yeah. Yoki is somebody who's kind of happy.
It's very me. Yoko means brightest sun.

ROBERT GREENE

The sun in the sky?

YOKY MATSUOKA

The sun. In Yoky, the first letter happy is also the sun. The feeling of the sun in Japanese means happiness.

ROBERT GREENE

That's really nice.

YOKY MATSUOKA

I really like that meaning. I didn't want to lose it all.

ROBERT GREENE

I came upon you because I was looking up people at the MIT Media Lab.

YOKY MATSUOKA

I must not show up there.

ROBERT GREENE

You didn't show up there. I was looking at some people doing robotics there. I contacted one of them to see if they were interested.

Your name came up in a Google search. It was similar to when I looked at this other woman.

YOKY MATSUOKA

Is it Cynthia? Patty Mays?

ROBERT GREENE

That was one, but it wasn't the person I ended up writing to.

YOKY MATSUOKA

Cynthia Breazeal?

ROBERT GREENE

Yes.

YOKY MATSUOKA

Okay. She was my office mate at MIT. That's probably how we were linked.

ROBERT GREENE

She was your office . . .

YOKY MATSUOKA

Office mate at MIT.

ROBERT GREENE

I believe that's the one I wrote to. Anyway, I saw your name Yoky and it got my attention.

YOKY MATSUOKA

That's great.

ROBERT GREENE

Then I read the article and I decided you were better than she was.

YOKY MATSUOKA

Thanks.

ROBERT GREENE

The name's a reflection. Then also deciding to mix neurology and robotics was another reflection of being different because no one's done that before. Are there other examples of things where you're expressing? I think that's the main one in a way.

YOKY MATSUOKA

In terms of mixing things?

ROBERT GREENE

Your interests. Creating a subject that no one's ever done before.

YOKY MATSUOKA

That's the theme of my life. I think I really like doing that.

ROBERT GREENE

How did that come about, the creation of neurorobotics? You studied robotics and then you decided that you wanted to shift to something else then you brought the two together?

YOKY MATSUOKA

Yeah. Bringing things together. Initially, I think I said about tennis. I wanted to bring somehow tennis and my math and science together. That's where robotics ended up being. After pursuing robotics for a while, I realized that in order to build better robots that can play tennis with me, I need to learn neuroscience for myself so I can discover things that nobody else has discovered so far. Then I can bring that into AI. I ended up studying neuroscience. By the end of my Ph.D. studying neuroscience, I realized that I'm much more fascinated with people who have neurological disorders than to bring the neuroscience knowledge to help AI which felt like it was helping me to build a tennis buddy.

I couldn't quite come up with advanced AI. What's the societal impact? I wasn't sure. The other way around is saying that robotic technology can assist those people who have neurological disorders. There was a clear message to societal impact. That excited me a lot more. That's how the combination came about.

ROBERT GREENE

Are you still doing that? Are you still creating new fields?

YOKY MATSUOKA

Interesting. To a certain extent, my Google job attracted me because of it. It really felt like I was creating something brand new with this much resource that not a lot of people can do. Ended up not creating new field at Google. I think this startup that I'm in is also exciting because of that. I didn't create it. It's a shift of paradigm. The star alignment is really occurring right here and those people in the right specific paradigm. Let's see what happens.

ROBERT GREENE

Can you say what the field is or is it all [inaudible 0:13:19].

YOKY MATSUOKA

Green energy is all I can say. Again, before you actually start writing about this, I'm sure we can tell you a lot more about it.

ROBERT GREENE

One of the ideas I have in the book, are you familiar at all with complexity theory?

YOKY MATSUOKA

Sure, a little bit.

ROBERT GREENE

I was reading a book on that. One of the people, I forget his name, was saying that in the future, the one we're facing now, people in science are going to have to become much more poetic and artistic because things are getting so complex that you can't possibly command all of the knowledge that's necessary. In the future, people are going to not need to be so specialized. They're going to have to know many different fields or have

a feel for them. That's where the future of science is. I'm getting a lot of thoughts about that. I'm not expressing it very well. You're not somebody that's specialized. A lot of people would have gone into robotics and AI and buried their heads into it deeply for 20, 30 years. Do you feel that's a movement that might be occurring in the world? Are you just a weird person?

YOKY MATSUOKA

It turns out that this is appealing to girls, which is interesting. What I'm doing is interdisciplinary or multidisciplinary field. In a way, in a very broad sense, I combined biology and engineering. That's called interdisciplinary. It's very difficult to fit into a current societal model. Biology has branched off a long time ago. They developed their own culture and what's acceptable. Even in academia, how to give tenure and all those things are very different from engineering. The structure is not set to reward those people who stagger in multiple fields. Lots of

people fall through the cracks. I have a very brilliant friend who was a Harvard professor who couldn't get tenure because he didn't stagger it just right.

ROBERT GREENE

Didn't stagger . . .

YOKY MATSUOKA

Right now, what you have to do, because you're a single human being and if you did 80% in both fields, it's not going to be good enough for either of the fields. You have to bank on one of the fields to a certain extent to play the current structure yet still be able to do both. My strategy was that I banked on robotics. Even though I was making biological discoveries, I published in robotics. At the end of the day, I had probably less impact about those discoveries because robotic people read it and say, "Neat." I would have wanted the evolutionary biologists to read it instead. That's just how it went. Robotics people really saw me as somebody who was evolutionizing the field of robotics by

combining neuroscience, so they loved me. It really worked for my career.

ROBERT GREENE

It's opposed to if you had gone into biology or whatever.

YOKY MATSUOKA

If I published 50/50, I would have never been successful. Because of the given structure, it's hard to succeed. Yet, those fields were defined a long time ago. Engineering was divided into mechanical and electrical and chemical because of the needs in the '50s or whenever it might have been. It's much, much higher. The field has moved on. That's not the right division anymore, but because the culture has built based on those divisions, it is hard to go in the middle. Biomedical engineering is clearly a place to be. There are a lot of problems to solve. Artificial organs all the way to what I do, all of that is biomedical engineering. Yet it's too hard to live in that world. It's just crazy. Because fields build like this, the middle is going to be a new place to

be. Biology and engineering branch off and then biomedical engineering is right in the middle. Clearly, all the new technology is being built because of it. Now we're training more and more engineers and biologists to become those people. The structure changes to accept those people. In a way, what you say, complexity. Old fields and new fields and they're all branching off. Then there are always all those betweens. I'm considered a generalist, because I know of know neuroscience and engineering, but I don't know the depths of either of them as well as people who are in those fields. I completely understand from the very simplistic way that these interdisciplinary directions are the way to the future. It's totally encouraged, yet structure doesn't support it.

ROBERT GREENE

Not yet.

YOKY MATSUOKA

Not yet. It's a hard problem. People talk about, "Oh, yeah. Let's hire more faculty who

do both." Then they fail tenure. Precisely the same people who wanted to hire those people cannot accept them because they don't have the right standard. I've changed the culture at all the different places I've been so far. I've gone through the pain myself of understanding the problem and then really fighting to make some things happen for me.

ROBERT GREENE

Do you have tenure?

YOKY MATSUOKA

Yeah.

ROBERT GREENE

That's because you've been so successful. That seems to be the strategy if one were to pursue something interdisciplinary. To have results and to have . . .

YOKY MATSUOKA

But it's not fair to have to be super successful to do interdisciplinary work.

ROBERT GREENE

No, life isn't fair.

YOKY MATSUOKA

I think that's one of the things. Girls tend to maybe not like the super hard engineering or math, but if it's combined with softer things that have more biology or effects in the world, society, it's a great way to encourage more girls. Biology at UDub has more than 50% girls. Engineering has less than 20%. We're trying to tip it over and inflow some more of the girls over.

ROBERT GREENE

Into engineering?

YOKY MATSUOKA

Yeah, to engineering right now through my Center. I think that's really interesting to me.

ROBERT GREENE

Traditionally, the male brain is more one-thing focused. Women are more multitasking by nature.

YOKY MATSUOKA

Like this?

ROBERT GREENE

What you're doing right now. Maybe the future is bright for women in science then.

YOKY MATSUOKA

I think so too. Even now, sometimes you listen on the radio or whatever how women are changing and what the difference is that women are making that may be different from men. Again, stereotypically speaking, women are good at the kinds of things that are really starting to make a difference.

Women-led companies apparently tend to do well. Overall, apparently the success rate of funding is better.

ROBERT GREENE

For women-led companies?

YOKY MATSUOKA

Like women CEO startups.

ROBERT GREENE

Startups.

YOKY MATSUOKA

Things like that. Maybe there are some organizational skills or who knows what

else that might be. There are things like that that their stats start to work for women even if there are so few of them. I think it's interesting.

ROBERT GREENE

I guess what I was getting at is I think people are too specialized now. When you were saying people in biology are not reading the reports that you're doing about things you're doing in robotics, they should be reading them.

YOKY MATSUOKA

It's hard to find them. This is all about the historical structure. Because there's an overwhelming amount of stuff within their own field, how could they even have time or notice to look for something else?

ROBERT GREENE

I hope that will change. I think it will.

YOKY MATSUOKA

Hopefully.

ROBERT GREENE

One other theme in the book plays off my first book, "The 48 Laws of Power," which is sort of about the social game, looking at the human being as . . . are you familiar with the term Machiavellian intelligence. The idea is that primates are very social creatures. Let's take chimpanzees for instance. They have a very complicated social hierarchy.

YOKY MATSUOKA

Very much so.

ROBERT GREENE

There are theories that this is part of the reason why primates developed larger brains. It was the social pressure of having . . .

YOKY MATSUOKA

The forebrain. That's right.

ROBERT GREENE

The forebrain, okay. Having all of the complex political dealings you have that involve other people is something that no other animal has in relation to its environment. The humans are the supreme

social primates. There's a whole area of what we call social intelligence. It has nothing to do with math. It has to do with how to deal with people. My first book is all about that. It's all it's about. This book isn't. But I want to say it's actually a component. You can't succeed in life or get to anywhere unless you have some degree of social intelligence.

YOKY MATSUOKA

Yes. I've certainly seen some scientists who've succeeded without it.

ROBERT GREENE

Scientists.

YOKY MATSUOKA

As a scientist.

ROBERT GREENE

They've succeeded despite. Imagine what they could have had if they had . . .

YOKY MATSUOKA

Yeah, certainly.

ROBERT GREENE

What this means is that when you are practicing in an environment, let's say for

you it's MIT, you have to learn the social rules that prevail in an environment. You in America in high school, then at Berkeley and then at MIT, being aware of that and learning these rules so you don't offend people, you don't make gross mistakes, you don't hurt yourself by saying and doing the kind of things that are going to alienate you. Is this something that has any relevance to your life? I think it does.

YOKY MATSUOKA

Certainly. I think we talked about the observation phase. I'm a slow starter when I go to a new environment because I don't like to make mistakes. I'm also sort of shy in a way that I just don't feel comfortable at first. I usually try to step away a little bit and observe for a while. When I feel like I have some model I can get in, then I do. I think that's one thing. The other thing is I feel that quite a lot of the reason why I'm doing what I'm doing and where I got to where I got to

has nothing to do with my science. It has quite a lot to do with the social side of it.

ROBERT GREENE

How so?

YOKY MATSUOKA

My people interaction style. I think about this a whole lot more probably than the science itself. It sounds really funny. I'm very interested in psychology. I'm very interested in philosophy. Even writing e-mails, it's not about the content alone but it's about how you really phrase it. There are lots of subtle ways. I just think about all those things all the time. That's part of the reason why e-mail takes way too long and I try not to do it too much anymore. I can't just write rough e-mail that has scientific content without the social content. I just can't write those e-mails. I just feel like it conveys the wrong message and I just don't feel comfortable.

ROBERT GREENE

What are some of the rules that you've learned about socially dealing in the science world?

YOKY MATSUOKA

Interesting.

ROBERT GREENE

Which is more political than people think.

YOKY MATSUOKA

Oh, yeah. It's extremely political especially the women's scientist world. It's really political. It sounds really funny, but I've learned this from before that in a field where there are so few women, women have their own fan club of men, scientifically or whatever it might be. All women get to be a queen.

ROBERT GREENE

Tell me what you're saying. I don't quite follow.

YOKY MATSUOKA

It's quite comfortable if there are not enough women in a field. If you're one in 50, it's quite

comfortable if you're okay with that kind of world. I heard that women also start to feel comfortable after they're with more than 30% women. You feel like there are other women like you and there's some bonding and then you feel like you can work with them. There's this awkward distance between something like 5% to 30% that it's a huge competition somehow. You are a queen but you're not a queen. You don't have friends. They're all competitors. You have to make it and you try to become a queen, but there are too many of them and you can't become one. It's really funny. I've read something about that in a female science society about there's this awkward percentage of women.

ROBERT GREENE

But you were in a field where it was never like that. You were the queen?

YOKY MATSUOKA

Maybe I was a queen mostly. I think it's slowly tipping over. I mean it's possibly even tipped over to a certain extent in robotics.

ROBERT GREENE

It's almost like what you had to do in high school, learning how to be popular. Can you generalize any kind of rules for women or people in science?

YOKY MATSUOKA

I've learned some funny rules. In terms of acceptance socially, even in the science world, I've noticed that acting dumber than others always helps.

ROBERT GREENE

In science?

YOKY MATSUOKA

In science as a woman. They feel somehow less intimidated. I don't know what. Also, at the same time, after I woke up from the airhead phase as well, I've realized that there are certain things that are acceptable everywhere else that scientific women cannot do. I cannot paint my nails. I will not be able to paint my nails because that indicates that I'm not smart enough. I can't put makeup on or a lot because that also indicates I'm not

smart enough. If my hair's beautifully done every day, I'm not smart enough. It's just all those stupid rules. It's true. To the point that I use that rule myself. I see women in science who have nail polish on and I immediately think, "Stupid." It's really sad, isn't it? It's such an obvious rule that everybody uses.

ROBERT GREENE

Wow. There's nothing equivalent for men obviously.

YOKY MATSUOKA

No. Men can be really cutely dressed and it'll be like, "Wow. He's really cute."

ROBERT GREENE

You really think so? A male scientist could be very well dressed?

YOKY MATSUOKA

There are some. A lot more than what women can get away with.

ROBERT GREENE

Really? Wow. Any more? These are good. Anything for women or just general?

YOKY MATSUOKA

Rephrase the question again.

ROBERT GREENE

Science is a different world.

YOKY MATSUOKA

Social intelligence wise. Got it.

ROBERT GREENE

You just said not appearing too smart but also not looking too dumb.

YOKY MATSUOKA

Once you establish a certain amount, then you can get away with a little bit more because they know you. Until they know you, you've got to dress scruffy.

ROBERT GREENE

I say when you first enter a place you have to mute your colors and not stand out too much and be able to observe.

YOKY MATSUOKA

Yes. I do that all the time. That's me. I don't necessarily think of that as an additional thing that I do. I don't necessarily notice, but that's true. It sounds funny but one of the

things I learned when I moved to the U.S. is to always sit in the back because it's uncool to sit in the front.

ROBERT GREENE

That's for the teacher's pet or the people who are trying to kiss up to the teacher.

YOKY MATSUOKA

I think the field of science is full of those kids who sat in the front, which is really funny. But I still notice myself always sitting in the back. It's more comfortable. Unless I'm giving a talk then I have to sit in the front because they're going to introduce me.

ROBERT GREENE

I do that too. I always gravitate toward sitting in the back.

YOKY MATSUOKA

Other social things. It's almost like a ranking. It's just like what you said about chimpanzees. I think I try to quickly, unconsciously, assess my ranking in this room wherever I walk in. Depending on that, I challenge a little bit to see if I can climb up a little bit.

ROBERT GREENE

Explain that in a little more detail.

YOKY MATSUOKA

If I walk into a conference with a room full of people and I look around and realize that I'm the oldest or the professor, most of them are students and somehow I want to establish that, then I would really think about a hard question. I would make a point to raise my hand and ask that question.

Everybody noticed that Professor Yoky was here basically. If I look around the room and there are plenty of people who are much more senior, then I would not ask some bold, rude question. I would ask only if I could come up with . . . it sounds really sad, but I ask questions not to want to know the science but I ask questions to place myself in a certain ranking in the room. Isn't that funny?

ROBERT GREENE

That's interesting.

YOKY MATSUOKA

It's a dual purpose of course.

ROBERT GREENE

What's the purpose?

YOKY MATSUOKA

The purpose is to place myself in a certain ranking or to be noticed by certain ranked people so that I can enter their ranking so they would come and talk to me and I could be in their social group. Then I'll be at their rank. I'm like a chimpanzee I guess. That's the reverse engineer. I'm quite a lot of that, pretty up front.

ROBERT GREENE

Reverse engineer in what way?

YOKY MATSUOKA

Like the ranking of people or the importance of different people in a room.

ROBERT GREENE

It's very Japanese.

YOKY MATSUOKA

You think so? I have no idea.

ROBERT GREENE

You would know better than me.

YOKY MATSUOKA

My life in Japan ended when I was in junior high. I just have no idea of what the adult society is.

ROBERT GREENE

They have a hierarchical structure.

YOKY MATSUOKA

Maybe.

ROBERT GREENE

You have to be very aware of what you do. It's true anywhere.

YOKY MATSUOKA

Maybe. If you were in a banquet and you clearly realize there are better tables to sit at, you feel like, "I would rather sit at that table." That's because you are scouting around. You're trying to figure out, for whatever reason, if there's a better table to sit at. You could socialize with people you really want to impress. It's sort of the same thing to me. When I walk into a room, that's basically what I'm doing. It's like a banquet seating.

ROBERT GREENE

You have to tailor your personality and what you say depending on the dynamic of the room and where you fit. Is that right?

YOKY MATSUOKA

Yeah. I do that, but maybe I'm a manipulator.

ROBERT GREENE

You're going to like my first book. If you're bold in an environment where you shouldn't be bold, it's going to hurt you, particularly for women.

YOKY MATSUOKA

That's right. So I don't do that. I calibrate it very quickly when I walk in. I never walk in, ask a question, and leave because I don't have enough time to calibrate. I always wait. There's a certain period of time that has to pass before I can make a statement.

ROBERT GREENE

This is very good.

YOKY MATSUOKA

Interesting.

ROBERT GREENE

There's a theory, I can't remember where, about people who are outsiders. That can be either women or outsiders in science or ethnically people who are outside, African Americans or whatever. People that end up being much more sensitive and are better observers in a social situation.

YOKY MATSUOKA

Makes sense.

ROBERT GREENE

Barack Obama is the classic example of that type. It actually can be quite an advantage once certain barriers fall down when you're interacting with people. A white man in your position doesn't feel the need to have to be so sensitive and care about what other people are thinking. He just assumes he has the privilege.

YOKY MATSUOKA

Certainly. I agree. Women minority and definitely women scientists work harder, definitely put in more hours. I've noticed that

when I leave, I used to leave a building and I'd look back in the office and the room that had lights on were like woman prof, woman prof, woman prof. It's just really sad, but that was really the case.

ROBERT GREENE

On the other hand, in the end maybe you'll be smarter, you'll [inaudible 0:37:13].

YOKY MATSUOKA

Maybe.

ROBERT GREENE

It makes [inaudible 0:37:15] that sort of thing.

YOKY MATSUOKA

We have to always be clearly above the cloud.

ROBERT GREENE

You think that's changing, or is it pretty much still that way?

YOKY MATSUOKA

It's a slow process. Changing a little bit but not enough. I've actually had an interview with Forbes Magazine about three days ago a little bit about women and how to encourage science and math for young girls and all those

things. One of the things they asked at the very end was precisely this, sort of saying, “Do you think things are changing now? Do you think that lots of effort that’s going on is making a big difference?” I said, “I have to say yes and no. I feel that where we need to get to is that we have 40% women. We started with 5% women.”

ROBERT GREENE

Forty percent women in science?

YOKY MATSUOKA

Yeah. Science is not good enough, because it includes things like biology and chemistry with a bunch of girls, but engineering probably. It started with 5%, maybe it’s 15%. Is it making a difference? Sure. Making enough difference? No. There’s a whole lot more complex things that may or may not be solvable that have to be addressed. If you interview all the fourth graders and say, “How many people want to be scientists,” 70% of boys and 70% of girls both say they want to be scientists when they grow up.

When you interview ninth graders, 60% of boys still want to be scientists, 40% or 30%, something like that, of girls want to be scientists. It’s a dramatic decrease during that 13 years old range where puberty hits, boys start to look cute, and all those things happen. There’s that first horrible drop off. We have to prevent that. Other countries are able to prevent it. The U.S. is the country that is not doing a good job.

ROBERT GREENE

Asian countries, Singapore, China, and Japan.

YOKY MATSUOKA

Middle East is doing fine. Eastern European countries are doing fine. They don’t have the same cheerleader thing going on. It’s very interesting. You walk into their engineering classes and it’s a good 40%, 50% girls. There’s something that happens in this culture. Biochemistry, sure. Maybe biochemistry. There’s more than that. Something’s going on that has to be changed.

Job wise also. There are all those things that go on for women. It’s really hard, because there are so few to begin with, the bar is higher. There are multiple levels and everywhere that’s just hard. I was telling them this is a very difficult problem to solve. It’s not something that scientists can just go cheer on and get more girls and be done with it.

ROBERT GREENE

It’ll take time.

YOKY MATSUOKA

Yeah.

ROBERT GREENE

Just to get back briefly, were there any other rules you can think of that you use in your social combination of the scientific and political world?

YOKY MATSUOKA

I’m sure there are tons.

ROBERT GREENE

It’s pretty competitive.

YOKY MATSUOKA

Yes.

ROBERT GREENE

You have to be pretty tough to take criticism.

YOKY MATSUOKA

Yeah. I think tough people tend to go a little higher. If you don't notice, it's easier.

ROBERT GREENE

Have you had to deal with criticisms.

YOKY MATSUOKA

Yeah. Criticisms come all the time. Getting tenured as faculty and all that stuff, it's all about what other people think of you.

ROBERT GREENE

How old were you when you got tenured?

YOKY MATSUOKA

I don't know. Five years ago maybe.

ROBERT GREENE

That's pretty young. For getting tenure in your mid-30s, that's very young.

YOKY MATSUOKA

Good. That's true.

ROBERT GREENE

Very unusual.

YOKY MATSUOKA

No, no.

ROBERT GREENE

You have to be like a star in the making.

YOKY MATSUOKA

In engineering, everybody gets tenure. If you're going to get tenure, it's in the 30s probably.

ROBERT GREENE

Oh, engineering it's tenure.

YOKY MATSUOKA

It's not unheard of in any way. I got lucky. I basically was at Carnegie Mellon, which has a tenure clock of nine years. I got recruited from UDub in the sixth year with tenure. It was like great, I'll take it.

ROBERT GREENE

You mean they gave you tenure right away?

YOKY MATSUOKA

Yeah.

ROBERT GREENE

Wow. Any more rules for dealing with the competitive aspect?

YOKY MATSUOKA

I'm sure there are tons that I use. I'm sure I could list 20. It's pretty hard to simply know. I'm very competitive. The negative word is I think I do whatever possible to manipulate the situation to make sure that I have an edge in some way.

ROBERT GREENE

There is nothing necessarily wrong with that.

YOKY MATSUOKA

Nothing is necessarily wrong with that. I agree.

ROBERT GREENE

I suppose it's a fact of life really.

YOKY MATSUOKA

Yeah. I think somebody like my husband, I look at him and he is brilliant. He has so many good insights, but he doesn't play that game like I do.

ROBERT GREENE

That holds him back.

YOKY MATSUOKA

No, he just doesn't think like that.

ROBERT GREENE

He finds an environment where he can be like that, but there's a limit to where you can go.

YOKY MATSUOKA

That's right. I think he could have gone much further if he was a little bit more that way. But he's okay with that. As he said, he's a competitive person without ambition and it fits that model. He doesn't have to. For me, I have to play that model to compete and then to go further. Definitely I play all kinds of social games in the competitive world.

ROBERT GREENE

If you come to realize any one that you haven't covered, you can relay it to me.

YOKY MATSUOKA

Sounds good. Because it's an unconscious process, usually I don't think, "I'm going to play game plan C." It's all something I just unconsciously do. I assess the situation over time and then I come up with a game plan and I just do it.

ROBERT GREENE

What would be a good example is something that I'll be talking about in the book.

Oftentimes, you learn these, they're like trip wires that exist in a political or social environment. They're not written down. Nobody talks about them. If you step over that line, you're going to suffer for it.

YOKY MATSUOKA

It's like painting nails.

ROBERT GREENE

I wrote that down. The way you learn about these trip wires is either somebody else made an egregious error and then everyone knows it, or you, yourself, do it. That's how you learn the parameters of what's good and right and wrong. If you made any errors that you can think of . . .

YOKY MATSUOKA

That's a very good way to think about it. I feel even the length of e-mail or things like that are all part of the game.

ROBERT GREENE

Like what? Keep them short?

YOKY MATSUOKA

Keep them short or else they don't read it. If you want to purposely have them not read it but you want them to think that you really thought about it, you might as well write a very long e-mail to please them and they notice. All those little games that you can play. I don't know if people play that game. If I think about it, I'll let you know. There are moments I definitely know that I so regret the fact that I did that. There are a lot of little things like that.

ROBERT GREENE

Not being so intimidated.

YOKY MATSUOKA

There are many cases. Whenever I look back, it gives me shivers because I'm like, "Why did I do that? I'm such an idiot for doing that."

ROBERT GREENE

Nothing comes to mind?

YOKY MATSUOKA

Not right now. I even had that last night about something else. Looking back, I'm like I can't believe I did that.

ROBERT GREENE

We all do.

YOKY MATSUOKA

It's pretty funny. That's one of those defining social boundary moments.

ROBERT GREENE

This is an area where I think women will also be a little better because women are better at the social game than men are.

YOKY MATSUOKA

Some men are pretty good, but yes, women are definitely better overall.

ROBERT GREENE

Overall women have more of those mirror neurons firing.

YOKY MATSUOKA

I agree.

ROBERT GREENE

I think it's cultural too.

YOKY MATSUOKA

That's why mother/daughter relationships are complicated.

ROBERT GREENE

How so?

YOKY MATSUOKA

All girl/girl relationships are manipulated. Boy/boy relationships are not as manipulated. Boy/girl relationships are not as manipulated, because girl manipulates it and boy doesn't manipulate it as much or whatever it might be.

ROBERT GREENE

I see. I never thought of it that way. It's interesting. Do you think that women in science think differently? Clearly male and female brains are different in some ways. Do you think a female scientist approaches a problem a little differently than a man does? Not 100% generalizable.

YOKY MATSUOKA

Oh, yeah.

ROBERT GREENE

How so?

YOKY MATSUOKA

Probably a lot more politically. It sounds funny. Women pick problems not because . . .

ROBERT GREENE

You have to leave at 5:30?

YOKY MATSUOKA

I'm going to a restaurant two minutes away from here to meet with my kids at 5:30. If you want to meet with them, you're more than welcome to come. I think women think a little bit more before picking a problem whether this fits their overall life goal or whatever it might be than boys. Again, this is a complete generalization. I think a lot of men pick it because it's locally interesting. It just fascinates them. Girls do that too. That's why girls tend to be more in social science or things that end up having more societal impact. Like nurses. Why would you want to be a nurse? Maybe locally drawing blood is not interesting and it's kind of gross, but if you

think about it, you might be saving lives. It's the bigger picture. It's a lot more purposeful somehow.

ROBERT GREENE

Women think more in the larger picture, what the larger purpose would be?

YOKY MATSUOKA

I think before they tack on to a scientific problem, they think to make sure this has a link to something like that. I even notice that when I'm reviewing grants. I go to Washington D.C. and review other people's grants. Women tend to, overall generalized, have a better introduction and motivation of why this scientific problem is interesting and we should fund it than men do.

ROBERT GREENE

That's interesting.

YOKY MATSUOKA

Men often go straight in an introduction like, "Here's the first equation."

ROBERT GREENE

The woman would focus more on the larger picture, purpose?

YOKY MATSUOKA

They say, there are 500,000 people who are suffering from stroke. Very different.

ROBERT GREENE

In some ways, that would mean they'd be at an advantage.

YOKY MATSUOKA

Yeah, certainly. I think so. That's definitely an advantage. If you go too far, then of course there's a 15 page limit. Science is weak if you motivate for the first page. Now you lost that much edge for the scientific depth. There's a give and take.

ROBERT GREENE

That would be the main difference you think. It's being more socially aware, larger picture, a little bit more empathetic about it?

YOKY MATSUOKA

Yeah. That's one. I think men also are on the opposite end. That's a praising women

side. The other side, I think men in general definitely seem to have more depth in the mathematical side.

ROBERT GREENE

What do you mean more depth?

YOKY MATSUOKA

More depth. Sort of in general, deeper, more complicated mathematical problems are typically more solved by men than women.

ROBERT GREENE

I imagine in the field of mathematics the percentages are still not so good for women.

YOKY MATSUOKA

I assume so. My husband's mom was a math professor. She's very early.

ROBERT GREENE

It's pretty unusual. Don't you think?

YOKY MATSUOKA

Very unusual. There were I think only two women at that time.

ROBERT GREENE

I was looking into maybe trying to interview a woman in mathematics, but we weren't very [inaudible 0:50:51].

YOKY MATSUOKA

It's very, very hard to find. Hard to find and often not interesting.

ROBERT GREENE

A man will take one small area of math or science and go more deep into it and maybe get somewhere with it, but a woman will try to be a little more. . .

YOKY MATSUOKA

This eventually will lose societal impact if it goes too deep. I think that's the pros and cons of going that way.

ROBERT GREENE

Two final questions. You said in one of the interviews that you wanted to make it cool for girls to be in science. That was a strategy of yours. It's a very admirable strategy. Part of the purpose in this book is to make it cool for young people to think about their relationship

to discipline and being patient with learning something so that when they're in their 20s or 30s, they're going to be the ones that have power and success. Make the disciplined approach to life something cool, which is not easy.

YOKY MATSUOKA

When you say discipline, it's being rigorous about something or be disciplined about doing something.

ROBERT GREENE

This is how I explain it. I'll do some psychology for you. I think the basic thing for a human being is our relationship to pleasure and pain. The childhood is a key moment. If a child learns from playing tennis, the piano, math, reading that by studying something for six months of the year, they get good at it and better at it that it brings them a satisfaction. They learn to postpone pleasure and find it later on. It becomes a pattern for their life. If you get frustrated, if you feel like you're a failure, if you feel like

you can't do it, your reaction is to go and find pleasure in immediate ways, in diversions, in entertainment, in drugs, in video games. That becomes the pattern for your whole life. You can never break out . . . you can break out of it a little bit, but you'll never . . . it's deep. A child who learns that by being patient and studying something a far greater pleasure will come to you than the immediate video game.

YOKY MATSUOKA

That's very true.

ROBERT GREENE

That's what I want to be able to preach in a very indirect way in this book.

YOKY MATSUOKA

I see. Interesting. I have that philosophy raising my kids as well. I get it.

ROBERT GREENE

I guess I'm not really asking you a question but I'm asking you . . .

YOKY MATSUOKA

How do you make that delayed reward be cool somehow?

ROBERT GREENE

Part of it is I'm showing people like you, the people I'm interviewing, in other words you did that and you're cool. Look, you're doing things with robotics which is an exciting field. The things that you're doing appeal to a young person.

YOKY MATSUOKA

It's funny. I never thought I'd be this person. Now that I'm here, if I could help them to feel like it's cool . . . I often basically also say there are certain times in life that maybe if it's biochemically or something, it stings your heart. Teenager years, if you are really smart, maybe things are just hard. When you come out of it, that's such a short period of life. If you optimize perfectly to be perfect in that specific span, you lose out big time in the long shot. I try to actually tell that to a lot of girls who are into science and they're in junior

high and they're about to get potentially get pounded by cheerleader girls. I basically say, "Look, I'm sorry, it's going to be tough. Once you go to college, you start to realize that being smart is good. You're going to be very happy you did all the AP classes. Even though maybe people picked on you during that, you're not going to be talking to them. They're going to be picking garbage and you're going to be discovering new science. Just don't worry about it. If it gets to you, call me."

ROBERT GREENE

I want to put that in the book, for everybody who reads the book.

YOKY MATSUOKA

To call me? Great. I think that's one of the things I just feel like it's hard. Sometimes it's hard. I wish that there was somebody who taught me that when I was going through a hard time. I didn't know. I really thought that if I'm not popular now, I'm screwed because I'm optimizing constantly for today.

ROBERT GREENE

You need role models, parents, people telling you this. Although peer pressure is very powerful.

YOKY MATSUOKA

It's very powerful. I didn't know when I was 17 that life at 30s is this exciting.

ROBERT GREENE

That's the point. That's what I'm trying to say. Look at the people who were all so cool in high school in Florida and where they are now working at Dairy Queen. You have all these great challenges and problems you have to solve. You're always stimulated. You have this exciting life.

YOKY MATSUOKA

Yeah. When people say, "You were an airhead. Do you recommend other people be an airhead?" I can't say, "Not at all." I kind of say, "Do what you can to get by."

ROBERT GREENE

You were not an airhead. You pretended to be an airhead.

YOKY MATSUOKA

Right. Is that a good strategy for all girls? Should all girls pretend like they're all airheads? Should I teach that? The answer is it's not, absolutely not. I feel like just do what you can to get by. If it has to be that you pretend to be an airhead, just know that's not the right thing to do long term. If it makes you that you get by, then great.

ROBERT GREENE

I think you're unique. You're probably one of the few people that could pull that off. If you start acting like an airhead, you're going to start all these people being like one.

YOKY MATSUOKA

Oh, yeah. I felt like one. In Santa Barbara, myself and my best friend, Debbie, we won the Wildest Thing of Santa Barbara competition on the radio.

ROBERT GREENE

What was it for?

YOKY MATSUOKA

The prize was to be a DJ.

ROBERT GREENE

What did you do to win the prize?

YOKY MATSUOKA

We had to go against other two girls who had things to say about each other. We verbally fought over radio. We acted like complete fun airheads and somehow we won it.

ROBERT GREENE

You were pretending.

YOKY MATSUOKA

Completely. I knew how to act it. My mom worried I was sick and my best friend would forever be Debbie and I would be ruined. My radio name was Okey Dokey Yokky and she was Debbie Does the Radio.

ROBERT GREENE

Debbie is sort of the classic airhead name.

YOKY MATSUOKA

It is. She changed her name as well. She was inspired by my change of name. She changed her spelling of her Debbie name. She went through the Deborah phase. When I google her, she still today is Debrie, with a single B.

ROBERT GREENE

I know in high school I was always attracted to the girls that wore glasses and were smart.

YOKY MATSUOKA

Really? That's great. Very nice.

ROBERT GREENE

I don't know how many guys were like that.

YOKY MATSUOKA

I don't know. I didn't try that route, so I have no idea.

ROBERT GREENE

Last question. I wanted to know about the future. First of all, the amazing thing you were describing with being able to move something with your thoughts, being able to manipulate a hand or something else that's a robot. It's the signals. How far away are we from this kind of world? What do you see the future of this as?

YOKY MATSUOKA

It's being done for prosthetic control for those people who have missing limbs, who have paralyzed legs. It's kind of done. It's being

done in a very small scale. You think about it and then certain biochemical reaction becomes electrical signals. We extract the electrical signal and amplify it and send it to robots and it happens.

ROBERT GREENE

People with prosthetic limbs that are having this power right now but it's very [inaudible 0:59:51].

YOKY MATSUOKA

Yeah. That's correct. It's a much more complex sophisticate. They're basically going from opening and closing the hand to really finding keys from the pocket that you can't see and pressing the button to unlock the car kind of complexity. It's going to be a while. It's a good 15 years maybe.

ROBERT GREENE

Or playing the piano.

YOKY MATSUOKA

Playing the piano is easy. Robots played the piano in the '80s. Open loop meaning that it just preprogrammed the whole set. If you

knocked over the robot, it would have fallen over and it would have gone like this up in the air.

ROBERT GREENE

What about other applications beyond just the prosthetic limbs?

YOKY MATSUOKA

Military already claims quite a lot going on in the soldiers' helmets.

ROBERT GREENE

That's a whole smart soldier thing going on.

YOKY MATSUOKA

Implemented in a soldier's level in terms of measuring, for example, how tired they are. Based on that, making certain level social decisions about who's going to keep advancing, who's not going to advance. That kind of stuff will happen any day. Neuro monitoring, your thought moving something else, your thoughts controlling something else. Again, it's like prosthetics. We know that we can do it in a very simple level. They're going to start doing it, if not done so already.

ROBERT GREENE

What are the non-military applications that will be part of our lives in the future where it's not just prosthetic limbs?

YOKY MATSUOKA

More and more sensing will go in the brain. Lights come on when you walk in a room. Is that detecting something about you? Maybe. It's detecting your heat entering a room.

ROBERT GREENE

What if there are things in a room . . . you desire the television. If I want the television on, and it turns on with heat, is that a possibility?

YOKY MATSUOKA

Completely. You might even get to the point where a chip in your brain starts to run ads in your brain. Like McDonald's. You sense the hunger and it runs McDonald's ads in your brain.

ROBERT GREENE

That's very scary.

YOKY MATSUOKA

It's very scary, but it's totally possible.

ROBERT GREENE

Would be a chip in your brain.

YOKY MATSUOKA

It doesn't even have to be a chip in a brain. It could be some sort of hat you buy that comes with a chip that's close to your head.

ROBERT GREENE

Is it Patty Mays or somebody who was working on something like that?

YOKY MATSUOKA

Everybody's working on this.

ROBERT GREENE

Where you go to a supermarket and you're able to . . .

YOKY MATSUOKA

Yeah.

ROBERT GREENE

It's very scary.

YOKY MATSUOKA

These days, neuro everything is popular. This is called neuromarketing. Neuromarketing is

reading your mind to know what you want or what you're thinking or what state you're in, and then they market appropriately.

YOKY MATSUOKA

There's neurolaw. Neurolaw, there's a woman from Harvard who's pretty interesting to talk to who basically, these days, showing the brain scan is so powerful. A lot of people are being prosecuted for wrong reasons because the opposing team hired a neuroscientist, a hokey pokey neuroscientist, who showed a colorful brain map and said, "When this person saw this victim, the color changed to red." They're like, "Ooh." That's enough to change a jury's mind.

ROBERT GREENE

That's terrible.

YOKY MATSUOKA

Isn't it?

ROBERT GREENE

That trend won't last.

YOKY MATSUOKA

Hopefully. Science will become more accurate.

ROBERT GREENE

What about the future for you? How do you see that?

YOKY MATSUOKA

I don't know.

ROBERT GREENE

You don't want to know.

YOKY MATSUOKA

No, I think it's exciting. I'm really excited to explore what's going to be. What I'll be doing in five years, I have no idea. That's part of the excitement.

ROBERT GREENE

Do you think about where you'll be in two years?

YOKY MATSUOKA

Right now, I'm in a funny fork, so I don't know. I know I'll be doing something, many things. I always make people laugh because my priority is my kids. I say, "Maybe I'll be

a stay-at-home mom." They're like, "You cannot do it. Try. You will not be able to do it." People think that I cannot do it.

ROBERT GREENE

Okay, that's it. ♦

ROBERT GREENE

I think the problem if you did that, you would put all of that engineering and figuring things out on your children and it would not be good for them.

YOKY MATSUOKA

Expectations you mean, or . . .

ROBERT GREENE

You need to leave them some space to become little Yokys. If you were at home all the time, you'd be like your own mother with you. You would morph into your own mother.

YOKY MATSUOKA

The role model for my kids is not somebody who stays at home. It sounds really funny.

Even though if they became that, I'd be very proud of them. I somehow want to show that I've explored to my limits. I think that's really exciting to me as well.

**VILAYANUR S.
RAMACHANDRAN**

ROBERT GREENE

Let's see. I just want to make sure this is working. Can you say something?

VILAYANUR S. RAMACHANDRAN

Hello.

ROBERT GREENE

Beautiful. There are three parts. There's the apprenticeship phase that people go through, everyone including Einstein or Darwin or Faraday. Then there's what I call the creative phase where you've reached a point where you know enough that you can start experimenting with the ideas that you have absorbed.

VILAYANUR S. RAMACHANDRAN

Some do develop courage.

ROBERT GREENE

You develop courage and you can move out on your own. The third phase is what I'm calling mastery. This is the most important part. When I return in January this is what I would want to talk about as it has a lot to do with the brain. It's a sense of almost

like embodied knowledge where it becomes intuition where you have an uncanny feel for what your . . .

VILAYANUR S. RAMACHANDRAN

Becomes more effortless.

ROBERT GREENE

Yes. It's almost like an intuition. Most really creative people or geniuses or whomever all talk about ideas coming to them from they don't know where, a hunch, an intuition. It comes from years of preparation and absorption. In the interview, I want to go into your own childhood, where you first were drawn to something, your apprenticeship phase, and then go to those other two phases. Then maybe . . .

VILAYANUR S. RAMACHANDRAN

There are four things.

ROBERT GREENE

There are. There are actually. You're right.

VILAYANUR S. RAMACHANDRAN

Childhood, apprenticeship, creative, being liberated, being creative, mastery.

ROBERT GREENE

The first one I call it your life's task. Everybody is unique genetically or however you want to phrase it. There's something that you were actually intended to do. This is the self-help element of my books. I can't help it. There's almost a sense of destiny.

VILAYANUR S. RAMACHANDRAN

Not everybody, unfortunately, has that.

ROBERT GREENE

I think they do.

VILAYANUR S. RAMACHANDRAN

You think they do? Okay.

ROBERT GREENE

Of course there could be exceptions.

VILAYANUR S. RAMACHANDRAN

Do you think it's common, that sense of destiny?

ROBERT GREENE

No.

VILAYANUR S. RAMACHANDRAN

No, it's not common is what I meant.

ROBERT GREENE

It's hard to find.

VILAYANUR S. RAMACHANDRAN

It's hard to find, yeah.

ROBERT GREENE

It's in everybody.

VILAYANUR S. RAMACHANDRAN

Okay. I see.

ROBERT GREENE

Potentially.

VILAYANUR S. RAMACHANDRAN

Potentially, okay.

ROBERT GREENE

It's something you're drawn to. It reveals itself in childhood. It's interesting like with Darwin, it can reveal itself when he's more like 17 or 18. As a child, he had interest in . . .

VILAYANUR S. RAMACHANDRAN

Collecting shells and . . .

ROBERT GREENE

Collecting shells like yourself and in biology, but he wasn't going to become a scientist in that way he was destined . . .

VILAYANUR S. RAMACHANDRAN

It is surprising though how often a famous scientist had collecting and taxonomy as a hobby. Not this 10% but as the general population is like 1% or .5%.

ROBERT GREENE

Why do you think that is?

VILAYANUR S. RAMACHANDRAN

I think it's a need to find order in diversity. The butterflies, they all look dissimilar but there are patterns of order. That's what taxonomy is. That's what childhood is. That's what fascinated. . . Other than things that are beautiful to look at. I think that's not it. It's about seeing order, geology, minerals. That's part of it [inaudible 3:24] Darwin.

ROBERT GREENE

Yeah. There's a person named Hooker, James Hooker? I can't remember his first name. He was the great taxonomist in the 19th century. He corresponded with Darwin.

VILAYANUR S. RAMACHANDRAN

Yes, of course. Lyell and Hooker are the ones who . . . Charles Lyell was the geologist.

ROBERT GREENE

The geologist.

VILAYANUR S. RAMACHANDRAN

Hooker was a botanist, professor of botany at [inaudible 3:49] College. I'm forgetting his first name too.

ROBERT GREENE

I thought it was James. Maybe not. Joseph? Maybe Joseph, yeah.

VILAYANUR S. RAMACHANDRAN

Joseph, yeah.

ROBERT GREENE

I think so. He talks all about the fascination of finding that order in diversity to the point where, and this is sort of what I'm talking about, he could see something and in an instant he could identify what it was. This was after 30 or 40 years of totally devoting his life to that. It's the kind of thing that nobody

does anymore because they don't believe in taxonomy.

VILAYANUR S. RAMACHANDRAN

Which is unfortunate.

ROBERT GREENE

I think so.

VILAYANUR S. RAMACHANDRAN

Okay. It's all DNA and genetics but what's it there for? It's there to explain animals and diversity of animals and behavior and all of that. There's nothing to explain, you say, "Well, all that is uninteresting." Then what's the use of the reduction?

ROBERT GREENE

Exactly.

VILAYANUR S. RAMACHANDRAN

You have to be able to reduce something else to something.

ROBERT GREENE

That's right.

VILAYANUR S. RAMACHANDRAN

The reductionism can be a fetish in itself.

ROBERT GREENE

Which a lot of people it is. That's what I wanted to do today. Maybe at the return, or even part of today, go into some of the larger issues and ideas some of which my ideas might be wrong. You could debunk the whole notion of my book and destroy my life.

VILAYANUR S. RAMACHANDRAN

That's part of being creative. The one thing though is I would say that in my case, the apprentice stage, even childhood and apprentice stage, was intermingled with a rich knowledge of history of science and inspirational role models. I think there's an intermingling of the apprentice stage and the childhood. They're all much more intermingled than stage by stage. Mastery is quite different. The first three stages are very intermingled. Maybe even not childhood. Let's say the apprenticeship . . .

ROBERT GREENE

And the creative.

VILAYANUR S. RAMACHANDRAN

. . . and the creativity are very intermingled. They intermingle also with a deep knowledge of . . . Now it's frowned upon. It's not frowned upon but it's not actively encouraged. For example, I wish departments of science would have actual courses on history of science.

ROBERT GREENE

They used to.

VILAYANUR S. RAMACHANDRAN

They used to. Here maybe in Philosophy 101 there's a little section of it on Popper and [inaudible 6:07] and things like that. It's not really history of science. It's not about Faraday. I think you can learn a lot by looking at the masters.

ROBERT GREENE

That's what this whole book is about.

VILAYANUR S. RAMACHANDRAN

What your book is about, yeah.

ROBERT GREENE

Yeah. It's not designed for college unfortunately.

VILAYANUR S. RAMACHANDRAN

I think the heuristics of science are discouraged.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

I think people just think it's IQ and that's not the case. Maybe I'm stating the obvious but you need a minimum IQ obviously. Once you get past 150 or 160, I'm just pulling that out of the air . . .

ROBERT GREENE

It's true.

VILAYANUR S. RAMACHANDRAN

Once you get past that, I would say a majority of the people in this department, in our neuroscience program or psychology department or cog sci, the IQs of the professors would be about 150, majority of them. You look at Francis Crick, okay? Let's say 10% of the people in the campus have IQ of about 170. It'd be the same as a Francis Crick. 10% of all major university professors

have the same IQ as Francis Crick but there's only one Francis Crick. There's something else going on there.

ROBERT GREENE

I have a book here I'll show you. With Darwin, they calculated what his IQ would be and it was about 160. I don't know how they did it. Then he has his cousin, Galton, whose IQ was probably around 190.

VILAYANUR S. RAMACHANDRAN

There you go.

ROBERT GREENE

Darwin is who he is and Galton is largely forgotten although he was a brilliant person. This is exactly what I'm going into because there's something else and I'm going to be trying to describe what that something else is.

VILAYANUR S. RAMACHANDRAN

That, to me, is a vital part of science education and apprenticeship. Unfortunately, I had teachers, nine of out 10 teachers were the wrong kind. All you need is one.

ROBERT GREENE

That's right.

VILAYANUR S. RAMACHANDRAN

There are one or two inspirational, passionate, enthusiastic teachers. Enthusiasm is highly contagious. Passion is contagious. Then you learn from them. Not just watching their style but they tell you how they learned and their views on the history of ideas.

ROBERT GREENE

That's right.

VILAYANUR S. RAMACHANDRAN

I'm trying to think of examples.

ROBERT GREENE

Examples in history or for you?

VILAYANUR S. RAMACHANDRAN

Both. Of the history of science being conveyed to me.

ROBERT GREENE

How about Faraday and Humphrey Davy being one?

VILAYANUR S. RAMACHANDRAN

How he just sprinkled line of advice in my books, sprinkled line advice on a sheet of paper and actually feels visible. Nobody had ever done that before. Any child could have taken 100 filings and sprinkled it on a sheet of paper. It required Faraday to have that tremendous insight that you could actually reveal. Now you see it and you say, "That's kind of obvious." Just actually show the feels, something that's intangible and mathematical in an actual physical reality, the desire in filings.

ROBERT GREENE

He did this without any knowledge of math.

VILAYANUR S. RAMACHANDRAN

Without any knowledge.

ROBERT GREENE

It's just visualizing things.

VILAYANUR S. RAMACHANDRAN

Just visualizing. I have a lot of aphorisms which are still unpublished from Francis Crick. I thought about putting it on a blog. I

was very close to him for about . . . Not in the last 10 years. He was closer to Christof Koch.

ROBERT GREENE

When did he pass away?

VILAYANUR S. RAMACHANDRAN

He passed away about three or four years ago. He would often tell us things, obvious statements, like if an experiment is not worth doing, it's not worth doing well.

VILAYANUR S. RAMACHANDRAN

I can tell you, 98% of my colleagues don't know that.

ROBERT GREENE

You should do a book with these aphorisms.

VILAYANUR S. RAMACHANDRAN

Maybe.

ROBERT GREENE

Or you could do some, well we'll go into that later. Yeah. He must have been amazing.

VILAYANUR S. RAMACHANDRAN

Oh, he's an extraordinary man. One of the major influences on my career. And Richard Gregory.

ROBERT GREENE

Richard Gregory. Is he still alive?

VILAYANUR S. RAMACHANDRAN

He passed away about six months ago.

ROBERT GREENE

When I took Psychology 101 back in my school days at Berkeley, I had to read *Eye and the Brain*.

VILAYANUR S. RAMACHANDRAN

Beautiful book.

ROBERT GREENE

Great book. I still have it.

VILAYANUR S. RAMACHANDRAN

That's what got me switched on to brain research.

ROBERT GREENE

He's your, what do you consider, number one mentor?

VILAYANUR S. RAMACHANDRAN

Yeah. Even though he was never formally my mentor. We hit it off when we met at a conference. The chemistry is right.

ROBERT GREENE

He was at a different university.

VILAYANUR S. RAMACHANDRAN

He was at Bristol.

ROBERT GREENE

Bristol, yeah.

VILAYANUR S. RAMACHANDRAN

He had been at Cambridge earlier, but he was in Bristol when he took me on as a scientific son. He was my guru. I was his apprentice, the style of thinking. This larger than life person, full of laughter and jokes and puns and history of ideas.

ROBERT GREENE

A bit like yourself.

VILAYANUR S. RAMACHANDRAN

That's where I got it from. Also [inaudible 10:39] of instruments.

ROBERT GREENE

I love the things in the books, your parentheses. Someday someone's going to write a book about your parentheses.

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

About humor. Everyone except the Germans and things like that.

VILAYANUR S. RAMACHANDRAN

You know the story behind that?

ROBERT GREENE

Hopefully your books aren't translated into German.

VILAYANUR S. RAMACHANDRAN

I was going to say, that's the story. I gave this lecture on the BBC and [inaudible 11:00]. Everybody thought it was funny and all that. Then the German publisher said, "We have to remove this." I said, "Why?" He said, "It wouldn't go down well, making a joke about Germans." I said, "I rest my case." [laughs] Not only that, it was published and they left it in tact. I got a nasty letter from a German professor.

ROBERT GREENE

Rest your case again.

VILAYANUR S. RAMACHANDRAN

Unfortunately, I mislaid it somewhere. It says clearly, "This is highly inappropriate." Something about southern Germany and northern Germany and we're not the same and you're generalizing and this is highly inappropriate in a book. I was going to write back to him saying, "You just proved my point." Then I wanted to say some of my best friends are Germans and it's a stereotype and all of that. It's also true.

ROBERT GREENE

It's true. Think of all the great German comedians.

VILAYANUR S. RAMACHANDRAN

Right. I don't know, was there such a thing?

ROBERT GREENE

I don't know.

VILAYANUR S. RAMACHANDRAN

I see, I see. Okay.

ROBERT GREENE

There isn't. I can't think of any German films that have any humor. Well, perhaps.

VILAYANUR S. RAMACHANDRAN

Or novels.

ROBERT GREENE

There must be a German comedian somewhere. I don't know. As Jewish, you make a joke about how the Jews have no humor, we're very self-deprecating. We like to laugh at ourselves.

VILAYANUR S. RAMACHANDRAN

Jews have a good sense of humor.

ROBERT GREENE

They have the greatest sense of humor.

VILAYANUR S. RAMACHANDRAN

I thought you were saying they didn't.

ROBERT GREENE

No. There would be no humor if . . .

VILAYANUR S. RAMACHANDRAN

Woody Allen.

ROBERT GREENE

There would be no humor if it weren't for Jews.

VILAYANUR S. RAMACHANDRAN

That's correct. Yeah. Certainly not in the United States.

ROBERT GREENE

Certainly not in the United States. We like to look at ourselves and laugh. It's the Germans. It's verboten. Let me just try and go back then a little bit. I want to go into your childhood. I gleaned a few things about . . . There are scientists on your mother's side. You were encouraged, I suppose. They gave you a microscope and things like that.

VILAYANUR S. RAMACHANDRAN

That was my father. That was only when I turned 11 or 12. I'm not really talking about much earlier in childhood. If I go back further in childhood, I think loneliness contributed a lot. Undoubtedly, these scientist uncles of mine and cousins planted seeds. It influences you when you're a child. I don't know how much of an influence but you go to dinner and you go to their homes and they're talking about Newton doing something to

somebody else. It plants seeds in your head, the stories of science. The seeds were really planted by my teachers when I was probably between 9 and 13. What do you call it here? Junior.

ROBERT GREENE

Nine and 13, that would be elementary, grammar school going into junior high. Middle school now.

VILAYANUR S. RAMACHANDRAN

This was pre-high school. That would be called junior high right?

ROBERT GREENE

Now I think they call it middle school. In my day, it was junior high.

VILAYANUR S. RAMACHANDRAN

Okay. I think more like between the age of 10 to 13.

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

That's when the seeds were all really planted. It was because of teachers in Bangkok,

Thailand who had extraordinary imagination and would give us chemicals to take it home and play with them. I think it had a bigger influence than people who are naturally inclined. There is a general component, I'm sure there is. I had another friend, Cookie, who was also considered the class nerd. I was maybe considered not the ultimate nerd, but a bit of a nerd. He and I would collaborate. We would go and buy chemicals from the shops. Take them and buy reports and test tubes. Talked to Mrs. Panachura, talked to Mrs. Vanib and then play with these chemicals and do experiments. Partly it was because we were not into sports.

There is an element of loneliness. That in itself, I don't know how common this is among creative scientists. The nature becomes your companion in a sense. Then you escape into this. . . This is very much the thing. Even in my early teens I was a little bit lonely. If I go collect shells, you may think it's a frivolous little hobby. Then I collect these

shells on the shore in Madras, amazing little things. Then I'd start wondering about them.

I went to the library, the all British library. It goes back to the mid-19th century. They had a book called *Conchologia Iconica*. It was about that tall for earlier editions. There are about 20 volumes. There are hundreds of colored plates, hand-colored engravings of shells, life sized or bigger. Somebody spent their entire 20, 30 years of their life doing this, hand coloring it. That's when the love of taxonomy was born. Then I would read about Cumming and Reed and all of these different conchologists. There's an international brotherhood of conchologists. I felt like I was part of this private universe which I could retreat into that I was master. Nobody in India knew anything about this. I'm king here even though I'm being ignored by all of these cricket players.

ROBERT GREENE

Oh, I see. You had beautiful shells to work with on the shore.

VILAYANUR S. RAMACHANDRAN

Yeah. A lot of them washed ashore like in Florida. Also there would be fishermen's nets. Fishermen would go out into the ocean to catch fish and in their nets there would be lots of fish and crabs. It was not just shells but crustaceans and starfishes and all of that. They dump all of that on the shore and then take the fish. I would go and pick and choose from that. Then of course there's taxonomy. There's the lives of the animals and all of that. There's an element of Darwin in me at that age.

ROBERT GREENE

Okay. There's the fascination first of all that nobody else is doing this.

VILAYANUR S. RAMACHANDRAN

That's part of it.

ROBERT GREENE

But also the form of it.

VILAYANUR S. RAMACHANDRAN

That's correct.

ROBERT GREENE

It's a very formal thing, conchology. How do you say it? Conchology?

VILAYANUR S. RAMACHANDRAN

That's correct. I didn't think of that.
Conchology.

ROBERT GREENE

Conchology. Almost mathematical.

VILAYANUR S. RAMACHANDRAN

Yes.

ROBERT GREENE

Is that maybe something that was appealing to you?

VILAYANUR S. RAMACHANDRAN

That's very much a part of it. That's unconscious. It's hard to articulate.

ROBERT GREENE

That's what I'm trying to get at.

VILAYANUR S. RAMACHANDRAN

What I'm saying is slightly different which is that the form defining different species . . . there are clumps, right? These are all murexes. There is something murex-like

about them. I can tell you right now, I will pick a murex shell and I'll pick a whelk or I'll pick a conch shell. They're so similar that they'll look like each other. You'll say, "That's obviously a conch," when in fact it's a murex. There are some subtle clues that say immediately that's a murex. That ability to pick the common denominator and abstract that quality is very much what we do in science.

ROBERT GREENE

It's an aha thing. It's an insight.

VILAYANUR S. RAMACHANDRAN

It's an aha thing. What you're saying is the aesthetics are the form itself.

ROBERT GREENE

There's always an aesthetics involved. All scientists have that. Right?

VILAYANUR S. RAMACHANDRAN

That's right. Absolutely.

ROBERT GREENE

You collected these. You were also interested, it seems like, in archaeology or in ancient history or fossils.

VILAYANUR S. RAMACHANDRAN

That came later. Fossils, yes. Paleontology.

ROBERT GREENE

Paleontology, I mean.

VILAYANUR S. RAMACHANDRAN

I think here there is something deeper than meets the eye in paleontology. What it is . . . of course it's disproportionately fascinating to people. I'm talking about adults in the country. Let's say one out of 30 people or one out of 40 people is fascinated by it, maybe even one out of 10.

ROBERT GREENE

For me, I'm one of them.

VILAYANUR S. RAMACHANDRAN

You're one of them, yeah.

ROBERT GREENE

Oh, yeah.

VILAYANUR S. RAMACHANDRAN

There's some intrinsic fascination. I think things like paleontology and cosmology. . . see cosmology, the problem is it's out of reach. It's too abstract. The idea excites you about black holes and all of that stuff. Paleontology you can understand what's going on. You say how whales evolved from such and such a thing. Fossils you can touch. It's tangible. Yet it's about on a grand scale and it's about . . . one of the things I say in my book, you may remember, is it's funny that all of these disciplines, like Freudian psychology, neuroscience, molecular biology, and indeed, paleontology, diminish human beings in a sense at first sight. It seems like they're diminishing you. Evolution is telling you and paleontology is telling you that you're just a puny, little, hairless ape. Here are these vast stretches of time and inhospitable space and here you are a little puny thing.

ROBERT GREENE

We love it.

VILAYANUR S. RAMACHANDRAN

Yeah and we love it. Cosmology's like that too. Molecular biology is saying you're just a bag of chemicals. Freud said and neuroscience is telling you . . .

ROBERT GREENE

Just a conscious.

VILAYANUR S. RAMACHANDRAN

. . . you're just wisps of jelly of your brain. Why would human beings enjoy being diminished? I think it's because it's the opposite. We all have the fear of mortality. We say, "Look, we're eternal in a sense. We're part of some grander scheme of things. We're part of that scheme." In a sense, it's a liberating effect. Instead of being selfish and self-absorbed, I think it has the opposite effect.

ROBERT GREENE

Did you have any of those feelings when you were a child? When you were first getting, or not a child or young adult . . .

VILAYANUR S. RAMACHANDRAN

I think unconsciously. We get more consciously articulated later. Again, you could say, and I'm thinking aloud here, it's also a part of that loneliness thing. Then you say you're part of something greater than yourself. That's a feeling of oceanic feeling. In the case of shells, it's quite literal. It's part of the same feeling of being part of something more lofty than little old me. I might not have a lot of friends, but I'm part of the grandeur of the universe. It's not articulated like the way I'm saying it.

ROBERT GREENE

No, it's unconscious perhaps. I think a lot of children are very obsessed with infinity. I know I was. Like in a barbershop in the United States, you'd have the mirror on both sides so you would see the mirrors going on forever. That thought obsessed me. I'm wondering if that was something similar with the notion of time of millions and millions of years.

VILAYANUR S. RAMACHANDRAN

Right. I think that fascinates everybody. I'm not sure about kids this day and age.

ROBERT GREENE

No, no.

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

Very rarely you come across . . .

ROBERT GREENE

I know it's a new world.

VILAYANUR S. RAMACHANDRAN

It's a new world. Short attention span.

ROBERT GREENE

Part of the reason why I'm doing the book is didactic, to show them the value, the higher pleasure to be had by going through a patient process and mastering something and not being so ADD.

VILAYANUR S. RAMACHANDRAN

That's excellent.

ROBERT GREENE

I have to sneak it in. I don't want to preach. I'm going to do it.

VILAYANUR S. RAMACHANDRAN

That's excellent. I wish they were here listening to the conversation.

ROBERT GREENE

They tune you out so you have to get it in through different ways. I'm also going to be interviewing people who they won't think of as scientists, like a musician or an artist.

VILAYANUR S. RAMACHANDRAN

Oh, good. This is creativity not just in science but in all realms including poetry.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

I strongly believe, by the way, that the creative spark is very similar across different . . . Peter Medawar said that. Have you ever read Peter Medawar?

ROBERT GREENE

No. You talk about him a lot.

VILAYANUR S. RAMACHANDRAN

I think it's about unusual juxtapositions of ideas.

ROBERT GREENE

Have you ever read Arthur Koestler?

VILAYANUR S. RAMACHANDRAN

A long time ago. *Act of Creation*.

ROBERT GREENE

Do you have that book? I was going to get that for you because I think you would like it. Have you read it?

VILAYANUR S. RAMACHANDRAN

Not in about 30 years.

ROBERT GREENE

The first part of it is about creativity and bisociation and juxtaposition, but the first part of it is all about humor and humor in science. It's really weird and I think you might find it really interesting.

VILAYANUR S. RAMACHANDRAN

I often say this in my classroom, I say that people should institute humor early in schools because it's also about unusual juxtapositions

of ideas. It may spill over into science. Nobody studied this. The real question is does it spill over into science?

ROBERT GREENE

He thinks it does.

VILAYANUR S. RAMACHANDRAN

We need evidence though.

ROBERT GREENE

Oh, yeah.

VILAYANUR S. RAMACHANDRAN

It stands to reason, I agree. The counter example I tell my students is Germans are often really good scientists.

ROBERT GREENE

Back to Germans. Then you get into things like Einstein had a good sense of humor but he's Jewish.

VILAYANUR S. RAMACHANDRAN

He did. What about non-Jewish Germans?

ROBERT GREENE

Then you've got a Max Planck. I don't think he had much of a sense of humor.

VILAYANUR S. RAMACHANDRAN

Yet he was an amazing scientist.

ROBERT GREENE

Yeah, you're right.

VILAYANUR S. RAMACHANDRAN

Heisenberg.

ROBERT GREENE

I had no sense of humor. Yeah, you're right.

VILAYANUR S. RAMACHANDRAN

They're the exceptions that prove me wrong.

ROBERT GREENE

I want to get you that book because I think you'd find it . . .

VILAYANUR S. RAMACHANDRAN

I'd love to.

ROBERT GREENE

Okay. You were drawn to conchology, paleontology, finding . . . Is there the same sort of thing as finding order in paleontology?

VILAYANUR S. RAMACHANDRAN

It's a combination of my own private retreat where I'm king, I'm supreme and finding order in diversity. It's very peculiar because

if I think of my generation in India, I think you can go through a few thousand students easily and not find a single student interested in paleontology or zoology or anything like that. Except when you're a little kid, when you're eight or nine or seven, there's all the dinosaurs.

ROBERT GREENE

Dinosaurs, yeah.

VILAYANUR S. RAMACHANDRAN

Not serious interest in paleontology as a 12 year old, 13 year old.

ROBERT GREENE

Why you?

VILAYANUR S. RAMACHANDRAN

I don't know. It's partly my early education in Bangkok and Thailand. My teachers were into it. Even they were not talking so much about paleontology. They mentioned it casually. It's about certain books I read, certain things, certain books my parents gave me. It was just random reading. Then you get hooked on something. You're [inaudible]

24:39]. I was never hooked on poetry at that stage but then I got hooked on poetry when I went to college, which we do in India much earlier than here. My brother, as I say in my book, was very much into poetry. He read everything. He probably knows 10% of Shakespeare by heart. All the key passages he knows by heart.

ROBERT GREENE

You have a lot of Shakespeare in your book which is very good.

VILAYANUR S. RAMACHANDRAN

It all comes from him. That's another example. Economy in science, elegance. Like Faraday's experiment, he's not fundamentally different. This act of juxtaposition, the act of economy and elegance. For example, Shakespeare says of life . . . what does he say? There are hundreds of ways. . . I've got a tablet or column of . . . he's got about 17 descriptions of life. Each of it is poignantly different from the others. In one of them he says, "When we're born, we cry because

we have come to this great stage of fools." King Lear. That says it all. It sure sends a shiver down your spine. The title itself means nothing. It's almost a meaningless sentence but it means everything.

ROBERT GREENE

You're talking about the economy of expression and simplicity.

VILAYANUR S. RAMACHANDRAN

And the most beautiful science fantasy experiments. Again, it's becoming less and less true. There are large teams of scientists doing complicated experiments. Let's take the double helix. Crick and Watson seeing in a flash of inspiration . . . again we're talking about analogy. It's juxtaposition of ideas but also analogies and metaphor. The complementarity of the strand dictates the complementarity of offspring and parent. For example, a pig walks into a room and if a donkey walks out you say, "My God, how is that possible?" If two pigs walk in and. . . That's what bacterial transformation was

where they took two different species of bacteria, put them incubated with each other, and it turned one bacterium into the other. Nobody paid any attention to it. If I had taken a cow and put it with a sheep and the sheep turned into a cow, you would have just jumped off your seat. It's not any different from that.

ROBERT GREENE

They paid attention to it.

VILAYANUR S. RAMACHANDRAN

Later, yeah, they paid attention to it. They said, "What's going on here?" Somebody took the chemical, Avery, and showed that the chemical alone would then transform the species. What is in this chemical? It was staring at people in the face but nobody's paying any attention to it. They say, "Maybe it's this molecule." How can a molecule dictate similarity of species? Maybe the helix complementarity dictates the similarity of offspring. At that moment, with that flash of insight, would all take about two or three

months, modern biology was born. Not from elaborate equations, not from. . .

ROBERT GREENE

Who had the insight? They couldn't have both had it at the same time. We'll never know.

VILAYANUR S. RAMACHANDRAN

We'll never know. It's one of those instances where neither of them could have done it without [inaudible 27:24].

ROBERT GREENE

Yeah. Your going into medicine for instance was mostly through your father because you wanted to go into regular science.

VILAYANUR S. RAMACHANDRAN

Yes. I wanted to go into either chemistry or biology. As I say in the book, one of the things is physics fascinated me too but not as much. It was almost too orderly. The nice thing about biology is it's a mess partly. The mess is a result of chemistry too, but you got four allotropes of sulfur. Why would sulfur, one element, occur in four different

crystalline forms? It's full of these oddities. At the same time there is order. You see the periodic table. All of this stuff, everything around you, is made up of these elements but they're all aspects of elements. Then you can explain it in terms of the periodic table and in terms of atomic theory. Physics is too orderly.

ROBERT GREENE

What is it about the messiness that appealed to you?

VILAYANUR S. RAMACHANDRAN

That's a good question. I think there's a more wider range of phenomenon to be explained and more phenomena that seemed inherently more intriguing. That's a good question. I don't know an answer.

ROBERT GREENE

You have a Sherlock-Holmes-like brain. You want puzzles to solve. Physics certainly has that, but. . .

VILAYANUR S. RAMACHANDRAN

It does have that, but not day to day.

ROBERT GREENE

No. In that sense, medicine would not be a terrible choice for you.

VILAYANUR S. RAMACHANDRAN

No. In fact, my father did the right thing. He said one of the things you need to be a creative scientist. . . He didn't know this. I think he accidentally pushed me in the right . . . no, he pushed me towards medicine because he said it's a great fallback option. In other words, you can be a mediocre doctor and survive but you can't be a mediocre scientist and survive. Okay?

ROBERT GREENE

Yeah. In America, you can be a mediocre doctor and make a million dollars a year.

VILAYANUR S. RAMACHANDRAN

Yeah. Same thing with India. If you're a scientist, you have to be good.

ROBERT GREENE

Great.

VILAYANUR S. RAMACHANDRAN

Otherwise you do nothing. If you're a poet, you have to be good.

ROBERT GREENE

I see.

VILAYANUR S. RAMACHANDRAN

That was his reasoning.

ROBERT GREENE

Smart.

VILAYANUR S. RAMACHANDRAN

I think medicine is also good for other reasons because there's a diverse range of topics it exposes you to, whether it's philosophy or chemistry or biology.

ROBERT GREENE

Philosophy? Not here. Maybe in India.

VILAYANUR S. RAMACHANDRAN

No. I mean ethics kicks in to some extent.

ROBERT GREENE

Oh, okay. Yeah.

VILAYANUR S. RAMACHANDRAN

Social interaction. Mainly, it exposes us to biochemistry, to biology, to anatomy,

to chemistry, organic chemistry, everything, evolution.

ROBERT GREENE

You were not upset in that advice that he gave. Or was it more than advice? He was sort of telling you what to do kind of thing?

VILAYANUR S. RAMACHANDRAN

Telling me what to do and advice and all of that. Another advantage with medicine is, as opposed to if I had gone into pure science, it gives you a no nonsense pragmatic attitude. Either your patients dies or he lives to put it crudely. We come from a lofty theoretical position but ultimately, and if it doesn't translate into something tangible, then it's bullshit most of the time. That in [inaudible 30:30] especially in being educated in India where at that time, we didn't have MRI, we didn't have CT scan. You really do have to play Sherlock Holmes. You have to use minimal resources. You got to be resourceful. That's no longer true in medicine. You don't have to be resourceful. I don't know if it's still

true that taking medicine prepares you much better for a research career. It may not be true anymore.

ROBERT GREENE

No, I don't know.

VILAYANUR S. RAMACHANDRAN

I don't think it is.

ROBERT GREENE

Have you heard of a Dr. Verghese?

VILAYANUR S. RAMACHANDRAN

Dr.?

ROBERT GREENE

Verghese up in Palo Alto.

VILAYANUR S. RAMACHANDRAN

No.

ROBERT GREENE

He was somebody I was going to interview but he's too busy. He writes novels as well.

He's trying to bring back the art . . . he's from Ethiopia and was trained, I think, in India.

VILAYANUR S. RAMACHANDRAN

Was he?

ROBERT GREENE
The art of diagnosing people without technology and being able to look at someone and how they walk and see if they have . . .

VILAYANUR S. RAMACHANDRAN
Parkinson's and things like that.

ROBERT GREENE
. . . Parkinson's and things like that.

VILAYANUR S. RAMACHANDRAN
There's another guy you might consider but I don't know how . . .

ROBERT GREENE
Oh, I was going to ask you about that.

VILAYANUR S. RAMACHANDRAN
It depends on the degree of eminence you need.

ROBERT GREENE
I need eminence.

VILAYANUR S. RAMACHANDRAN
No, I'm sorry, eminence.

ROBERT GREENE
I do need eminence.

VILAYANUR S. RAMACHANDRAN
This guy is very eminent but also considered a little bit, slightly nutty.

ROBERT GREENE
Everybody I've chosen is slightly nutty.
No offense.

VILAYANUR S. RAMACHANDRAN
No, I know. A little offbeat, yeah.

ROBERT GREENE
Everyone's offbeat.

VILAYANUR S. RAMACHANDRAN
This guy is Jaron Lanier who invented Virtual Reality. He lives in Berkeley.

ROBERT GREENE
Oh, my researcher recommended him but I don't know why I didn't . . .

VILAYANUR S. RAMACHANDRAN
He's a bit too diverse. Even I'm mainstream compared to him.

ROBERT GREENE
I'm very interested in that because I read that book *Complexity*.

VILAYANUR S. RAMACHANDRAN
That was by somebody else.
ROBERT GREENE
Right. I know. No, he's not mentioned in it. The man who created Artificial Life, I was going to interview him but he's disappeared off the face of the planet. Jaron Lanier is very good idea. I will look into that.

VILAYANUR S. RAMACHANDRAN
I don't want to advise you how to write your book but if you expound the spectrum from people . . . I think none of the people you are going to pick are real mavericks.

ROBERT GREENE
They aren't?

VILAYANUR S. RAMACHANDRAN
I'm saying they're professionally respected and mavericks as well.

ROBERT GREENE
Exactly.
VILAYANUR S. RAMACHANDRAN
They're not pure mavericks. A pure maverick is somebody who's considered just fooling

around. Depending on how you use the word. Maybe the American usage is different.

ROBERT GREENE

I think you're right. No one will have heard of them anyway or they won't have any success. I am interested in the combination of the two.

VILAYANUR S. RAMACHANDRAN

I think that there are people who are very straightlaced and hard nosed. I think science is many different styles as you well know.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

There are those who are very anal, very rigid. The trouble is you need them. You have starry-eyed idealists and romantics. It's what I am. You can't just have us nor can you have just them. I think maverick is yet another type.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

There's a strong streak of maverick in me, a defiant streak in me but on the other hand, I publish mostly in major journals and I do my grant. True mavericks are there.

ROBERT GREENE

Oh. Maybe to have one peculiar person that doesn't fit quite exactly is actually good. Otherwise the book gets too predictable.

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VILAYANUR S. RAMACHANDRAN

It's getting harder especially for grants. One good fortune for me is a lot of the things I do are not high tech.

ROBERT GREENE

Yes, I know.

VILAYANUR S. RAMACHANDRAN

But when I want to use high tech, I just pick up the phone and say, "Look, here's an experiment I want to do which requires a SQUID, MEG machine." They'll say, "Oh, sure. We can do that." Then they get it done. I don't have to buy my own. I don't need

\$10 million to buy one. Also, for the clinical stuff I do like phantom limb, there's plenty of money so I don't have to struggle. If I want to do synesthesia or something offbeat as you may know about, [inaudible 35:04] get a grant for that. They'll say, "What the hell are these people listening to five and two?" I'll say, "Look, it gives you deep insight into creativity." They'll say, "Time isn't right."

There is that maverick side to me which is bold. Then I have my bread and butter. This is a trick I tell my students. They'll say, "Look Rama, we can't all be like you. We won't get tenure." I said, "No. I was in here saving your place." What I do is like stocks. You have blue chip. I always do that because you need the blue chip to get the grants.

ROBERT GREENE

I do the same thing. I understand.

VILAYANUR S. RAMACHANDRAN

You have high payoff, low risk and low payoff, high risk. I'm sorry, the other way around.

High risk, high payoff, low risk, low payoff.
You have to do both.

ROBERT GREENE

You have to do both. You have to spread your wealth, your bets there.

VILAYANUR S. RAMACHANDRAN

Those are the guys who do the best. If you don't do that, you get scared. Under fear, you can't do science. If you say, "Look, my livelihood depends on this, let me suck up to them," you're not going to do good science.

ROBERT GREENE

That's right. It even applies to business. I have a person whose business fits this, the same mold.

VILAYANUR S. RAMACHANDRAN

Oh, yeah. Oh, oh, another very creative scientist . . .

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

He's just like me. He's profession of disparity and Fellow of the Royal Society but he has a

strong streak. . . I think you need an upstart streak. I guess there's a difference between maverick and upstart.

ROBERT GREENE

What do you mean?

VILAYANUR S. RAMACHANDRAN

You want to challenge the status quo constantly.

ROBERT GREENE

That's all I'm looking for because I don't think we have enough of that.

VILAYANUR S. RAMACHANDRAN

I see a maverick as somebody, it's just terminology, who's defined for the sake of being defiant.

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

Or who's completely offbeat or off the wall and every now and then hits the jackpot. That's a maverick. I think what Jack and I have, we're pretty mainstream in many ways, but . . .

ROBERT GREENE

Who's Jack?

VILAYANUR S. RAMACHANDRAN

My former advisor, Jack Pettigrew, who's the other person I was going to suggest.

ROBERT GREENE

Where do I know that name Jack Pettigrew?

VILAYANUR S. RAMACHANDRAN

He does hemispheric dominance and all that but he also discovered the neural best medicines.

ROBERT GREENE

Is he also a neuroscientist?

VILAYANUR S. RAMACHANDRAN

Neuroscientist, yes.

ROBERT GREENE

I don't know if I can have two neuroscientists. You're my neuroscientist.

VILAYANUR S. RAMACHANDRAN

All right. That's fine. He'd be redundant, yeah..

ROBERT GREENE

Okay. What would you classify Einstein as because he had a very rebellious streak. He hated authority.

VILAYANUR S. RAMACHANDRAN

I wouldn't call him a maverick. I'd call him rebellious.

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

Actually I would call Galton a maverick. He was very eminent.

ROBERT GREENE

Galton?

VILAYANUR S. RAMACHANDRAN

Yeah, but I would almost lean towards calling him almost a maverick. He was always interested in very quixotic subjects.

ROBERT GREENE

He was which is what's so fascinating about him.

VILAYANUR S. RAMACHANDRAN

Yeah. He was fingerprinting and all sorts of things. He never made a major contribution. Oh, no. Wait a minute. In statistics he did.

ROBERT GREENE

He did, yeah.

VILAYANUR S. RAMACHANDRAN

In the field of statistics.

ROBERT GREENE

Yeah there are a few. He's very interesting.

VILAYANUR S. RAMACHANDRAN

You could call Damius Haldane leans in the direction of being maverick but again, he made amazing contributions in major . . . okay. If you make amazing contributions in mainstream and then entertain and test out oddball ideas simultaneously and every now and then they pan out, I don't call anything like that a maverick.

ROBERT GREENE

What if you had tough people like Einstein or Darwin, who at the time when they're coming up with their ideas . . .

VILAYANUR S. RAMACHANDRAN

Are considered mavericks.

ROBERT GREENE

There's nobody else there to lean on.

They're doing something that now we've completely accepted.

VILAYANUR S. RAMACHANDRAN

This is a perennial question. When do you call a guy just a crackpot versus a budding genius? I think that one has to have an open mind. I have certain rules of thumb. For example, I say look for odd phenomenon. If you just look for any odd phenomenon and go after it, you're wasting your time. I have certain heuristics about which odd phenomenon.

ROBERT GREENE

I want to go into that.

VILAYANUR S. RAMACHANDRAN

Sure.

ROBERT GREENE

Actually, I just want to do a couple more things in childhood. You're obviously

fascinated, as we said, by anomalies. We were just talking about that. Was that something also when you were a kid . . .

VILAYANUR S. RAMACHANDRAN

Absolutely. That goes back very early.

ROBERT GREENE

Can you give me an example of that?

VILAYANUR S. RAMACHANDRAN

Okay. Let me think. I might be able to email you about.

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

Let me give you an example. Like carnivorous plant. A plant is not going to be carnivorous. That's an oddity, an anomaly.

ROBERT GREENE

You were interested in that.

VILAYANUR S. RAMACHANDRAN

I was fascinated.

ROBERT GREENE

Did you have them in your house?

VILAYANUR S. RAMACHANDRAN

I tried to but in India I couldn't. Later when I went to England I was able to purchase them and play with them. Maybe it was not even in England, maybe when I was a post-doc at Caltech. I can't remember. Another thing's an axolotl. I now have pets. I'll show you. An axolotl is a salamander.

ROBERT GREENE

You have as a pet?

VILAYANUR S. RAMACHANDRAN

I have it as a pet, yeah. It's a salamander which belongs to the salamander group. The extraordinary thing about it is salamanders have gills in the water. They're not sexually mature. They're larvae. Then they moved to land and lose their gills and become air breathing. Then they lay eggs. Still, they can go partly into the water.

ROBERT GREENE

That's amazing isn't it? Yeah.

VILAYANUR S. RAMACHANDRAN

If you give salamanders thyroid hormones, you can accelerate the metamorphosis. They become adults more quickly. You can do it with frogs too and tadpoles. It's called a metamorphosis hormone. Somebody did the experiment about 100 years ago, I think, where they took axolotls and put thyroid hormone. Axolotl is a permanent larva. There's no adult in existence. It becomes an adult as a larva. They become sexually mature in the water. It can't go into the ground on earth because it can't breathe anymore. It needs to be in the water. It becomes sexually mature in the water, reproduces in the water. It's becoming more and more fishlike or tadpole like. Think of it as a permanent tadpole. Now, somebody put thyroid hormone in it. Guess what happened. You went back in time to the ancestral creature that evolved into the axolotl. You go back in time 100,000, 200,000 years and putting thyroid hormone in it.

ROBERT GREENE

How do you know that?

VILAYANUR S. RAMACHANDRAN

Because of its [inaudible 41:04]. It's now become a creature that doesn't exist in nature. You can't find it in nature. You got to call it a new species.

ROBERT GREENE

Wow.

VILAYANUR S. RAMACHANDRAN

You're going back in time. It got me to start wondering. I said, "You gave this chemical and changing the tadpole into a non-existent creature. You created a new species." It's not any less surprising than somebody giving you a cocktail of hormones and transforming you into Homo erectus. It's not any less surprising than that. It's the same phenomenon.

Completely same idea to give a human baby
...

ROBERT GREENE

Oh, homo . . . yeah.

VILAYANUR S. RAMACHANDRAN

Human beings are neotenous primates.

That's well known. That's why we lost our hair and have a huge head and all of that. Suppose that I claim tomorrow that I can give a cocktail of hormones to you and make you revert back into an ancestral hominid. You say, "My God, that's the most amazing discovery."

ROBERT GREENE

Yeah. I would probably even want to do it.

VILAYANUR S. RAMACHANDRAN

That would be an example of an anomaly.

ROBERT GREENE

What did you do? You collected this?

VILAYANUR S. RAMACHANDRAN

No, no. This is just a thought experiment in my head.

ROBERT GREENE

Oh, okay.

VILAYANUR S. RAMACHANDRAN

Even simple things like why does every liquid . . . this I knew when I was in school. I was

totally mystified. Why does every liquid contract when it solidifies, when you cool it? Water alone, when you cool it, expands as ice. Why the hell is that? I don't know the answer. Even now I don't know. It's the only one when it cools that does that. Also, if you heat a substance, a solid, it becomes a liquid and then become gaseous. You heat ice, it becomes liquid water, then becomes steam.

Most elements do that. Most chemicals do that. Guess what happens to iodine. You heat it, there's no liquid iodine. It instantly becomes vaporized. Why? It's called sublimation. It's always the exceptions.

ROBERT GREENE

They fascinate us.

VILAYANUR S. RAMACHANDRAN

It's very interesting. I like patterns and I like diversity, like shells, and I like seeing patterns in diversity. I see patterns in diversity.

That's about abstraction. Then I like to see exceptions in the patterns. You're now

making me think along lines which I haven't thought before.

ROBERT GREENE

Oh, that's what I was hoping to do.

VILAYANUR S. RAMACHANDRAN

I come down to find the shells . . . it's anomaly within the diversity and within the patterns that you're seeing. An anomaly often leads to a new discovery.

ROBERT GREENE

Yeah. I don't want to be Freudian here but is there anything yourself feeling anomalous?

VILAYANUR S. RAMACHANDRAN

Oh, absolutely. I think so.

ROBERT GREENE

Is there any kind of projection going on there?

VILAYANUR S. RAMACHANDRAN

I don't know about projection but I suddenly felt out of place in the school curriculum. I hated memorizing stuff but that's common among most creative scientists.

ROBERT GREENE

Your interest in these sort of freaks of nature, if you want to call them that . . .

VILAYANUR S. RAMACHANDRAN

Yeah. Another thing I was interested in in medical school was freaks, anomalies. There's a creature in humans every now and then, you get a thing called hamartoma. It's a tumor. These tumors, suddenly you can find them anywhere in the body, will have teeth and hair and . . .

ROBERT GREENE

I've heard of those.

VILAYANUR S. RAMACHANDRAN

. . . and some skin and all that. They're called hamartomas. They're like distorted little embryos. It's called hamartoma because hamartoma means, in Greek or Latin, a spear thrown. It's like a spear from the embryonic stage thrown into your body. Then it develops into a semi-embryo.

ROBERT GREENE

I've heard of those, yeah.

VILAYANUR S. RAMACHANDRAN

Truly this can't tell us anything about normal development. Why does this happen? Similarly, with all kinds of freaks, a stable of freak shows, we had our anatomy museum full of these guys pickled in formaldehyde. That was when I was nine or eight.

ROBERT GREENE

Oh, really? In Madras or in . . .

VILAYANUR S. RAMACHANDRAN

Yes. My cousin was a doctor in Madras. My cousin was a doctor so she would take me. She was at that time, must have been 19 or something. I was about eight or nine years old. She said she's never seen a kid . . . she just left me there saying she'll . . .

ROBERT GREENE

What is this? A museum?

VILAYANUR S. RAMACHANDRAN

It's a museum, an anatomical museum. She said she left me there with my . . . we had a nanny or a servant. She said, "I'll come back in an hour." She came back in an hour and

I refused to leave. She came back in three hours, refused to leave. The entire day I was sitting there looking at these things.

ROBERT GREENE

What were you looking at? They were pickled in jars?

VILAYANUR S. RAMACHANDRAN

In jars with different types of deformities. Multiple hands.

ROBERT GREENE

All human?

VILAYANUR S. RAMACHANDRAN

All human. And encephali where there's no brain. All of them are human.

ROBERT GREENE

Why were you so . . . can you think of why you . . .

VILAYANUR S. RAMACHANDRAN

I think you could say it's something silly like a Halloween-like obsession.

ROBERT GREENE

Which boys would be into. It's more than that for you.

VILAYANUR S. RAMACHANDRAN

It's more than that. Seeing why it happens. Utterly fascinated by pathology.

ROBERT GREENE

I just wonder if there's some part of you that felt . . .

VILAYANUR S. RAMACHANDRAN

Different.

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

Identified. Could be. Could be. I think also it's one-upmanship. That's another Freudian thing. There were bullies in class that were not super smart. I said, "Well, I'll bully them with knowledge." Again, that's a common syndrome.

ROBERT GREENE

It is but why would you be going towards these anomalies that aren't really . . .

VILAYANUR S. RAMACHANDRAN

It's even more of a treat.

ROBERT GREENE

Oh, more esoteric.

VILAYANUR S. RAMACHANDRAN

The more esoteric the better, the more special it makes me feel.

ROBERT GREENE

I see. That sounds more accurate.

VILAYANUR S. RAMACHANDRAN

I'm just doing a volunteer psychoanalysis here.

ROBERT GREENE

We're both doing that. Another thing I noticed, I'm just looking at strains in your work trying to see if there's any . . . by the way, whatever . . .

VILAYANUR S. RAMACHANDRAN

Do you want to get some coffee?

ROBERT GREENE

Sure. I'm going to get tired.

VILAYANUR S. RAMACHANDRAN

Take a little stroll?

ROBERT GREENE

Huh?

VILAYANUR S. RAMACHANDRAN

Take a little stroll to the cafe?

ROBERT GREENE

Definitely.

ROBERT GREENE

Yeah. Well, this man, Daniel Everett, spent 30 years with the Amazonian tribe in...

VILAYANUR S. RAMACHANDRAN

Oh, I know that stuff. In fact . . .

ROBERT GREENE

He's one of the people I'm interviewing.

VILAYANUR S. RAMACHANDRAN

Beautiful.

ROBERT GREENE

He's a total maverick.

VILAYANUR S. RAMACHANDRAN

He's a total maverick, yeah. And in anthropology, it's hard to say, I did some mainstream work and now I'm doing this, because this is his main work.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

But I guess successful anthropologists, they're all mavericks in some sense.

ROBERT GREENE

If they're successful, but one could say that about anybody who's successful.

VILAYANUR S. RAMACHANDRAN

Anybody who's successful. [laughs] That's right. But you know, the same guy who did that book, who did a profile on Everett in the New Yorker, he did the profile on me.

ROBERT GREENE

That's interesting.

VILAYANUR S. RAMACHANDRAN

Wonderful guy. Colapinto.

ROBERT GREENE

Yeah, yeah.

VILAYANUR S. RAMACHANDRAN

Great writer. Just a coincidence.

ROBERT GREENE

I had a profile in the New Yorker as well, but it wasn't as illus- . . . it was a different writer.

It was more about my connection to hip-hop artists and things like that.

VILAYANUR S. RAMACHANDRAN

You wrote about hip-hop?

ROBERT GREENE

No, no, no. I was profiled in the New Yorker as well.

VILAYANUR S. RAMACHANDRAN

Oh, you were? Okay.

ROBERT GREENE

Yeah, in 2006.

VILAYANUR S. RAMACHANDRAN

That's great. Great. But about writing, about your career.

ROBERT GREENE

Yeah, about my books. Yeah.

VILAYANUR S. RAMACHANDRAN

I enjoyed that book "Seduction" tremendously. It's just like what I was saying about scientific heuristics, right? When you state it, it seems kind of obvious that you should have passion. But to actually absorb it into your thinking is extremely hard.

ROBERT GREENE

It is very difficult.

VILAYANUR S. RAMACHANDRAN

Like you said, to implement it is against the grain of . . .

ROBERT GREENE

There's a guy who's obsessed with the books, who studies a lot of . . . did you want me to pour that into a second cup?

VILAYANUR S. RAMACHANDRAN

Yeah, pour it in a second cup.

ROBERT GREENE

I understand now what you were doing.

VILAYANUR S. RAMACHANDRAN

Because what happens is, I have what's called familial tremor, which is a completely benign condition. But it's like a . . .

ROBERT GREENE

Is that better?

VILAYANUR S. RAMACHANDRAN

It's much better. What happens is that if I have coffee too much, it accentuates it.

ROBERT GREENE

Oh, well, don't have coffee.

VILAYANUR S. RAMACHANDRAN

[laughs]

ROBERT GREENE

I never drink coffee. I just drink tea.

VILAYANUR S. RAMACHANDRAN

Really?

ROBERT GREENE

Yeah. I need to be awake. There's a guy who studied a lot, he thinks he studied a lot of neuroscience, and he's trying to find a way to create a system for *The Art of Seduction* and *The 48 Laws* where you . . .

VILAYANUR S. RAMACHANDRAN

For what?

ROBERT GREENE

For my books. Where you could learn them on the computer or whatever.

VILAYANUR S. RAMACHANDRAN

I see.

ROBERT GREENE

And you practice them, so they become imprinted in you. Otherwise, it's not so abstract.

VILAYANUR S. RAMACHANDRAN

So you put yourself in scenarios like that.

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

I thought you did that. I kind of remember.

ROBERT GREENE

No.

VILAYANUR S. RAMACHANDRAN

Maybe I'm confusing two different books. Lieberman is good. David Lieberman? Do you know him?

ROBERT GREENE

Mm-mm.

VILAYANUR S. RAMACHANDRAN

He talks about love strategy and strategy of seduction and things like that.

ROBERT GREENE

No, I don't know that.

VILAYANUR S. RAMACHANDRAN

It's great. It's very good too.

ROBERT GREENE

Is it good?

ROBERT GREENE

If you have the time to read it, you might enjoy the war book [*The 33 Strategies of War*].

VILAYANUR S. RAMACHANDRAN

Okay.

ROBERT GREENE

Which is full of things like that.

VILAYANUR S. RAMACHANDRAN

I see. Okay.

ROBERT GREENE

Particularly the last section on dirty war and unconventional warfare. I even have a chapter on Gandhi.

VILAYANUR S. RAMACHANDRAN

Oh, you do?

ROBERT GREENE

Gandhi was a great strategist.

VILAYANUR S. RAMACHANDRAN

Oh, right. I'm interested to hear that. Of course he's a great strategist, but he was also the deep spiritual.

ROBERT GREENE

Of course.

VILAYANUR S. RAMACHANDRAN

Some people say he was merely a politician.

ROBERT GREENE

No, no, no. I would never be so cynical. But a lot of people only look at the . . .

VILAYANUR S. RAMACHANDRAN

Spiritual side.

ROBERT GREENE

Yeah. They don't understand that he was also a great strategist. Because he understood the English so well, he knew their weaknesses. He tailored his various marches for media and for getting attention and for getting the public in England, because that was sort of what he was aiming at. He knew if he detached liberal opinion in England from occupation,

eventually they would quit. So, I don't know.

You have to read it.

VILAYANUR S. RAMACHANDRAN

I would love to see that.

ROBERT GREENE

Okay. I just want to do one last idea on this childhood, and then we'll go into the apprenticeship.

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

Did you ever have a sense of destiny?

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

You did?

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

Can you tell me a little bit about that?

VILAYANUR S. RAMACHANDRAN

It's very abstract. I mean, also of course, I may be misremembering, as one often does

with one's childhood memories. But it's all part of it. Going to the beach and looking for shells, and going to the library and isolating myself, looking at the old books. I thought I was going to be a great man.

ROBERT GREENE

You did?

VILAYANUR S. RAMACHANDRAN

Yeah. I didn't know how to get there, but I had a sense of it. I had it in my teens, and I had it in my . . . and it didn't hurt that my mother, I think she was like a Jewish mother, us Brahmins have a lot of similarities.

ROBERT GREENE

Brahmins and Jews you mean?

VILAYANUR S. RAMACHANDRAN

Jews and Brahmins.

ROBERT GREENE

That's interesting.

VILAYANUR S. RAMACHANDRAN

Which is why they're often called Boston Brahmins.

ROBERT GREENE

I didn't know that.

VILAYANUR S. RAMACHANDRAN

Maybe that's how the phrase arose.

ROBERT GREENE

What's the phrase?

VILAYANUR S. RAMACHANDRAN

The Boston Brahmins.

ROBERT GREENE

Oh, yes, yes.

VILAYANUR S. RAMACHANDRAN

So, a Brahman mother, what she does is, she implants in your brain two completely contradictory messages, right from childhood. She says you are the chosen one. You are the best. You have to have this sense of effortless superiority over the rest of mankind. Two, you're never good enough for me, whatever you do.

ROBERT GREENE

That's very Jewish.

VILAYANUR S. RAMACHANDRAN

And it's a recipe for neurosis. But a recipe for success.

ROBERT GREENE

Success. Yeah, yeah, yeah. Freud had that kind of background. His mother did exactly what you're saying.

VILAYANUR S. RAMACHANDRAN

Really?

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

She passed away three years ago, but if I phone her and say, "Mom, I just got a Nobel Prize." You know the first thing she would say?

ROBERT GREENE

I got what?

VILAYANUR S. RAMACHANDRAN

I just got the Nobel Prize. You know the first thing she would say?

ROBERT GREENE

What?

VILAYANUR S. RAMACHANDRAN

I hope you didn't share it with somebody.
[laughs]

ROBERT GREENE

[laughs]

VILAYANUR S. RAMACHANDRAN

She wouldn't say congratulations.

ROBERT GREENE

That's kind of how my mother would be.

VILAYANUR S. RAMACHANDRAN

Is that right? She's still . . . she's around?

ROBERT GREENE

My mom's still alive. My father passed away. I never understood that, the Brahmans and the Jews. I'll have to look into that. It's very important, that feeling that you have, that you're unique, that you're destined for something, because it has a sort of self-fulfilling element to it, doesn't it?

VILAYANUR S. RAMACHANDRAN

Yeah. I was never lacking in confidence ever. Maybe in school, but not when I passed 10 or 11 years of age.

ROBERT GREENE

And you don't know why that changed.

VILAYANUR S. RAMACHANDRAN

I think teachers encouraged me properly.

ROBERT GREENE

They recognized something in you?

VILAYANUR S. RAMACHANDRAN

Yes. Absolutely. My school, teachers. I went to a British school in Thailand, in Bangkok. And I had two teachers, one was British and the other was Thai. I couldn't even tell you their names. They were just amazing as teachers. Very inspirational and amazing, and that makes a huge difference. I always tell my students, my son went to Torrey Pines High which is a very good school. But the classes are terrible, the teachers are terrible, and the classes are terrible. I don't blame him for getting bored.

ROBERT GREENE

Yeah, right.

VILAYANUR S. RAMACHANDRAN

So I said, a must for your school is every boy and every teacher in the school should see *Dead Poets Society*. Have you seen the movie?

ROBERT GREENE

Mm-hmm.

VILAYANUR S. RAMACHANDRAN

About how he animates, how he conveys the passion for poetry to the students. He's a school teacher. If every school teacher were like that, even half of them were like that, our country . . .

ROBERT GREENE

Who's a school teacher? Oh, you mean in the movie.

VILAYANUR S. RAMACHANDRAN

In the movie. Robin Williams.

ROBERT GREENE

Yeah, but at some point, you have to also be self-motivated, too.

VILAYANUR S. RAMACHANDRAN

That's true. You need both.

ROBERT GREENE

But you do need good teachers as well.

VILAYANUR S. RAMACHANDRAN

How did you get onto this career? Did you go for formal journalism school?

ROBERT GREENE

No. I was kind of a loser until I was about 38.

VILAYANUR S. RAMACHANDRAN

Really? So did you not have a sense of destiny?

ROBERT GREENE

I did. Very much so.

VILAYANUR S. RAMACHANDRAN

You were educated at Berkeley.

ROBERT GREENE

Berkeley, and then I did graduate work at NYU. My field was languages, Greek and Latin.

VILAYANUR S. RAMACHANDRAN

My son's in the Greek field. He's in Berkeley, and he's going to go to do Greek and Latin and Sanskrit.

ROBERT GREENE

How exciting.

VILAYANUR S. RAMACHANDRAN

Either in Columbia or Chicago or something.

ROBERT GREENE

How exciting.

ROBERT GREENE

And Classics is a brilliant mental discipline.

VILAYANUR S. RAMACHANDRAN

That's interesting. That's very interesting. I never thought of that.

ROBERT GREENE

I know that this goes against some ideas in cognitive science, like Pinker doesn't believe in this, but it trains you in a certain way of thinking. So you take one sentence of Thucydides, you could spend four hours trying to . . .

VILAYANUR S. RAMACHANDRAN

One sentence of who?

ROBERT GREENE

A writer named Thucydides, who was particularly difficult. He was known for writing . . .

VILAYANUR S. RAMACHANDRAN

Can you write it down for me?

ROBERT GREENE

Your son will know about him.

VILAYANUR S. RAMACHANDRAN

I'll pass it on to my son.

ROBERT GREENE

He wrote . . .

VILAYANUR S. RAMACHANDRAN

The trouble with my son is he's counter-suggestible. If I tell him something, he'll take that book from the library and dump it.

ROBERT GREENE

Well, say that it came from me.

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

Well, he . . .

VILAYANUR S. RAMACHANDRAN

I'll just pass it on to him. He [inaudible 0:12:33]. It's the most difficult to interpret. Let me ask you a question. Why is that a good thing? Isn't it Shakespeare, a line from Shakespeare saying, "Tomorrow, tomorrow and tomorrow." Isn't that a better thing than reading this?

ROBERT GREENE

I'll give this to you, because there will probably be more things here on this. No, because Thucydides is like the equivalent of you with your shells...

ROBERT GREENE

or Sherlock Holmes. It's a puzzle and you have to think. You have to stare at the sentence, and you have an aha moment, when suddenly you see the agreement between the verb and the subject, and the word that you thought went here went there. And the whole sentence comes alive for you.

VILAYANUR S. RAMACHANDRAN

So it's very different from Shakespeare, where it's the simplicity of it that appeals to you. There's no puzzle to solve. It's instant.

ROBERT GREENE

Shakespeare is.

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

Well, Shakespeare is not easy to read, and there's also a difficulty, and you have to think very deeply. There's so many layers, because finally you figure out what the verb agreement is. You figure out what it means, and then you figure out the beauty of the thought. Because he's the greatest Greek historian. He's an amazing writer, but he's very difficult. Anyway, it trained my mind.

VILAYANUR S. RAMACHANDRAN

People say that about, sorry to interrupt, but about Sanskrit, which I don't speak.

ROBERT GREENE

I would love to learn Sanskrit.

VILAYANUR S. RAMACHANDRAN

But what my son says is the complexity of the sentences, and often you have synonyms. Here is an amazing thing, speaking of anomalies. There's a famous poem in Sanskrit about this big, where certain letters repeat as you read the poem. I may be misremembering this. You can follow the [inaudible 0:14:40]. It's a poem. It makes sense. In chess, which comes from India, there's a pretty famous puzzle called a horse puzzle, where you have to move the horse so that every square has been visited once without ever revisiting one square twice. Now that puzzle was solved by Euler.

ROBERT GREENE

Euler, sure.

VILAYANUR S. RAMACHANDRAN

A couple hundred years ago maybe. But it's there in Sanskrit manuals, this poem is there in the eighth or ninth century. And if you follow that repeating alphabet, it's the solution to Euler's problem.

ROBERT GREENE

That's great.

VILAYANUR S. RAMACHANDRAN

Isn't that absolutely astonishing?

ROBERT GREENE

I love things like that.

VILAYANUR S. RAMACHANDRAN

This is the whole thing about complexity you're talking about. Although I would think that probably in Sanskrit, you're not going to find the kind of grace and simple elegance of Shakespeare. It's a different kind of elegance.

ROBERT GREENE

There are amazing classical writers in Sanskrit, aren't there?

VILAYANUR S. RAMACHANDRAN

Oh, yeah. They're all beautiful. I don't speak it, so I don't know. But I bet they're beautiful in a different way from the way Shakespeare is beautiful.

ROBERT GREENE

I'm sure. Well, when you read . . .

VILAYANUR S. RAMACHANDRAN

Just as Milton is different from Shakespeare.

ROBERT GREENE

Well, when you study an ancient language, and I don't know the relationship between Sanskrit and ancient Greek. I'm sure they're different. But the thought process is different than how we think. The language changed how people think. It's so much more concrete. The way of thinking is so much more concrete, and you can feel it. That's when you understand a sentence. So everything is related to a smell or a tree or . . .

VILAYANUR S. RAMACHANDRAN

I see. So there's a synesthetic component.

ROBERT GREENE

Very much so.

VILAYANUR S. RAMACHANDRAN

In Greek. That's true of Sanskrit literature. It's all about allusions and metaphors and associations.

ROBERT GREENE

And Shakespeare, too. But language has gotten progressively more abstract.

VILAYANUR S. RAMACHANDRAN

Right, right, right.

ROBERT GREENE

Well, if you ever want your son, if he gets depressed, I think studying Classics is the greatest thing in the world.

VILAYANUR S. RAMACHANDRAN

That's what he's doing now at Berkeley.

ROBERT GREENE

And then he doesn't have to hear it from you. He can hear it from somebody else. Because if he hears it from you, then he'll drop out and he'll go into something else.

VILAYANUR S. RAMACHANDRAN

That's good. That's very interesting. It's a new side for me, because I thought it's just English public schools saying Latin trains your mind and some bullshit. It requires discipline. It requires you to do your homework.

ROBERT GREENE

The thing that Pinker says, which he annoys me sometimes. Of course learning Latin isn't going to help you learn physics. There's no relationship between learning an ancient language and a direct correlation to learning math or science or anything. But the discipline and the sense of being patient and going over something over and over and over again and trying to unravel a secret and finding a key in a specific word, it's the same thought process that applies to all sorts of things. I know it does.

VILAYANUR S. RAMACHANDRAN

That's very interesting.

ROBERT GREENE

I've used it in my own life, but I can't prove it.

VILAYANUR S. RAMACHANDRAN

That's very interesting, because how often jocularly I've said to my students that jokes and humor should be introduced into the curriculum. And that might generalize to science or poetry. And also poetry should

be introduced into the curriculum, because it's all about metaphorical thinking, linking ideas. And that would explode into science and even into mathematics. A sort of cross fertilization, which is related to what you're saying. Pinker would probably disagree.

ROBERT GREENE

He does disagree.

VILAYANUR S. RAMACHANDRAN

Related insight. I always tell my students, some of the most amazing discoveries have come from jokes. They started out as a joke.

ROBERT GREENE

Can you give me an example?

VILAYANUR S. RAMACHANDRAN

Here's a guy with a phantom limb, and he says it's stiff, it doesn't move, and it's painful. Can you get it to move? Well, if you put a mirror here and put your hand here, he's going to see it, and he moves his hand, you're going to see his phantom moving. [laughs]

That's ridiculous. It sounds like a joke, right? I remember people laughing when I said this,

my students themselves laughing. I honestly half meant it as a joke. I didn't think it would work. Here's a problem that's 200, 300 years old, or 100 years old clinically. And the guy has been in pain for years. The very idea that you could make it look like it's moving and therefore the pain will go away. It's a joke.

ROBERT GREENE

And they would literally laugh.

VILAYANUR S. RAMACHANDRAN

Yeah. We laughed. And then you give it to the patient. Sometimes the patient laughs, too, by the way. He thinks it's very funny that his phantom is resurrected and it's moving. But then of course it helps in pain. And now it's used in stroke. It's used in RSD. It's used in all sorts of things.

ROBERT GREENE

Going back to that then. Do you think that was just luck on your part, or do you think there was something more to it?

VILAYANUR S. RAMACHANDRAN

Mirrors are inherently fascinating.

ROBERT GREENE

They are.

VILAYANUR S. RAMACHANDRAN

You can make a mirror with two mirrors like this. You look into it. Unlike a normal mirror, when you raise your right hand, the mirror image raises its left hand. Correct?

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

It reverses everything. This mirror does not do that. It's very peculiar. If you do this, when you raise your right hand, the creature in the mirror raises the right hand, instead of normal left hand.

ROBERT GREENE

I've seen that before.

VILAYANUR S. RAMACHANDRAN

I just mentioned that as an example. A better example is the old problem of why mirrors reverse left, right, why not top down? How does the bloody mirror know?

ROBERT GREENE

There was somebody who solved that.

VILAYANUR S. RAMACHANDRAN

Richard Gregory.

ROBERT GREENE

Richard Gregory, right.

VILAYANUR S. RAMACHANDRAN

And it's a very simple solution. Not everybody agrees with him. Philosophers have discussed this for years. It's an utterly simple solution to it. Philosophers have discussed it for years. So that's an example of why mirrors are inherently fascinating. That was sitting in my brain.

ROBERT GREENE

But mirrors are also, there's a philosophical aspect. This whole idea of consciousness and the self.

VILAYANUR S. RAMACHANDRAN

Self awareness, yeah.

ROBERT GREENE

It's a very potent image.

VILAYANUR S. RAMACHANDRAN

Right. Doppelgangers and out of body experience.

ROBERT GREENE

But how is it that your idea of the mirror, which you're half joking. Because you're not sure whether it will end up solving the pain issue.

VILAYANUR S. RAMACHANDRAN

I said, "Well, what's the harm in trying?"

ROBERT GREENE

But that's what I'm asking. Is it sort of luck, then, that it ended up working, or do you think it was more than luck?

VILAYANUR S. RAMACHANDRAN

It's like the whole penicillin thing. Chance favors fate. It's a funny idea. It was not a ridiculous idea.

ROBERT GREENE

So you felt like it could work.

VILAYANUR S. RAMACHANDRAN

Yeah, I felt like it could work, but it sounded funny, let me put it that way.

ROBERT GREENE

You weren't sure.

VILAYANUR S. RAMACHANDRAN

And that's true of a lot of the things I've done. Like even synesthesia. A guy says five is red. Everybody laughs at him. Five is red, or Sunday is blue. It doesn't make any sense.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

I said, "Well, let's see if it's really true. Let's sit down with this guy and talk. That's not a joke. Let's sit down and talk to him and see what he says. "And I found that it's a perfectly legitimate phenomenon, and it can get you close to understanding metaphor. Another good example of a joke, which I don't think it will work, but it's utterly ridiculous. There's a language disorder called Wernicke's aphasia. So with language, there is the Broca's area in front, responsible for syntactic structure. Behind it there's Wernicke's area, which is involved in semantics and comprehension.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

So Wernicke's aphasics will talk fluently and effortlessly, but talk complete gibberish. So Chomsky's famous example, colorless green ideas fly furiously. That's not a real example. He made that up, but that's the sort of thing Wernicke's patients would say. They make elaborate, complicated sentences, talk to you. Complete gibberish, but he doesn't realize it's gibberish.

And I've gone to a Wernicke's patient and said, 'Pen ally tapoot, by pen man.' And he says, "Oh, yeah, [gibberish]." I speak gibberish, and he doesn't understand I'm speaking gibberish. We think that maybe some of the gibberish is coming from the right hemisphere. So the question is, is the gibberish the same for every patient? So, if you introduce one Wernicke's patient to another Wernicke's patient, would they just have a conversation all day?

ROBERT GREENE

Well, you were having a conversation speaking gibberish.

VILAYANUR S. RAMACHANDRAN

Right.

ROBERT GREENE

You were.

VILAYANUR S. RAMACHANDRAN

In a sense, I was. Just an amazing experiment. Is that a private language they have?

ROBERT GREENE

You're wondering if maybe they'll understand each other. Now that's a joke.

VILAYANUR S. RAMACHANDRAN

Which is just a complete joke.

ROBERT GREENE

But maybe it's true.

VILAYANUR S. RAMACHANDRAN

Maybe it's true.

ROBERT GREENE

With the mirror, it wasn't just a blind attempt. There must have been some thinking behind

it as far as how mirrors work and how the brain works and how pain is an illusion.

VILAYANUR S. RAMACHANDRAN

Well, it came from the idea that the guy's not moving, and he's had years without a real arm which is not moving. So this has been stamped into the circuitry in his brain. With the mirror and given feedback, maybe that will kick in. That idea was there. But it must have been provoked . . .

ROBERT GREENE

But that idea is based on something.

VILAYANUR S. RAMACHANDRAN

Yeah. That idea is based on neuroscience. But the idea of then using a mirror to allow that to happen.

ROBERT GREENE

It's so simple. You'd think anybody would have thought about it. It's like "The Purloined Letter." You know "The Purloined Letter"?

VILAYANUR S. RAMACHANDRAN

What's that?

ROBERT GREENE

It's a story of Edgar Allan Poe where the guy decides to hide the stolen letter in the most obvious place, and nobody sees it, because it's in the most obvious place.

VILAYANUR S. RAMACHANDRAN

That's very nice. It's like the dog that did not bark until it comes.

ROBERT GREENE

Yeah, exactly. A lot of your things come from things that seem so obvious.

VILAYANUR S. RAMACHANDRAN

Yeah. Well that's another quality of . . . again, I don't want to toot my horn here, but one of the things about great science is the obviousness of it once it's stated. Not for everything. Not for relativity or quantum mechanics. But a lot of these discoveries in medicine and physiology and biology, even DNA, once it's stated, it's elegant and simple. Your grandmother will understand it. And Rutherford once said, for a scientific theory to be truly considered great, you should be able

to explain it to a reasonably educated person. If you're not, then there's something wrong with the theory.

ROBERT GREENE

That doesn't hold for relativity.

VILAYANUR S. RAMACHANDRAN

No, it doesn't hold.

ROBERT GREENE

Is it okay to stay here?

VILAYANUR S. RAMACHANDRAN

Why don't we go back?

ROBERT GREENE

You want to go back?

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

Because I wanted to go into the apprenticeship phase.

VILAYANUR S. RAMACHANDRAN

Yeah, sure.

ROBERT GREENE

Yeah, you definitely have to see the book by Arthur Koestler.

VILAYANUR S. RAMACHANDRAN

I would love to see that.

ROBERT GREENE

I have it with me, but I . . .

VILAYANUR S. RAMACHANDRAN

By the way, it was completely trashed by Medawar.

ROBERT GREENE

Oh, it was.

VILAYANUR S. RAMACHANDRAN

Yeah. But Medawar is known for being vicious. So you should read the review just for fun.

ROBERT GREENE

It's a review of it?

VILAYANUR S. RAMACHANDRAN

Yeah, a review.

ROBERT GREENE

Of that book? You remember that?

VILAYANUR S. RAMACHANDRAN

Yeah, I remember that. In fact, I read the review first before I read the book.

ROBERT GREENE

The book, "The Act of Creation" has had a huge influence.

VILAYANUR S. RAMACHANDRAN

On you? On lots of people.

ROBERT GREENE

On the cognitive science world. A lot of the ideas in it have been proven wrong, but so has Freud, but look at the influence it had. But all right, I'll look at Medawar's critique.

VILAYANUR S. RAMACHANDRAN

I wonder where you can find it. All you do is you go into Google or Amazon.com, "The Strange Case of the Spotted Mice." A collection of his essays, the most recent collection.

ROBERT GREENE

So that review is in the collection of his essays.

VILAYANUR S. RAMACHANDRAN

Otherwise you can just find it on the Internet these days, most of the time. And the title of the interview is *Act of Creation*.

ROBERT GREENE

Is what?

VILAYANUR S. RAMACHANDRAN

The title of his interview, I think *Act of Creation*.

ROBERT GREENE

Okay. Only because the very direct relationship between humor and science, I think you'll find interesting.

VILAYANUR S. RAMACHANDRAN

Well, Medawar at that time was in his 40s, and Nobel Prize, and arrogant.

ROBERT GREENE

Oh, I know one thing I was going to mention. An element in the book, which I do want to get to at some point, is kind of like the 48 laws and the whole Machiavellian aspect. I'm going into, particularly in the apprenticeship phase, having to learn the various political rules that pertain in your field, because . . .

VILAYANUR S. RAMACHANDRAN

Are you talking about political diplomacy with colleagues, or are you talking about heuristic discoveries?

ROBERT GREENE

No, dealing with your colleagues.

VILAYANUR S. RAMACHANDRAN

I have very pleasant colleagues, but it is important.

ROBERT GREENE

Well, only in the sense . . .

VILAYANUR S. RAMACHANDRAN

People are too preoccupied. That's more of a problem.

ROBERT GREENE

Yes, you're right.

VILAYANUR S. RAMACHANDRAN

I think for grad students, it's more important to find courses in areas other than his own, latch onto people who are professors in the department who he sees have a creative spark and passion.

ROBERT GREENE

That's what I'm talking about.

VILAYANUR S. RAMACHANDRAN

Okay. That's absolutely right.

ROBERT GREENE

Well, I mean, that would be . . .

VILAYANUR S. RAMACHANDRAN

I don't know. I don't know what I think.

ROBERT GREENE

Well, it's more like, there was a whole theme of all of these people of how much they've had to suffer at the hands . . .

VILAYANUR S. RAMACHANDRAN

Of mediocre.

ROBERT GREENE

. . . of mediocre and egotistical types. Like Faraday with Humphry Davy.

VILAYANUR S. RAMACHANDRAN

Humphry Davy was eminent. He was a good scientist himself.

ROBERT GREENE

He was.

VILAYANUR S. RAMACHANDRAN

But he was an asshole.

ROBERT GREENE

Completely.

VILAYANUR S. RAMACHANDRAN

There was a whole class thing unfortunately.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

His wife was even worse than him.

ROBERT GREENE

And then Darwin had to deal . . .

VILAYANUR S. RAMACHANDRAN

With his dad.

ROBERT GREENE

With his dad and all of the kind of weird, radical politics going on at the time. So he had to kind of hide his ideas for 20 years and play kind of a double game.

VILAYANUR S. RAMACHANDRAN

Yes.

ROBERT GREENE

And then the moment that Wallace is about to publish his theory, he has to rush in. He does want to get some credit for it. Just sort of some . . .

VILAYANUR S. RAMACHANDRAN

That's a good distinction by the way. There's Wallace, there's Huxley, and there's Darwin. I would classify him as being closer to Wallace than to Darwin.

ROBERT GREENE

Really, how so?

VILAYANUR S. RAMACHANDRAN

Wallace did have that streak of rebellion.

Darwin did, too.

ROBERT GREENE

He did.

VILAYANUR S. RAMACHANDRAN

Amazingly. But Wallace got off on very far tangents, if you remember. Spirituality . . .

ROBERT GREENE

Yes, he did. Yes.

VILAYANUR S. RAMACHANDRAN

But of course, his solid work was incredible. Basically, he discovered natural selection independently. And it's just a matter of circumstance in history that he missed being the first.

ROBERT GREENE

Right. He had a slightly different take.

VILAYANUR S. RAMACHANDRAN

He was also doing that famous Wallace's line, which is the beginning of biogeography. You know Wallace's line?

ROBERT GREENE

Mm-mm.

VILAYANUR S. RAMACHANDRAN

Okay. He found that if you go to Malaysia, the group of islands, there's a line you can trace through the ocean and through some of the islands. On this side, just like 20 miles apart, the fauna is completely different.

ROBERT GREENE

The what is?

VILAYANUR S. RAMACHANDRAN

The fauna. The animals and the flora. Completely different. You could easily jump across and be different. This is created by continental drift. The line is called the Wallace Line, and that's the starting point of biogeography. So people don't know about all of that. Now, Darwin, I can relate to in a different sense. The sense that, people only think of Darwin as this lofty, theoretical person who came up with natural selection, right?

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

But as you well know, he's written an entire book on insectivorous plants, and an entire book on climbing plants.

ROBERT GREENE

And on barnacles.

VILAYANUR S. RAMACHANDRAN

Sorry?

ROBERT GREENE

On barnacles.

VILAYANUR S. RAMACHANDRAN

On barnacles, two volumes.

ROBERT GREENE

Eight volumes or two volumes?

VILAYANUR S. RAMACHANDRAN

Two volumes.

ROBERT GREENE

Eight years, two volumes, yeah.

VILAYANUR S. RAMACHANDRAN

So, in fact, there's the joke, I don't know if it's really true, that barnacles he did to get tenure. It's to establish respectability. So, I think every maverick has to do a barnacles first.

ROBERT GREENE

Yeah, that's another theme in the book. What would your barnacles be?

VILAYANUR S. RAMACHANDRAN

I got away without one.

ROBERT GREENE

Oh, really?

VILAYANUR S. RAMACHANDRAN

Well, fortunately, nothing I've done ever has been disproved empirically. So the only reason to label me a maverick would be because the ideas, like mirrors and phantom limbs, are far out. See, a lot of men get a lot of things wrong.

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

And at least I've not been [inaudible 0:30:52]. I've done a lot of things that have failed. Not a thing I published that later turned out to be wrong.

ROBERT GREENE

So you're careful that way.

VILAYANUR S. RAMACHANDRAN

I'm very careful, yeah. That's a distinction between being a maverick and me.

ROBERT GREENE

Right. But you can still be rebellious or unconventional.

VILAYANUR S. RAMACHANDRAN

Absolutely.

ROBERT GREENE

But not expose yourself to ridicule. Because then it turns political.

VILAYANUR S. RAMACHANDRAN

But also not do it as a fetish, not do it for the sake of doing it. I think I'm genuinely led in directions, which . . .

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

In that sense, like you said, Einstein is a maverick. I'm thinking of a maverick who . . . I'm thinking of failed mavericks.

ROBERT GREENE

Right, which we don't know about too well.

VILAYANUR S. RAMACHANDRAN

Which we don't know about.

ROBERT GREENE

There are some. They had like one shot that they got right, and then they disappear. Nobody comes to mind.

VILAYANUR S. RAMACHANDRAN

I wouldn't call Wagner a failed maverick.

ROBERT GREENE

Who?

VILAYANUR S. RAMACHANDRAN

The continental drift guy.

ROBERT GREENE

Oh, Wagner, Wagner . . . yeah. Why, that was his only . . .

VILAYANUR S. RAMACHANDRAN

Yeah. It was, pardon the pun, but an earth-shaking idea, continental drift. But it was rejected completely during his lifetime.

ROBERT GREENE

Right. Well you had a little bit with the autism and the mirror neurons.

VILAYANUR S. RAMACHANDRAN

That's controversial.

ROBERT GREENE

That stirred up political . . .

VILAYANUR S. RAMACHANDRAN

I didn't know that. Did it? I haven't followed it. Really, I'm quite serious.

ROBERT GREENE

What's that?

VILAYANUR S. RAMACHANDRAN

I didn't know it stirred up any political.

ROBERT GREENE

Well, maybe I'm wrong then.

VILAYANUR S. RAMACHANDRAN

All I know is, we did some experiments. We make it perfectly clear, this is preliminary evidence. And then a lot of people replicated it. And then other groups, one of the other groups, I can claim why the other groups didn't get it. So there's still a debate going on, but I'll be the first to admit it's a debate. It's not solid. Politically, I didn't know.

ROBERT GREENE

You said in the New Yorker article, I think it was . . .

VILAYANUR S. RAMACHANDRAN

Oh, oh, oh. What I said was there's a huge group of autism people . . .

ROBERT GREENE

Mm-hmm. The funding and . . .

VILAYANUR S. RAMACHANDRAN

Yeah, yeah. Okay. That's true. But that's not because what I'm doing is offbeat or something like that. It's mainly because . . . yeah, it is because it is an unconventional approach. What happens is . . . okay. It's not about me and autism, right? What it's about is the whole funding climate is political.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

You have clubs. You have to be part of the club to get funded.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

So the way I overcome that . . . I've never had problems with funding. The way I overcome that is I pretend to be in that club, and I do some things they want me to do. And I get the money, and I use it for something else. Actually, they don't mind that. So long as you use it for something else productive. They're

not stupid. But if you tell them right out, I'm going to work on synesthesia, they don't give you any money.

ROBERT GREENE

Right, right.

VILAYANUR S. RAMACHANDRAN

So there is that club mentality, which is pernicious for young scientists getting into the field. Because what happens is they say, I have to conform to the club. And then the mask becomes the man, and they stop being creative. That you should put in your book. That's a very . . . it has a pernicious effect on the whole system. Another thing that happens is instead of getting young people, more young people less money, they give a few outstanding people, and sometimes not even outstanding, a few very politically astute people, tons of money. This is not the Canadian system. This is not the English system.

ROBERT GREENE

You mean here in America.

VILAYANUR S. RAMACHANDRAN

Only here in America. In Canada, they do only small grants. They say, if you're going to be innovative, you're going to be clever, you don't need that much money. But more people get grants. And scientists are happier there.

ROBERT GREENE

Yeah. I mean, also, when you get that huge grant, the pressure to meet the expectations.

VILAYANUR S. RAMACHANDRAN

That's correct. You become a politician. You become a Mercedes-Benz salesman.

ROBERT GREENE

And then it has the effect on your ego.

VILAYANUR S. RAMACHANDRAN

Absolutely. You put your finger on it. And you can't get good science except in the atmosphere of complete freedom.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

That's one thing great about American science, which was being threatened in

England by the tenure system. It's the only job in the world where you have total job security.

ROBERT GREENE

That's changing now.

VILAYANUR S. RAMACHANDRAN

People say that. I haven't changed for 20 years now.

ROBERT GREENE

No, but maybe in the next couple of years.

VILAYANUR S. RAMACHANDRAN

Maybe. But I think it's a good thing, because . . .

ROBERT GREENE

Oh, of course.

VILAYANUR S. RAMACHANDRAN

What it means is you're going to get some slouchers, some people getting a free ride. In fact, there are lots of them. But it also means that the ones who are creative have complete freedom. You can't say that about any job in the world in any country in the world.

ROBERT GREENE

No. I suppose you could say that the complete freedom could warp you a little bit.

VILAYANUR S. RAMACHANDRAN

I think its positive effects outweigh the . . .

ROBERT GREENE

Yeah, I agree with you. I notice, like in the arts, if you're given a huge grant and you make work that's kind of experimental, then you kind of start losing touch with the public.

VILAYANUR S. RAMACHANDRAN

That's a good point.

ROBERT GREENE

So it's not good to have one or the other in the arts, so it's all commercial, and you're only in it to make money. But if it's like in Europe where you can just collect the money and just do whatever you want, then you have no connection to the public. But science isn't the same.

VILAYANUR S. RAMACHANDRAN

Yeah, I think scientific creativity, there's proof in the pudding. In art, there's an arbitrary note.

ROBERT GREENE

Yes, exactly.

VILAYANUR S. RAMACHANDRAN

You can produce a bunch of pipes together and it's art. So, you give the guy tons of money, tons of freedom, he could just lounge and smoke in cafes.

ROBERT GREENE

But he has to produce . . .

VILAYANUR S. RAMACHANDRAN

Put pipes together and call it art, then he gets away with it. In science, you can't do that.

ROBERT GREENE

No.

VILAYANUR S. RAMACHANDRAN

But you need the freedom.

ROBERT GREENE

You're right. Yeah. But science is only one part of the tenure.

VILAYANUR S. RAMACHANDRAN

It all depends on the individual. That's how I work.

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

But something that's really normal can be great.

ROBERT GREENE

Oh yeah, me too.

VILAYANUR S. RAMACHANDRAN

We have covered a lot of ground.

ROBERT GREENE

Yes, we have. It's kind of moving around, which is fine.

VILAYANUR S. RAMACHANDRAN

You want to talk about the . . .

ROBERT GREENE

Apprenticeship.

VILAYANUR S. RAMACHANDRAN

. . . apprenticeship. That's very critical, very important.

ROBERT GREENE

Okay. I might have to . . . well, we'll see how you feel.

VILAYANUR S. RAMACHANDRAN

I was going to say, the childhood phase is partly conjecture, and false memories kick in and psychoanalytical. Although I think most of it is true. But the apprentice phase, the memories are all fresh. I think I'm right on target there.

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

But certain key individuals influenced me in the apprenticeship. It's vital that you find the right types of mentors.

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

If you end up working for a heartless drudge . . . again, the problem is you can't generalize. Some scientists are suited for that. I'm talking about great pioneers, so let's be clear. If you

want to get into science, you want to be a great scientist. You don't want to be just any scientist.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

Because as you very correctly pointed out, there are professions where you can make lots more money and life is much easier.

ROBERT GREENE

Yeah, why do it?

VILAYANUR S. RAMACHANDRAN

I may be a doctor. You're productive, you're useful to society. The results are tangible. You're rich. You're secure. Or you get into science and be second rate.

ROBERT GREENE

So that really is . . .

VILAYANUR S. RAMACHANDRAN

Yeah, that's Hornby. Just for fun, one of my students put it up.

ROBERT GREENE

How come I don't remember that? That's Baker Street, right?

VILAYANUR S. RAMACHANDRAN

Baker Street, yeah. They actually made that into a museum.

ROBERT GREENE

Yes, I think I've been there.

VILAYANUR S. RAMACHANDRAN

I remember taking my 10-year-old. Manny was 10 years old, and the super sharp kind. He was very much into Sherlock Holmes. So I remember with Richard Gregory, whenever I would go to England, I would meet up with him and we'd go to museums. So that particular occasion, I said, let's take Manny to Sherlock Holmes' home, because he's a great fan of Sherlock Holmes. He used to imitate Holmes.

ROBERT GREENE

Is this the older one?

VILAYANUR S. RAMACHANDRAN

The older one who is now at Berkeley.

ROBERT GREENE

That makes sense that he's gone from Sherlock Holmes to Classics.

VILAYANUR S. RAMACHANDRAN

Yes. Yeah, it does. So, we said, let's go there. And we were approaching the Sherlock Holmes house, and I whispered to Richard, "Don't tell Manny that he's not a real person, because he's grown up with this and it would be really traumatic for him." And Richard looked at me and says, "Mind you, Rama. He's actually much more real than most real people we know. So we don't have to lie." Which is true.

ROBERT GREENE

It is true.

VILAYANUR S. RAMACHANDRAN

Absolutely true.

ROBERT GREENE

Was he not based on anybody real?

VILAYANUR S. RAMACHANDRAN

He was based partly on Conan Doyle's own professor. He used the little clues to deduce

what the . . . diagnose the illness. That sort of rubbed off on Conan Doyle. Conan Doyle used to do that.

ROBERT GREENE

Even as a doctor. He was a doctor. He wasn't a detective.

VILAYANUR S. RAMACHANDRAN

No, from a doctor. Conan Doyle was a doctor, so that style rubbed off on Conan Doyle. Conan Doyle then created a detective.

ROBERT GREENE

Wow. How come I never knew that? That's very interesting.

VILAYANUR S. RAMACHANDRAN

Thereby establishing that whole genre.

ROBERT GREENE

Wow. Okay. So, your first apprenticeship then was as a doctor studying medicine in India.

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

And what interested me there was the low tech aspect of studying medicine in India at the time.

VILAYANUR S. RAMACHANDRAN

Correct.

ROBERT GREENE

And how that trained you to think instead of depend on machines.

VILAYANUR S. RAMACHANDRAN

Correct. Think and use little clues to draw big conclusions. So, that's very Sherlock Holmes.

ROBERT GREENE

So, can you give me some examples of that? How they . . .

VILAYANUR S. RAMACHANDRAN

Well, you have to pull out repressed memories, but an example is Parkinson's gait. An example of the smell of acetone if you have diabetes. Nobody would even think of anything like that now.

ROBERT GREENE

And these are the things that they would train you in?

VILAYANUR S. RAMACHANDRAN

They would train us in that. And if you auscultate, I mean with a stethoscope, there's a condition called coarctation aorta, where the aorta gets constricted. What happens is, to compensate for that, you get ancillary blood vessels. Smaller blood vessels sprout from the aorta, which become larger, and more blood flows through them. It turns out, one of them goes behind the scapula. One of them goes underneath the ribs.

So, what you do is you put your stethoscope behind the scapula. Put the stethoscope here. You actually hear the sound of the blood flowing, the turbulence of the blood. Similarly, you put your stethoscope between the scapula, the blood flowing through the constriction in the aorta produces a splashing sound, turbulence which you can hear. So these are all little clues which clue you in

about, this must be . . . you can't get these two symptoms, this anastomosis becoming enlarged and a sound between the scapula unless the guy has coarctation of the aorta.

ROBERT GREENE

And they would literally show you how to hear that?

VILAYANUR S. RAMACHANDRAN

Yes, and they would diagnose it in five minutes.

ROBERT GREENE

And what do they do now to diagnose something like that?

VILAYANUR S. RAMACHANDRAN

I'd have to look it up. Probably an MR, coarctation of the aorta.

ROBERT GREENE

And what's the superiority of that?

VILAYANUR S. RAMACHANDRAN

Well, you can bill the patient much more.

ROBERT GREENE

Exactly.

VILAYANUR S. RAMACHANDRAN

Well, no. To be fair, medical diagnosis has improved enormously now with all this equipment. So one doesn't want to be a technophobe [inaudible 42:44]. But what I'm saying is that, the way you learn it . . . so I'm not saying if I'm a doctor now, I'm going to go and auscultate, do all that. If I can get it done with an MR, I'll do it with an MR. But what I'm saying is, say if I was a cardiologist, I would do an echocardiogram, and I would do an EKG and all that. Even now, I'd put the stethoscope first, because that's been my ritual. But what I'm saying is there's a limited amount you can learn with a stethoscope. But the training. You have to use small clues to draw these conclusions and diagnose diseases very quickly, often. That stays with you.

ROBERT GREENE

But what is another element . . . a larger question I want to get to later on. It's on the theme of the interpersonal interaction with a doctor and a patient, or in any level with the

whole mirror neuron element. As a doctor, you're actually literally touching the patient, listening to them, dealing with them instead of strapping them to a machine. And the back and forth relationship suffers, doesn't it?

VILAYANUR S. RAMACHANDRAN

I think there are two questions there. One is the compassion, which is another element I think. Right? Because most of the science we do is not for compassion, to put it bluntly. It's because you're curious, because of curiosity. So that's irrelevant. But what's relevant is, again it's about clues. One of the first things you're taught about in medical school in India is 90% of the time, this is still true, you arrive at the diagnosis talking to the patient. You don't have to touch. You don't have to feel. You don't have to measure. You don't have to do anything.

From the sequence of events that led to the disorder, from the combination of symptoms, which is peculiar. So it's like shell collecting. That particular combination of traits, you

would never see in any other disorder. So you have to have a statistical view . . . another thing they teach us is, if you hear hoof beats, don't think of a zebra. If you hear hoof beats, don't think of a zebra. Horses is the first thing you think of.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

But a naive medical student wants to think of exotic possibilities.

ROBERT GREENE

Right, right.

VILAYANUR S. RAMACHANDRAN

So, have a sense of proportion.

ROBERT GREENE

Is that literally an aphorism that they say in India?

VILAYANUR S. RAMACHANDRAN

It's an aphorism. In India, but it's used here, too. So, talking to the patient with a certain set of symptoms, which he describes to you, that's often enough, 90% of the time, to

reach a diagnosis. But you never get that constellation of symptoms with any other disorder. So then, it also helps to know why the symptoms are produced by the disease. It's not like bird watching where you say, if it has a red feather here, blue feather here, it must be a finch. If you know why exactly, like coarctation of the aorta, if it's constricted, if you put the stethoscope there . . . it stays with you all your life. I learned this . . . I haven't auscultated between the scapula in about 30 years. But once you do it, it stays with you for the rest of your life, because you know why it happens. So this is all very detective like and very Sherlock Holmes like, which is no wonder that Sherlock Holmes' author was a doctor.

ROBERT GREENE

Right. That's very interesting.

VILAYANUR S. RAMACHANDRAN

And his inspiration was a doctor.

ROBERT GREENE

Was a doctor. And you're very much . . .

VILAYANUR S. RAMACHANDRAN

To give you a simple example. Let me give you another example. I think it's there in my book, but maybe it's not. Today, if you wanted to diagnose appendicitis, you do an MR, see if there's a mass and things like that. See if there's inflammation. In my day, if you wanted to diagnose appendicitis, you just talk to the patient. And then you do a little bit of examination.

The patient will say, "Doctor, I'm vomiting." Just all in a one day period or two day period. "I vomited, and I had a headache, and I have fever." This could happen for any number of reasons. But then, in addition to that, "I had a bellyache. It was here in my bellybutton. It's funny, the ache is more here in the right lower side of my belly." You go and palpate him, and you palpate here. He'll say ouch. So you put three fingers here and you do this, he'll say ouch. If you do it anywhere else, he doesn't say ouch. So lower right corner,

because that's where the inflamed appendix is.

But remember, he said the pain started here, and it moved here. Then you release. Again, he'll say ouch. It's called rebound tenderness. So there is tenderness in the lower right corner, rebound tenderness, and there's a pain that migrated from the umbilicus to the lower right corner. Now last thing that clenches the diagnoses, you go and press him here, he gets a pain here. You see that. You don't do any other test on this guy. He's got appendicitis. Take him to emergency before it ruptures. Do the surgery. Remove it. That's all you need.

The reason is, in the embryo, the appendix was here. When it moves here, it carries the nerves with it. So when the appendix is inflamed here, the brain is fooled into thinking, even though the appendix is inflamed here, that it's still here, because the nerves are being dragged. Is that clear?

ROBERT GREENE

Yeah, yeah, yeah.

VILAYANUR S. RAMACHANDRAN

So the patient first feels it here where the nerves are. Or not the nerves, where the appendix used to be. And the brain refers the sensation to the middle. Then, the appendix has been so inflamed that it actually starts irritating the abdominal wall. So it's now migrated here, the pain.

ROBERT GREENE

It's similar to some of the things you ended up studying.

VILAYANUR S. RAMACHANDRAN

That's true. It may have been sitting in my brain. But then, when you press here, obviously the appendix, it's very painful. If you press here, it's not painful. Now why would it be painful when you release? Because when you pressed it and you release the abdominal wall, there's inertia, springs back, and there's the viscera here, slowly goes back, and pang, it hits again. Second time it

hits, you get a second pain. So you get two twinges of pain. Then you go and press here, you displace the air in the colon. Is this all in my book? I can't remember.

ROBERT GREENE

No.

VILAYANUR S. RAMACHANDRAN

Okay. It displaces the air in the transverse colon, it comes and balloons the appendix and it pains. You can't get this combination with any other disorder. So you've diagnosed it in five minutes.

ROBERT GREENE

As opposed to expensive machinery.

VILAYANUR S. RAMACHANDRAN

This is what they always do now.

ROBERT GREENE

Right. But also in knowing why it occurs, it gives you a general knowledge of anatomy that . . .

VILAYANUR S. RAMACHANDRAN

That's applicable not just for appendicitis, but any number of disorders.

ROBERT GREENE

Yeah. I don't know if they don't teach that anymore. They just strap you to a machine.

VILAYANUR S. RAMACHANDRAN

I think they may still . . . the good professors still probably would mention the sequence of what I'm talking about. It's so much a part of history of medicine.

ROBERT GREENE

But it wouldn't stay in your mind. It's the actual doing it and trying to diagnose it that sticks.

VILAYANUR S. RAMACHANDRAN

That's correct.

ROBERT GREENE

Well, all of your work it seems, or most of it, is talking to patients now.

VILAYANUR S. RAMACHANDRAN

That's correct. It's the same principle. A lovely example is synesthesia, this condition where a person looks at a number . . . this is not even published, but I can still tell you a five minute experiment we did just yesterday.

Okay. Where did she put those papers?

Maybe it's in here. Give me a second. I wish I could show you the stimulus.

ROBERT GREENE

What's that?

VILAYANUR S. RAMACHANDRAN

I'm trying to find that picture. Let's take a little stroll to my car and I'll show you, because without the pictures, I can't explain it to you. Let me set the question. Here's a woman who says every time she sees five, she sees red. Six is blue, seven is green.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

People used to think . . . Galton described this first. For the last 100 years . . .

ROBERT GREENE

Galton, right.

VILAYANUR S. RAMACHANDRAN

150 years people said this is bogus, because he couldn't make any sense of it. An anomaly, right?

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

We've done a number of experiments to show it's real. But then, the question is at what stage in the processing the number in the brain do you actually see the color? There are multiple stages of processing. We gave her puzzle pictures where you don't see the letter initially. Then suddenly the letter clicks in place. You said, it's a B and it's red. So the question is, what happens?

What happens is absolutely amazing. The person looks at this puzzle picture and says, "I see it looks red. Why the hell is it red? I don't know why it's red."

ROBERT GREENE

But they haven't recognized the . . .

VILAYANUR S. RAMACHANDRAN

"Oh my god." No, they haven't. "My god, there's a letter here. That's why it was red." So the brain has already processed the grapheme, that shape, and that has then

evoked the color at an earlier stage, before you finally . . . so you can follow this chain. We're sending it for publication in the next couple of days. There are three such experiments. Another such experiment is called . . .

ROBERT GREENE

You do these with your wife, right?

VILAYANUR S. RAMACHANDRAN

No, this particular one, I just did with Elizabeth, who is my student, grad student. I may have it lying around here somewhere.

ROBERT GREENE

But you were thinking of that in relation to the talking to the patients.

VILAYANUR S. RAMACHANDRAN

Yeah. Because what equipment does this involve? Nothing.

ROBERT GREENE

Exactly.

VILAYANUR S. RAMACHANDRAN

Let me give you another example. The same ilk. Can you read that?

ROBERT GREENE

No sex. But the rest of it I can't read. I have . . .

VILAYANUR S. RAMACHANDRAN

You're normal. Most people don't even read the first line.

ROBERT GREENE

I have a brain problem that you could probably study my brain once I'm dead. Because I see things . . . I don't function well with these kinds of things.

VILAYANUR S. RAMACHANDRAN

Most people don't.

ROBERT GREENE

No, but . . .

VILAYANUR S. RAMACHANDRAN

You're especially bad, you're saying.

ROBERT GREENE

I am especially bad.

VILAYANUR S. RAMACHANDRAN

So this is what this woman . . .

ROBERT GREENE

But not bad. I recognize things that nobody else sees, and they don't even exist.

VILAYANUR S. RAMACHANDRAN

So the woman said she couldn't see even these, the letters. But she said, "It's funny. I see some reddish, greenish, bluish, yellowish, green, blue, yellow, chartreuse, indigo. Why is that? I don't understand it." Then I said, "Look. It says causes, C-A-U-S . . . causes." Do you see that now?

ROBERT GREENE

Jesus.

VILAYANUR S. RAMACHANDRAN

Bad eyes. Can you see bad eyes?

ROBERT GREENE

That I can see for sure.

VILAYANUR S. RAMACHANDRAN

Okay. So you can't see causes yet. It's harder to see. A, C, U, S, E, S.

ROBERT GREENE

I see the A really clearly. Oh, now I see it.

VILAYANUR S. RAMACHANDRAN

You see it?

ROBERT GREENE

No sex causes bad eyes.

VILAYANUR S. RAMACHANDRAN

So she says, "That's yellow, that's blue, but what the hell? Why are these blocks colored? I've never seen colored blocks." She stares at it, stares at it, and she says, "Oh, my god. That's why they're colored." And the colors are all right. So in a five minute experiment just talking to her, we learned something important and settled a controversy about this which has been going on for a while. That's even better.

ROBERT GREENE

This one's better?

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

What am I supposed to do with it?

VILAYANUR S. RAMACHANDRAN

What do you see? Let me take it far away. I'll tell you what she said she saw. She said, "Oh, I see kind of a seven."

ROBERT GREENE

Seven?

VILAYANUR S. RAMACHANDRAN

Yeah, I vaguely see a seven. But then she said, "It's not very clear. But the thing looks blue for some reason. It's a blue seven. Seven is never blue for me, but it's probably because it's a messed up seven. It's not a very good seven. I see blue, but I don't know why."

ROBERT GREENE

Is it Z?

VILAYANUR S. RAMACHANDRAN

Do you see a Z?

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

But it's solid blocks Z. It's shadowed. She said, "Z is blue for me."

ROBERT GREENE

How do you devise these things?

VILAYANUR S. RAMACHANDRAN

Well, these are well known. In books you find them. I didn't devise them. There's another one like that. So there are several like that. So, in about 10 minutes, we learned that before the stage of conscious awareness of letters, they're evoking activity in color areas of the brain. Now we can go to brain imaging, which takes six months to do. So, this is about talking to the patient. We just talk to them. Why would a patient make up something like that? So that's an example. I just mention that, not because it's the best example, but because I just happened to do it three days ago.

ROBERT GREENE

The style of talking to patients, was that something that was sort of ingrained in you from medical school?

VILAYANUR S. RAMACHANDRAN

Yeah, absolutely. I think that listen, listen, listen very carefully to inflections of voice to see how convinced they are about what they're saying. Because that often gives you a clue whether they're making it up or not. That's very interesting from the point of view of your courtship business, too.

ROBERT GREENE

Yes, and my whole Machiavellian intelligence. You can tell when people are lying?

VILAYANUR S. RAMACHANDRAN

Not so much . . .

ROBERT GREENE

So if I lied to you right now, you could tell?

VILAYANUR S. RAMACHANDRAN

No, no. It's not that simple. There's a point when the patient says . . . forget about this. I'm trying to think of a good example. Okay. I put hot water here. No, I put a Q-tip with water here, and they said they feel the water here. And I move it, and they say they feel the

water here. Then I put hot water here, and they spontaneously say, "Oh, you know it's very funny, because I feel the touch before. The heat kicks in later." And then you see other subjects say the same thing. Now the spontaneity of them saying that without my asking him, and his surprise, the fact that he himself is surprised, so it's highly unlikely that he's making it up. Supposing he says, "Yeah, you know, I feel the touch first." Or, "You know, I feel the warmth a little bit later." That makes it a little bit more suspicious, that he's making up a story to make . . .

ROBERT GREENE

Why would somebody lie about that?

VILAYANUR S. RAMACHANDRAN

First of all, why would somebody lie about that? That's the first question. So maybe that's a bad example. But often the surprising aspect of it. When you touch the guy, the first time I did that experiment, he felt it in his phantom hand. He was astonished by this. If you were trying to make something up to

please me, first of all, why would he make it up, as you say? But if he made it up, he would not act surprised. So that's one example of a clue. So, interacting with the person gives you clues about whether it's something they're making up or if it's real.

ROBERT GREENE

That probably helped with the neglect patients where you're trying to see the level of denial, perhaps.

VILAYANUR S. RAMACHANDRAN

That's correct.

ROBERT GREENE

Can you read through them a little bit? I don't know.

VILAYANUR S. RAMACHANDRAN

That's correct. Well, sometimes the weirdness of their statement tells you that they can't be making it up. So for example, I tell the guy, "Can you lift the table?" I remember that. And he says, "Yeah, sure, I can do that." I said, "Can you lift it with your right hand?" He says, "Yes." "How

much?" "Six inches." "Can you lift it with your left hand?" "Sure." Left hand is the paralyzed one. "How much?" "Nine inches." Okay. So somebody in there bloody knows that if he's trying to outright lie, why would he exaggerate the ability? He would say, "Oh, yeah. I can lift it equally. I can lift it six inches." Why would he . . .

ROBERT GREENE

Well, you know that he's lying there, but what are you looking for clues for? Like how conscious he is?

VILAYANUR S. RAMACHANDRAN

Well, he's not lying consciously. If he were lying consciously, he would be cleverer about lying. Similarly, when I'm testing somebody's memory . . . this comes up in medical legal issues. The easiest thing to fake is I've got a terrible memory problem. What's your name? Where did we just go to have coffee? What did we have? Hot chocolate or coffee? I can just make up stuff, pretend I'm lying.

So one of the tests is, you give him a list of words with pairs. Pig, John. Apple, pencil. And you know that normal people get a certain rate. Let's say 30%. If you've got no memory at all, your hit rate is about 50% chance.

ROBERT GREENE

What is it that you're trying to hit? I didn't get it.

VILAYANUR S. RAMACHANDRAN

Let's say you have a test, some kind of test. And the guy, you're testing his memory. And you're completely guessing at chance. So the guy's never seen that list before, and you ask him to guess which animal goes with which.

ROBERT GREENE

I see.

VILAYANUR S. RAMACHANDRAN

He's getting a chance. Let's say the chance score is 50-50. If he gets 50-50, you know that he's going to have no memory. He's missing. What if he gets only 10% right? Then you know he's fudging. Right? Because he's

deliberately making up . . . unless he's really clever, he's fudging. So this is what I'm saying. Just talking to people, you can very easily . . . you don't have to do elaborate brain imaging to see that he's lying.

ROBERT GREENE

Can you also read their body language and their intonation? You were trained in that a little bit?

VILAYANUR S. RAMACHANDRAN

No, not formally. Inevitably, you learn as you go along.

ROBERT GREENE

You then went to Cambridge after studying medicine in India to do more, like, research.

VILAYANUR S. RAMACHANDRAN

To do my Ph.D.

ROBERT GREENE

In visual optics or psychology?

VILAYANUR S. RAMACHANDRAN

Visual neuroscience recording from cells in the visual pathways and Psychology. So the idea was to try and link the two. So the

whole idea is trying to link mind and brain. What is consciousness? What is memory and all of that stuff? Here is an area where a great deal is known about the physiology in intricate detail. We've got 30 visual areas and all the connections. And there's 100 years of research on perception, all the illusions and everything. So there's an opportunity to link the two, like DNA and heredity. So that's right. Let me get into that.

ROBERT GREENE

You were conscious of that when you did it?

VILAYANUR S. RAMACHANDRAN

Yeah, I was conscious.

ROBERT GREENE

So you look for fields like that?

VILAYANUR S. RAMACHANDRAN

I look for fields like that.

ROBERT GREENE

But they also intrigue you in a very deep way.

VILAYANUR S. RAMACHANDRAN

That's correct.

ROBERT GREENE

The element of optics and optical illusions.

VILAYANUR S. RAMACHANDRAN

Right. Illusions are great, because again, I'm intrigued not just by anomalies. Illusions are anomalies, or paradoxes. Anomalies, paradoxes, whatever you want to call them. Here are two lines. They're exactly the same length. You just put some fins on them, this looks much smaller. Even when you know they're the same length. But it doesn't help. It still looks smaller. You put red light and green light on a piece of paper, it looks yellow. So this is magic. It's more magical than any magic show.

ROBERT GREENE

So this is the same thing from childhood where you're entering a field where you can kind of be the king in a way, where you can dominate.

VILAYANUR S. RAMACHANDRAN

That's right. That's right.

ROBERT GREENE

An interesting strategy.

VILAYANUR S. RAMACHANDRAN

It is a strategy in science, too. I pick areas which people shy away from, and every now and then . . . most of them are wild goose chases. Every now and then, you hit the jackpot. Francis Crick, again, one of these aphorisms. The greatest scientist is not one who has the largest number of hit rates. It's not like somebody who makes 90% of discoveries. Nine out of ten discoveries or nine out of ten expeditions are successful. But the destination is trivial.

ROBERT GREENE

Right, right, right.

VILAYANUR S. RAMACHANDRAN

He's one who goes on the largest number of wild goose chases, but once or twice hits the gold mine or jackpot, which is what he did in his career. So, just like blue chip in this and that. So that answers your question.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

So, anomalies in this and that, very often they're just wild goose chases, like telepathy is a wild goose chase. It's an anomaly. But we have to do it by trial and error partly. And you have an affinity for them. And then you have to have a nose for anomalies. Which anomaly is going to be a gold mine?

ROBERT GREENE

Right. Because some anomalies aren't going to lead to anything.

VILAYANUR S. RAMACHANDRAN

And one of the litmus tests . . . I don't say it in my book, but I tell my students. If an anomaly is regarded as an anomaly and a waste of time for the sole reason that it doesn't fit the big picture, then you're wrong. If you're ignoring it because the empirical evidence doesn't hold up, and people have repeatedly tried it and it doesn't work, don't go after that anomaly. It's a waste of time.

Like continental drift, Wagner showed the evidence. He said, "Look. Look at the dinosaurs here. Bones. In the same rock strata, there are dinosaurs on the east coast of North America and the west coast of Africa." And the pundits said, "Well, there must have been a long land bridge they walked across, because how could these two have been continents together. Terra firma." The most axiomatic thing about human life and about science and about geology and everything is the earth is stable. Continents drifting, that doesn't make any sense.

He said the coastlines fit. They said, "Well, it doesn't fit perfectly." He said, "Well, if you go under the water and look at the continental shift, it fits better." They ignored it. All because . . . not because the empirical evidence wasn't sound. The evidence was staring at them. But because it didn't fit their big picture of physics and geology. So that's a wrong reason to reject a theory.

Telepathy is the opposite. A, it doesn't fit the big picture. B, it also doesn't hold up empirically. You repeatedly do the experiment. It always gets smaller and smaller and smaller, the effect. The more careful your controls, the smaller the effect. That's a dangerous sign in science. Don't waste your time on that. Bacterial transformation. You put pneumococcus A and pneumococcus B, it transforms it. That's an anomaly, because the most accepted axiom in zoology and biology is the immutability of species.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

You don't have a species . . . dogs don't change to pigs. That's an axiom. Here's a dog changing into a pig. As I said, it should be as surprising as . . .

ROBERT GREENE

And nobody . . .

VILAYANUR S. RAMACHANDRAN

Nobody paid any attention, because it's an anomaly. What do you mean a dog changes to a pig? It doesn't make any sense. It's rubbish. It was repeated. Even then people didn't pay any attention. People extracted the juice, DNA juice and put it. Even then they didn't pay any attention. So here is the empirical evidence which is staring at you, and because it doesn't fit the picture, you ignore it. Same thing with Marshall and bacteria and ulcers, which is in my book.

ROBERT GREENE

Oh yes. You had that example in that book. Yeah, that's a great example. How did your father feel when you decided to go to Cambridge to study?

VILAYANUR S. RAMACHANDRAN

He was okay with it, because he knew I had the solid background, and if I failed in Cambridge, I could always come back.

ROBERT GREENE

And Cambridge is Cambridge.

VILAYANUR S. RAMACHANDRAN

Cambridge is Cambridge. By that time, he was confident I would excel.

ROBERT GREENE

Now, you met Richard Gregory.

VILAYANUR S. RAMACHANDRAN

Oh, that was wonderful. In Cambridge, I was in Cambridge. First six months I arrived there. First of all, it's an interesting history behind that, as John [inaudible 1:05:08] it in his article. I was a medical student in India, and I read Richard Gregory's book, and it turned me on.

ROBERT GREENE

"I Am Brain"?

VILAYANUR S. RAMACHANDRAN

"I Am Brain". Same book that you read. And I said wow. The great thing about experiments in perception is you can sit at home, do this, do this it on yourself. In other words, you doing an experiment on yourself is unique in science. Usually you have an external phenomenon, and you're studying

that phenomenon. Here, the subject of scrutiny is not an external phenomenon, but you yourself.

ROBERT GREENE

Is that the only example that you can think of in science that you can do that?

VILAYANUR S. RAMACHANDRAN

It's the only example in science I can think of.

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

Where the mind turns in on itself and does experiments on itself.

ROBERT GREENE

It's fascinating, isn't it?

VILAYANUR S. RAMACHANDRAN

So, I read that and I got intrigued. And I went to Cambridge. So then, I did some experiments at home using Gregory's ideas. I had my own ideas on stereoscopic depth.

ROBERT GREENE

You had already done experiments with that, right?

VILAYANUR S. RAMACHANDRAN

I had done experiments on two or three people. Like what you said about just talking to people, ask them what they see. That's where it started. Then I just said . . . my uncle who was a physicist said, "Oh, just send it to Nature." I said, "Nature is the most prestigious . . ." I'm like 19 years old, I was then. 19 or 20 years old.

And I said, "Do you think they'll publish it?" He said, "The great thing about science," my uncle said, "it doesn't matter who you are. If it's sound, they'll publish it." So I sent it to Nature. And he said, "That's the way, you have to be bold." This man emboldened me. He said, "You're 20 years old." My uncle's like that. "You're 20 years old. Science is science. If you think you're right, you've got the boldness and confidence, challenge them. Send it." I sent it. Three weeks later, the letter comes. Acceptance.

Early successes are very important. That just happened, just a matter of luck in science, but that gives you confidence and chutzpah. So, then I go to Cambridge. Sorry, no. Then what happened was, I sent these papers to various scholars, professors in Cambridge, Bristol, Oxford, and all that. Two or three people replied. Among them was William Rushton, who was a very famous scientist. He discovered the pigments in the eye. Who wrote a letter to me saying, "I don't know anything about this, what you're writing about stereo, because it's so specialized. But I'm giving it to Oliver Braddick, who is a specialist in stereopsis. He wants to correspond about this. So Oliver Braddick and I started corresponding. This is unique about Cambridge by the way. He said, "You come over. I know you're still in medical school. Come over. We'll give you one month, your travel expenses, and your accommodation and food and stipend." And I was absolutely thrilled and astonished. So

I went there, spent a month. Now, I can't imagine UCSD, some undergraduates write from Kenya, and UCSD saying, "Here's a few thousand dollars." It's unheard of, to give them credit. So I go there, and then we start up this mentorship with Al Braddock. I was there for a month, then I was hooked on science. He said, "Come back and do a Ph.D." I went back, finished medical school, then back to a Ph.D. When I went there, I had been reading all this about Faraday and Huxley and Darwin and Wallace and Owen, and Wallace and Huxley and Owen arguing about evolution and uniqueness of man and all of that stuff. And I go there thinking I'm going to run into Faradays and Huxleys and Owens. But Victorian science is over. Victorian science was grand. It was a romantic enterprise.

ROBERT GREENE

It was.

VILAYANUR S. RAMACHANDRAN

This was just like India, or just like American science. It was just competitive, cut throat, everybody was doing 9:00 to 5:00, most of them. So three months, I was kind of gloomy, and I was saying . . . sorry, I'm just stretching my legs. I was gloomy. I was excited when I was in Cambridge and Trinity College, beautiful buildings and all of that. But I said, "Where's the Faradays and Huxleys?" Then I found him.

ROBERT GREENE

Richard Gregory?

VILAYANUR S. RAMACHANDRAN

It was Richard Gregory. All these illusions, in those days no electronics, no computers, spinning disks and wires, and he was standing on stage like a great magician.

ROBERT GREENE

It was like the Victorian era.

VILAYANUR S. RAMACHANDRAN

Like Victorian, like Faraday and the Royal Institution. And showing us this. "Ha, ha, ha.

Look at this. Ha, ha, ha. How do you explain that?" And he would go and draw right on the board, here's what's going on in the brain. So he just completely transformed me. I want to talk to him afterwards. We hit this friendship, or he became my scientific guru. I had an idea about an experiment. He said, "Come to Bristol and stay with me a couple of days." That wouldn't happen these days. He was one of the most eminent psychologists in English. I went and stayed in his house for two days. The house is a museum. Scientific instruments, pictures, fossils, this and that. He said, "Victorian science is an anachronism," but obviously highly recognized in Fellowships and societies and everything. Just to emphasize, he's not a maverick. But he has a maverick style.

ROBERT GREENE

He is.

VILAYANUR S. RAMACHANDRAN

So he then asked me to sit down, and we went over this, and we did an experiment. It took

three days to suggest it. Sent it to Nature, it was published.

ROBERT GREENE

Wow.

VILAYANUR S. RAMACHANDRAN

So I got spoiled very early on in the business. And he became my role model saying, how can somebody enjoy life this much? Another person like him is David Attenborough, whose “Nature” program you must have seen. He’ll take something like this. “In my hand, I hold an owl pellet. It’s regurgitated gastrointestinal remains of an owl. And if I take it apart and see the tiny jaws, with the teeth of a vole.”

ROBERT GREENE

Is this Attenborough now?

VILAYANUR S. RAMACHANDRAN

Attenborough. No, no, not Richard Gregory. “I see the gastrointestinal remains, and inside, I see the teeth of a vole.” No. Anybody else telling you that would be boring. Attenborough telling you that, it seems like

it’s the most important thing in the world. He’s telling you about these regurgitated contents of an owl.

ROBERT GREENE

Did you know him? Did you meet him?

VILAYANUR S. RAMACHANDRAN

I met him, yeah. He’s not quite as exciting as Richard, because Richard is wide ranging. Attenborough is natural history period.

ROBERT GREENE

So what was it that drew you to Richard? Was it the drama and the passion?

VILAYANUR S. RAMACHANDRAN

The drama, the passion, the personality, the humor. For example, I asked him, just before he died . . . he had a stroke. After his first stroke, he was paralyzed. I wanted to be sure he was okay, so we did Skype. He had an amazing sense of humor, a punster. So I asked him, “I’ve been reading Libet.” Richard says, “Oh, I’m fine Rama. And I’ve been doing some reading and writing. How about you? Are you still dazzling?” And I said, “Well,

Richard, I’ve been reading Libet, about free will, the neural basis of free will.” And you know about his experiments. Free will has been debated for 2,000 years, since Aristotle and the great Indian philosophers in my country. There’s no resolution of this problem. There are neurons firing away, and how do you . . . your sense of freedom. He says, “It’s very simple Rama. Depending on whether you believe . . .” You’re not a neuroscientist. Do you know what action potentials are?

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

Nerve action potentials.

ROBERT GREENE

Yeah. Readiness potential?

VILAYANUR S. RAMACHANDRAN

No, there are also nerve action potentials. They’re just the spikes you get on nerves. They’re called action potentials. That slightly spoils the joke. “Rama, it depends

on whether you believe in potential action or action potentials."

ROBERT GREENE

I don't know if I got the joke.

VILAYANUR S. RAMACHANDRAN

Well, action potentials are neurons, and potential action is potential free will.

ROBERT GREENE

Oh, oh, I see.

VILAYANUR S. RAMACHANDRAN

Anyway, it's funny if you know the field. So that's typical of him. He's always . . . and he's written a book called "Oxford Companion to the Mind." He's basically a Renaissance man with humor and brilliance, and a dazzling person, and a wonderful human being. Unique combination. So I latched onto him, and I did a lot of experiments with him, including camouflage in flounders and all kinds of things.

ROBERT GREENE

Right. The camouflage flounder experiment sounds amazing.

VILAYANUR S. RAMACHANDRAN

Yeah. And we had a lot of . . . see, another thing with Richard, right, he has a sense of humor. So we had a lot of puns in the first . . .

ROBERT GREENE

I know. They took them out, right?

VILAYANUR S. RAMACHANDRAN

They took them out. You've done your homework.

ROBERT GREENE

Well, the New Yorker article. Why would they take that out? Maybe you overdid it or something.

VILAYANUR S. RAMACHANDRAN

We overdid it.

ROBERT GREENE

Every other sentence had a pun in it or something?

VILAYANUR S. RAMACHANDRAN

Yeah. I hope I have the original copy I could give you.

ROBERT GREENE

I'm somebody who loves puns, so I would've found it . . .

VILAYANUR S. RAMACHANDRAN

I said things like, it'll make a splash in the etiology world. And things like, it'll allow us to discover whether the flounder has its soul in the right place. So it's a double pun.

ROBERT GREENE

I loved your thing about blondes, the kind of fake article that you did that you submitted. That was brilliant. I got to read the whole thing, and that was really . . .

VILAYANUR S. RAMACHANDRAN

Did you read it?

ROBERT GREENE

Oh, of course.

VILAYANUR S. RAMACHANDRAN

[laughs]

ROBERT GREENE

Your footnotes are very long. Do you ever read Nabokov?

VILAYANUR S. RAMACHANDRAN

I love Nabokov.

ROBERT GREENE

Do you know "Pale Fire"?

VILAYANUR S. RAMACHANDRAN

No, I haven't read "Pale Fire."

ROBERT GREENE

"Pale Fire" is one of the silliest books you'll ever know, but "Pale Fire" is a poem written by a fake writer that he created. And the poem is only about 30 pages long. And it's like a parody of a typical American epic poem of the 1950s. But then there are the footnotes. And the footnotes are 300 pages. The poem's only like 30 pages.

VILAYANUR S. RAMACHANDRAN

[laughs]

ROBERT GREENE

And the footnotes contain the novel.

VILAYANUR S. RAMACHANDRAN

That's very Nabokov, isn't it?

ROBERT GREENE

It's hilarious.

VILAYANUR S. RAMACHANDRAN

By the way, he was a great taxonomist.

ROBERT GREENE

He was, and a synesthesiac.

VILAYANUR S. RAMACHANDRAN

And a synesthesiac.

ROBERT GREENE

Yeah. So I love your footnotes. But anyway .

..

VILAYANUR S. RAMACHANDRAN

You're allowed to say outrageous things in footnotes.

ROBERT GREENE

Are you? Yeah, I guess so.

VILAYANUR S. RAMACHANDRAN

More so, yeah.

ROBERT GREENE

Maybe you should have done that with the flounder thing. You should have put it all in the footnote. All your puns. No, that would've been tiresome.

VILAYANUR S. RAMACHANDRAN

No, no. You can't do it in a scientific journal.

They don't like footnotes.

ROBERT GREENE

Oh, they don't. I see.

VILAYANUR S. RAMACHANDRAN

It was in Nature.

ROBERT GREENE

Okay. So he just had sort of a spirit that stood out from other people, and you just gravitated towards . . .

VILAYANUR S. RAMACHANDRAN

That's correct. And I think he would say that I'm almost a clone of him. I'm his most . . . how do I describe. I don't want to say most successful student, but in a sense I am.

ROBERT GREENE

Yeah. Were there any other mentors, or is he sort of the one that stands out?

VILAYANUR S. RAMACHANDRAN

He stands out. And then there's Fergus Campbell, who had an acerbic Cambridge sense of humor. And he was one of them,

but not to the same extent as Richard. It is amazing how few people you need to have. Just like three or four. I have an uncle, two uncles. They're both role models. They're polar opposites. One of them is grandiose, delusional. Brilliant, but grandiose and delusional. The other one is extremely razor sharp.

ROBERT GREENE

Are they the same side of the family?

VILAYANUR S. RAMACHANDRAN

One is my mother's side, and the other is . . . one is very distantly related. He's my uncle, but he's married to my aunt. He's related by marriage, but he's also related, like a third cousin or something like that. This happens in India. So for example, Hariharan, who is my optics uncle, told me a story. And this is what I was raised on, this banter, when I was in my teens. He's an optics professor in Sydney. Very eminent. He was involved in the invention of white light holography.

And he told me about how in holograms, you get this problem called speckle, these tiny little spots. They've more or less eliminated now, but in those days it was a problem. I don't know if you've seen those old red holograms in the old days or green ones. There's tiny amounts of speckle, like rice grains. It was a serious problem. Nobody could get rid of it. He was one of the people who was involved in that.

He had a serious competitor called Professor Yu in Penn, the University of Pennsylvania. And Professor Yu, a very mathematical guy, published a 20-page paper in Journal of the Optical Society of America, which is the bible, where he described a way of getting rid of speckle in holograms. And Hariharan read it, and the next night wrote a paper about one paragraph long, just one or two equations, and says, describing Professor Yu's method of getting rid of speckle in holograms. He says, "Yes, Professor Yu's method for getting rid of

speckle works extremely well. Unfortunately, it also eliminates the hologram."

ROBERT GREENE

[laughs]

VILAYANUR S. RAMACHANDRAN

Which it doesn't. That was a minor point that Professor Yu missed. So this kind of thing really got me hooked on science, this kind of intellectual . . .

ROBERT GREENE

It's almost like a wrestling match or something.

VILAYANUR S. RAMACHANDRAN

Yeah, a wrestling match.

ROBERT GREENE

You sublimated your competitive interests into science a little bit.

VILAYANUR S. RAMACHANDRAN

That's correct. And science is full of these stories, like how Huxley and Owen, and Huxley was thrown off the horse. Sorry, Owen was thrown off the horse. Sorry, not

Owen. Bishop Wilberforce. Huxley. You know that story.

ROBERT GREENE

Yeah, yeah. Vaguely, yeah.

VILAYANUR S. RAMACHANDRAN

Well, you know there's big debate about creationism. Wilberforce was a staunch creationist. And so they argued about this for 25 years, neither of them giving in. And when Bishop was thrown off the horse, he hit the pavement and died. So this reporter goes up to Huxley at The Athenaeum and he's drinking cognac. And he says, "Professor Huxley, did you just hear what happened?" Huxley says, "Yes, at long last, the Bishop's brain has come into contact with hard reality. And the result has been fatal." So even in death, there is no mercy.

ROBERT GREENE

Only English people could have the presence of mind to come up with a line like that. That's brilliant. Just before I forget, have you

read a book called "The Master and His Emissary"?

VILAYANUR S. RAMACHANDRAN

Why is that so familiar?

ROBERT GREENE

You didn't read it, because he quotes you in there.

VILAYANUR S. RAMACHANDRAN

Tell me about it.

ROBERT GREENE

Well, I read it . . .

VILAYANUR S. RAMACHANDRAN

Who wrote it? Is it a novel, is it a . . .

ROBERT GREENE

No, it's a man with a strange English name, like Ian Macelway [McGilchrist] or something like that. It's about the right hemisphere and the left hemisphere.

VILAYANUR S. RAMACHANDRAN

It's a big, fat book.

ROBERT GREENE

It's a big, fat book.

VILAYANUR S. RAMACHANDRAN

Oh, I know that. I know. It's a good book.

ROBERT GREENE

Did you like it?

VILAYANUR S. RAMACHANDRAN

Yes.

ROBERT GREENE

It's very interesting, but it's a little . . .

VILAYANUR S. RAMACHANDRAN

It's on the boundary.

ROBERT GREENE

. . . dogmatic about the . . .

VILAYANUR S. RAMACHANDRAN

About the right/left thing, yeah.

ROBERT GREENE

Yeah. Anyway, I don't know why I'm bringing that up. There's a whole theme in the book about marginality, where a lot of people who are the most creative feel like they're marginalized in some way. And that makes them more observant about how things operate, more creative, less arrogant in a way. Did you feel that at all, or you never

really felt that you were . . . I mean, in India you wouldn't feel that way, but when you were in England.

VILAYANUR S. RAMACHANDRAN

No, I really haven't felt marginalized. I've had my fights, but not as much as you would think. I've sometimes felt that . . . you know, you always send papers to referees, and referees will sometimes say no. But not any more than anybody else. I've never felt paranoid.

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

But on the other hand . . .

ROBERT GREENE

But you have an outsider's approach to science that seems . . .

VILAYANUR S. RAMACHANDRAN

Right, but I'm proud of it, and I don't think . . . I think people at home will appreciate it.

ROBERT GREENE

Do appreciate it.

VILAYANUR S. RAMACHANDRAN

Yeah, because . . .

ROBERT GREENE

Oh yeah, you're . . .

VILAYANUR S. RAMACHANDRAN

Because if you take my books and look at the blurbs, they're from Nobel Laureates. But let me put it this way. There are some mediocre people in the field. There's envy. Because the sort of thing I'm saying, this guy just makes all so effortless and simple. Here I am slogging away. And that's irritating, but sometimes some of these people sit on committees. But it has not affected me very much.

ROBERT GREENE

Why? Do you think you're just lucky? You're just born . . .

VILAYANUR S. RAMACHANDRAN

Just lucky.

ROBERT GREENE

I don't believe in that. I think there's something that you do that's different.

VILAYANUR S. RAMACHANDRAN

Well, the proof of the pudding.

ROBERT GREENE

You don't make mistakes that expose yourself to the kind of . . .

VILAYANUR S. RAMACHANDRAN

Right. And I don't make overconfident remarks. I say, I'm not sure.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

You know, but the funny thing is, it's not enough to say I'm not sure. It's not enough to put a disclaimer. You have to write a page saying you're not sure. Otherwise, they'll still miss it, and they'll still attack you. An entire page being your own devil's advocate, and saying, "This may be wrong for this reason. It may be wrong for this reason. It may be wrong for this reason. But I still think it's worth testing." Then, people don't give you hassle. And it's unfortunately against human nature to do that.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

To be self deprecating. I don't sound selfishly deprecating to you, but . . .

ROBERT GREENE

No, you do. The element of admitting that you're not certain about things. You're always careful, at least in your books, to say what's speculation.

VILAYANUR S. RAMACHANDRAN

Well, I'm glad that comes through.

ROBERT GREENE

The degree of speculation. You even give numbers and say, this is 90%, this is more speculative than the other statement. You're quite cautious about that.

VILAYANUR S. RAMACHANDRAN

That's absolutely right. Maybe that's one reason I haven't really got into that much trouble.

ROBERT GREENE

Okay. What would you say . . .

VILAYANUR S. RAMACHANDRAN

And the other reason I'll tell you is because of the low tech nature of the work I do, I don't need huge grants. And if I get half a million, I'm happy for three years, four years. Some of these people want 20 million. If you're in a biochemistry lab, you need 20 million dollars. The minute you start talking big money, there's big politics, clubs. So I don't align myself with these political clubs, and therefore, if I say I'm working . . . okay, here's a good example. There is no phantom limb club. Before I came into the picture, there was nobody studying phantom limbs. So I said, I'm going to do all these amazing experiments. Here's some evidence. How can they say they won't give you the money? How can they get irritated? You'll irritate people if you step on their toes.

ROBERT GREENE

But there's nobody there.

VILAYANUR S. RAMACHANDRAN

So they say give him the money.

ROBERT GREENE

This is your strategy throughout life.

VILAYANUR S. RAMACHANDRAN

Yeah. They say give him the money. So I've never had that problem. Except every now and then, you get somebody who gets annoyed, because you make it seem effortless or just plain professional jealousy. But that person may not be in that club, so they don't have any power over me.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

But in general, what I find in my work is, the top people in the world, top people in the field, admire it, because they have no axe to grind. There's no rivalry.

ROBERT GREENE

They've already reached the part, they're not petty anymore.

VILAYANUR S. RAMACHANDRAN

They just look at what you do. The people who are outside the field are very positive

about it, because they see the proof in the pudding. It's people who are very close to me as colleagues, sometimes who are part of the club so to speak, they'll sometimes say, "That's bullshit."

ROBERT GREENE

I looked up on the Internet to see if there were any overt criticisms of you, and there are very few. That's rather strange.

VILAYANUR S. RAMACHANDRAN

I don't even know of any.

ROBERT GREENE

It's rather strange. You look up anybody else, myself included . . .

ROBERT GREENE

Yeah.

ROBERT GREENE

[laughs]

VILAYANUR S. RAMACHANDRAN

Who doesn't know that?

ROBERT GREENE

Okay. What would you say is your relationship to authority?

VILAYANUR S. RAMACHANDRAN

Oh, I don't like that.

ROBERT GREENE

Even when you were a student?

VILAYANUR S. RAMACHANDRAN

No, never. Because it has to do with this whole freedom thing and being in my private world and doing what I like. And I don't mind authority figures like police or something. When it comes to science, I don't like authority figures at all. And fortunately, it's not common in science; despite what people think. In Germany it's common. But in American science, they make you conform to their style of research, but it's not through authority. It's more through setting an example and withholding reward rather than . . . well, I guess that's a form of authority. They won't give you grants unless you do this and do that. But authority figures themselves

are not common, not even in American science. Certainly in German science . . .

ROBERT GREENE

But there's a lot of conformity.

VILAYANUR S. RAMACHANDRAN

Yeah. Conformity is there. And I like to not conform. But that's not because of one or two authority figures who I'm rebellious against.

ROBERT GREENE

Okay. But were there teachers that you had that you respected and were able to learn from, but others that you . . .

VILAYANUR S. RAMACHANDRAN

Yeah, inevitably. It doesn't loom large in my life. What looms large is people like Richard who were tremendous catalysts. The naysayers, I just stay away from. And I think that the problem is, there are some scientists who actually take perverse delight, they spend all their time debunking ideas. Now why would that be an interesting enterprise? They're naysayers. And I find that I stay away from them, because they're not fun. I

find gourches, I don't find them fun. We need some of them, but I stay away from them. It's a different matter. Whether you need them . . .

ROBERT GREENE

So, you had mentioned that things come kind of easy to you, or that you kind of make it into play. There were never moments in your years at Cambridge or even in medical school where it was somewhat boring or frustrating or a lot of . . .

VILAYANUR S. RAMACHANDRAN

Yeah, I can give you examples of that. I just have to check.

ROBERT GREENE

Your phone?

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

Do you need to . . .

VILAYANUR S. RAMACHANDRAN

. . . palm of your hand.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

Something a grain of sand, right?

ROBERT GREENE

Grain of sand, I think so, yeah.

VILAYANUR S. RAMACHANDRAN

So that, then they interpret it as a mystical experience.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

And then, another possibility is that, related to possibility one, is that they're confabulating it. In other words, they're having some weird sensations that they experience, and they just say it's a mystical experience. One way of dealing with it. The other thing is that there is specialized neural circuitry for something akin to a religious experience to provide stability to social structure. Every society, every culture, every civilization has some

kind of either primitive or substantiated religious system.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

This is just in my universe, and then maybe there is circuitry involved with that. So what I say in my final concluding line is that the circuits in the temporal lobes whose activity is conducive to feeling a religious experience, which is very different from saying there's a god module in the brain. The press made up that phrase. In fact, we said in that paper, because it does not show there is a god module in the brain.

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

The last part of the paper, god module, you'll see is [inaudible 01:12].

ROBERT GREENE

So you never said that.

VILAYANUR S. RAMACHANDRAN

No. If you look at the original abstract, we say that . . . in fact, we claim that this does not mean there is a god module in the brain. They latched onto that, and then they ran with it. Of course, anything you say about opinions of god, there is a certain amount of controversy in the press. Religious people say you're saying they're all crazy.

ROBERT GREENE

Well, you actually were being quite gentle. You were even saying, how do we know who's crazy? And perhaps . . .

VILAYANUR S. RAMACHANDRAN

That's right. It's god's way of visiting us.

ROBERT GREENE

I would've thought you would've had more controversy from . . .

VILAYANUR S. RAMACHANDRAN

Scientists.

ROBERT GREENE

Scientists, yes, exactly.

VILAYANUR S. RAMACHANDRAN

Well, controversy in science occurs if you publish a paper where you claim things and say something [inaudible 01:52]. And then you don't follow up.

ROBERT GREENE

But nobody gets upset that you're even speculating about these things.

VILAYANUR S. RAMACHANDRAN

No.

ROBERT GREENE

Okay. Well, that's fortunate.

VILAYANUR S. RAMACHANDRAN

Well, I take that back. The speculation on our . . .

ROBERT GREENE

Okay. You're being recorded now.

VILAYANUR S. RAMACHANDRAN

Yeah, that's fine. The speculation on our, again as I say, I get good reactions from scientists. They say, well, nice to push the speculative once in a while. He's paid his dues. He's having some fun. That's the way

scientists react to it. An artist said, my god, it's legitimizing what we're doing. Art historians start thinking it's depriving them of a job, and I'm talking about on a deep unconscious level, not stated explicitly. Because artistry is all about historical trend. It's about diversity of artistic style, not universal figurative style. It's fundamentally antithetical. What they don't realize is you can have Chomsky and universal rules of recursiveness. Maybe, right?

ROBERT GREENE

Probably not.

VILAYANUR S. RAMACHANDRAN

It doesn't mean that all languages are the same. It doesn't mean you can't study literature.

ROBERT GREENE

No. Chomsky wouldn't say that.

VILAYANUR S. RAMACHANDRAN

No, he wouldn't say that either. So likewise, you have artistic universal, aesthetic universals I call them.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

But different artistic style.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

No incompatibility ideas there.

ROBERT GREENE

Well, as soon as you start threatening people's livelihood, that's when they start getting a little angry.

VILAYANUR S. RAMACHANDRAN

That's right. The only time I've done that is with art.

ROBERT GREENE

I really enjoyed your aesthetics speculation. It makes me think of a lot of many different things.

VILAYANUR S. RAMACHANDRAN

Oh, good.

ROBERT GREENE

Because I'm late, I want to get to things quickly so I don't take too much time today. We covered your apprenticeship phase last time. There were a few gaps. Today I wanted to get into what I call the creative phase. I think of you as a very creative thinker. So, the first thing I wanted to talk about was the idea of anomalies, because I think that plays a huge role in how you think. There are a couple of things I wanted to ask about it, but I noticed in phantom limbs, you said that from a very early age, you were drawn to exceptions, to studying things like iodine and the rings on Saturn. Before getting into the idea of anomalies itself, do you have any idea why you were drawn?

VILAYANUR S. RAMACHANDRAN

To anomalies?

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

I think it's natural for human beings to be drawn to exceptions. Of course, our attention with irregularities, the brain is constantly looking for irregularities. You see irregularities, and you suddenly see an exception. The exception highlights the irregularity in some way, but it's also interesting because it's an exception. I don't think one can probe very deeply exactly why that happens. I could speculate, but I think it's very natural in humans to be curious. Why anomalies? That's a good question.

ROBERT GREENE

I know, because a lot of children or people are drawn to patterns, but you seemed to be drawn to anomaly from a very early age.

VILAYANUR S. RAMACHANDRAN

Right. I think it's a slightly irreverent streak maybe. I don't know. Saying everybody's following these rules, but how can you explain A? How can you explain B? If it's true that solid, liquid, gas as you heat

something, why does this big [inaudible 05:17] suddenly become gas. So things of that nature. There was not ever a deep reason. And then you start reading about anomalies, and you find it very intriguing, the mysteries of science. X-rays were anomalies when they were discovered. But not all discoveries are made by looking for anomalies. There are lot of discoveries that involved simple hypothesis testing. But a disproportionately large number of them are, surprisingly.

ROBERT GREENE

Anomalies.

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

Yes. Thomas Kuhn's book, I forget where that is. He puts a lot of emphasis on the importance of anomalies. In fact, perhaps maybe in some way, every discovery is sort of related to some anomaly.

VILAYANUR S. RAMACHANDRAN

That's correct. That's true.

ROBERT GREENE

So, you can remember early on. Not only were you attracted to it, but you were studying it in relation to the history of science?

VILAYANUR S. RAMACHANDRAN

Yeah. But mainly I was attracted to it. For example, a seashell. I used to collect seashells. The seashells I used to find on Madras Coast called xenophora, X-E-N-O-P-H-O-R-A, which believe it or not, collects other shells. It's the first shell collector. It pastes them on itself as camouflage. As he grows, he picks up another shell, attaches it to him, grows more, and puts. . . some of them are elaborate shells, they're bigger than themselves attached to them. I said how the devil does he do this? Maybe it's not an anomaly, but it sort of is.

ROBERT GREENE

It is.

VILAYANUR S. RAMACHANDRAN

I still don't know how it does it. And also, I used to look at these, I don't know if you've

seen these murac shells. Long thin spines, extremely long. This is essentially a snail, but a regular snail grows by secretion. As it grows bigger, it just adds another layer of calcium carbonate. It keeps doing that, so the shell becomes more and more big. But how does it produce spines, this guy? I don't know if you've seen these things. It's almost like a cone. And how would you secrete that from your mantle?

ROBERT GREENE

And in that shape.

VILAYANUR S. RAMACHANDRAN

In that shape, exactly.

ROBERT GREENE

You never found out?

VILAYANUR S. RAMACHANDRAN

Never found out, no. I'm sure there's an answer somewhere.

ROBERT GREENE

But you remember being very drawn and curious about this when you were young.

VILAYANUR S. RAMACHANDRAN

That's right. That's right. And also, as I said in my last meeting with you, you don't want to pursue anomalies for their own sake, because there are lots of false leads. I think we talked about, how do you know when something's a fake anomaly and when they are real.

ROBERT GREENE

You talk about it in one of your books a little bit.

VILAYANUR S. RAMACHANDRAN

I think so, yeah.

ROBERT GREENE

The difference between pursuing telepathy or ESP. We can go into that and tell me more. I don't think we covered that last time.

VILAYANUR S. RAMACHANDRAN

Well, basically, it's always a great thing for all scientists to pursue anomalies, because every anomaly is a gold mine. But how do you know which ones to pick? There are several ways. One is just trial and error, but

that's painstaking. Then you say, pursue ten of them, one of them works. But as Francis Crick used to tell me it's better to pursue 10 important ideas, fail 9 of them, succeed in one, rather than pursue 100 trivial ones and solve all of them. So, one is trial and error. The other rule of thumb is if an anomaly has been regarded as anomalous because it can't be replicated any number of times and people try it, like spoon bending, telepathy, the more you study, the smaller the effect. Then you're in danger. Don't waste your time.

ROBERT GREENE

The smaller the effect. What do you mean?

VILAYANUR S. RAMACHANDRAN

Sorry. The more you probe, the more time that elapses after its discovery, the smaller the effect becomes. You always make excuses like, the conditions weren't . . .

ROBERT GREENE

Oh, I see what you're saying.

VILAYANUR S. RAMACHANDRAN

So, anomaly, when you become more refined, the effects become more clear, in the experiment, it will be more refined. If it becomes more wooly and more fuzzy and more elusive. . .

ROBERT GREENE

The more you probe into it.

VILAYANUR S. RAMACHANDRAN

Then there's a danger sign. So for example, telepathy, the empirical finding itself could not be replicated. But if something like bacterial transformation, which I don't know if I spoke about last time.

ROBERT GREENE

I think you did briefly.

VILAYANUR S. RAMACHANDRAN

Yeah. Somebody took pneumococcus A, put it into another species, pneumococcus B, and A changed to B. This was published in a reputable journal. People replicated it. It made no waves in the biology world, because people couldn't make any sense of it. So if an

anomaly can be clearly replicated, that's an anomaly. It's as big an anomaly as if I bring a goat, put it in a pen with a pig, and two pigs walk out. You jump off your seat. That's what they did with bacteria rather than goats.

But nobody paid any attention to it. And the reason it didn't fit the big framework of science is because the immutability of species is the accepted, one of the axioms in biology. At least currently. Evolution may entirely change. But currently, you define a species as a quantized entity. So here they're questioning that, so people just go into denial. They say it's some curiosity and they brush it under the carpet.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

If they paid attention to it, it's a curiosity, but it challenges the very foundations of biology. Let me take a closer look. DNA would have been discovered 20 years earlier, because when they took the juice of one bacteria to

the other bacteria, that was enough to change it. Something in the juice. Then they figured out DNA could do it. So all of this was done long before Watson and Crick. People just ignored it because they couldn't make any sense of it. The whole idea of heredity being in a chemical. Another one is Wegener and continental drift.

ROBERT GREENE

Yes, you talked about that.

VILAYANUR S. RAMACHANDRAN

We talked about that.

ROBERT GREENE

In the book, yeah.

VILAYANUR S. RAMACHANDRAN

So, those are examples of things regarded as anomalous simply because they challenge the accepted status quo. But the empirical evidence is solid. Then you pursue it, you have a gold mine. If the empirical evidence itself is shaky, don't waste your time. It's spurious. So that's the kind of rule of thumb.

Similar to the other thing, just luck and trial and error.

ROBERT GREENE

But when you do things with phantom limbs or some of these syndromes, like the neglect . . . I forget the term.

VILAYANUR S. RAMACHANDRAN

Denial.

ROBERT GREENE

Yeah, but the . . .

VILAYANUR S. RAMACHANDRAN

Anosognosia.

ROBERT GREENE

Yeah. How do you choose which one . . . are you specifically looking for answers to something, or are you just curious about the anomaly itself?

VILAYANUR S. RAMACHANDRAN

Curious about the anomaly, but as Michael Faraday or someone said, even though a scientist may seem like he's stumbling in the dark if he wants to be a good experimenter, behind all that is always a theory, theoretical

stance which may not be explicit. So, neurology is full of anomalies, because we know so little about the brain, they're all anomalies in a sense. But I was not so much interested in motor neuron disease instead of other functions, because I was more interested in higher functions in the mind, which we're all naturally curious about.

Phantom limb is an obvious thing everybody's curious about. It's an anomaly, because you can't make any sense of it. What does it mean to say your arm is still there? And people regarded it as a form of mental illness for a long time. Freudians used to say it's wish fulfillment. They wanted to have their arm back. And that's an example of it's a clearly established phenomenon, but people are ignoring it, because we didn't know how to fit it in the mainstream neurology. So, apart from being intrinsically fascinating and intriguing, who's not interested in phantom limbs? Right? I could ask myself, can you do experiments on this? And then I saw some

literature on animals showing tremendous malleability of brain maps.

ROBERT GREENE

Yeah, monkeys.

VILAYANUR S. RAMACHANDRAN

Monkeys. So then I predicted, if you touch the face, he'd feel it in his phantom, and my students all started laughing together. Then it turns out, some of my best experiments started as jokes. Because jokes have a lot in common with scientific creativity. It's about unusual juxtapositions of ideas. So I said, you touch his face, he'll experience it on his fingers. Okay, let's find out anyway. So we got this guy, and of course, the rest is history. Then the mirror was similar. The guy said his arm was frozen and it can't move. And I said, what if we make it look like it's moving? There was a mirror lying around, I put it there.

ROBERT GREENE

Why do you think nobody else has thought of this before?

VILAYANUR S. RAMACHANDRAN

It's too simple. Another thing I wanted to say is you can develop a nose for anomalies.

ROBERT GREENE

Tell me about that.

VILAYANUR S. RAMACHANDRAN

Initially, it may be there's a genetic propensity. Who knows? And then there's attraction to the strange and the curious. And then you can develop a nose for it and consciously look for them. That I have started doing more and more as my career progressed. I said this is where the gold is. It's more fun.

ROBERT GREENE

I'm very curious to know about that. So you've developed a better sense of what is a rich anomaly.

VILAYANUR S. RAMACHANDRAN

Correct.

ROBERT GREENE

Can you explain that at all, or is it too . . .

VILAYANUR S. RAMACHANDRAN

Let me give you an example. This I already told you about recently. So a guy says he wants his arm amputated. Now, I looked at this . . .

ROBERT GREENE

He wants his arm amputated, but there's nothing wrong with it.

VILAYANUR S. RAMACHANDRAN

Nothing wrong with him. Mentally normal, neurologically normal, supposedly. No neurological dysfunction. Completely normal. No psychiatry history, no depression, nothing. Any depression there is, it's about his arm. It feels like. So now, why would a normal, sane adult person say he's always wanted his arm removed, ever since childhood? As long back as he can remember. And then some of them, about one out of three go and get it amputated in Mexico.

I knew a very eminent medical school dean who came to me at the age of 70, he just retired. They said he's had this lifelong desire,

and he's going to go get it amputated. I tried to discourage him. Three months later, he went and had it amputated. Here is a guy . . . just imagine you or me going and doing this. Perfectly . . . charismatic, normal, good sense of humor, intelligent, successful in his profession, well-to-do.

ROBERT GREENE

That is hard to believe.

VILAYANUR S. RAMACHANDRAN

That's a classic example of an anomaly. Now a standard reaction is it's bogus.

ROBERT GREENE

It's crazy.

VILAYANUR S. RAMACHANDRAN

It's crazy. Brush it under the carpet. You ignore it completely. You're in denial. Or when you confront it, you say that he's crazy. One view is that they remove the arm, because they feel the stump resembles a giant penis substitute. This is a Freudian idea about why . . .

ROBERT GREENE

Yeah. We've moved past that.

VILAYANUR S. RAMACHANDRAN

Bullshit. So I said one of the things that struck me was the left arm is much more involved than the right arm. So why is that? Now, another thing is they want to draw attention to themselves. If they want to draw attention to themselves, why do they keep it hidden 60 years or 70 years in some cases? Why wouldn't they say very early on, I want my arm removed? And why not nose removed, why not ear removed? Why an arm?

ROBERT GREENE

It's always arm.

VILAYANUR S. RAMACHANDRAN

It's always arm. One of the things we learn in medicine, I think I told you last time, is 90% of the diagnosis is clenched in conversation with the patient. Then another 9%, just a basic simple clinical exam. 1% is high-tech.

ROBERT GREENE

For you, in your work.

VILAYANUR S. RAMACHANDRAN

No, I'm saying in the early days of medicine. We were taught this as medical students, and that has lingered on in my brain. It's persisted in my brain, and it sort of spills over into my science, too. So this guy is telling you something important. He's telling you that he's had it all his life. He doesn't want any attention. He wouldn't do that. Why not nose or ear or tongue? Why his arm? He's already telling you something real.

ROBERT GREENE

And left arm.

VILAYANUR S. RAMACHANDRAN

Why more predominantly left? If he wants to draw attention, why wouldn't he say, I want to remove my right arm? Why is it a 3 to 4 to 1 ratio?

ROBERT GREENE

Interesting.

VILAYANUR S. RAMACHANDRAN

So already, this is telling you all the clues you need. So people don't talk to patients these days. Finally, then I saw this is similar to apotemnophilia . . . sorry, not apotemnophilia, somatoparaphrenia, where you get right parietal stroke, you get a anosognosia, denial of problem. Some of them want their arm removed. They say, "Remove my arm, doctor." Sorry, I said that backward. They don't want their arm removed. They say their arm doesn't belong to them. They say this is my mother's arm.

Here's a perfectly sane person. You hold their arm up and say, "Whose arm is this?" They'll say, "That's my mother's arm, doctor." That's because the body image region of the brain is damaged. But also the sensory region of the brain, with the fingers and hands and touch and joints, called S1 and S2, that's also damaged. So there's essentially no representation of the arm in the brain.

ROBERT GREENE

Is it usually the left?

VILAYANUR S. RAMACHANDRAN

Usually the left. We can go into that if you want.

ROBERT GREENE

No.

VILAYANUR S. RAMACHANDRAN

It's the right parietal that's specialized for this.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

Okay. Body image. The other thing is they'll take a felt pen and draw the exact line where they want their arm amputated. Sometimes they get the amputation done. It's done sloppy. They say, "My god, there's still a little piece left. I want to remove it." Now, if they want to draw attention in some vague sort of . . . why would the line matter? This tells me there's a body image center in the brain. Maybe the arm is missing there. There's

analogy with somatoparaphrenia, which is also much more common in the left. The analogy that the ownership of the arm is in doubt.

The key difference is these guys will say . . . you ask them, “Does it feel like it doesn’t belong to you?” He says, “No, no. I know it belongs to me. It feels like it belongs to me. That’s why I want to get rid of it. It feels it belongs to me too much. It’s intrusive. It’s overpresent.” Listen carefully to their words. So this shows there are similarities with somatoparaphrenia, but there are differences too.

ROBERT GREENE

It’s too much part of them.

VILAYANUR S. RAMACHANDRAN

Why would somebody say that?

ROBERT GREENE

Too much emotion attached to it?

VILAYANUR S. RAMACHANDRAN

Yes. Too much emotion attached to it. It’s overpresent. Now what do they mean by that?

ROBERT GREENE

That’s exciting.

VILAYANUR S. RAMACHANDRAN

Yeah, it’s exciting. So that’s the key difference that gave us the clue.

ROBERT GREENE

You really are Sherlock Holmes.

VILAYANUR S. RAMACHANDRAN

Okay. It’s like the dog that did not bark. So the first thing we did to show it was real is if you take galvanic skin response. Touch somebody, poke them with a needle, or even hit them a little big like that, you get a galvanic skin response in the brain. This is because the message goes to the tactile areas, alerts the amygdala and insular cortex, which is another region which is involved in emotions, and cascades down the hypothalamus, down the autonomic nervous system, causes you to sweat, blood vessels to expand, dilate. Causes you to sweat, makes his hand sweat more. It changes the skin resistance. I can measure immediately how

aroused you are. If I ask you, you may lie. This is why it’s used for lie detector tests.

So, I hook you up to that, and then I touch you here, here. You will get a galvanic skin response, but a small one, unless I poke you with a needle. So I map your whole body. It’s not a map, but I get a big . . . I measure the galvanic skin response in the other hand. So, you’re poking me here, measure my GSR, it goes up. So we measured his GSR below that line. It went through the roof. Above that line, it was normal. Other arm was normal. So something about that arm is getting him riled up. You could say, if it’s like somatoparaphrenia, that arm is not represented in the brain. He’s in denial about the arm. You should get a smaller response. But remember, he doesn’t say that. He says it’s overpresent. Why is that?

So, David Berman, my student, and I, we went and looked at the right parietal region, or the body images. It turns out that the

signals from the body, the skin surface and the muscles, go to an area called S1. You saw the Penfield map. Every point is represented on a point in the map. There's S1, S1 is for touch, S2 is for joints and all of that. That's a basic sensory map of the brain. Behind that is a structure called the superior parietal lobule, which gets information from all the senses -- vision, touch, hearing -- and constructs your body image. So that's a high level analysis of the body, or higher level representation, creating body image.

What we found was if you touch the guy below the line, if you touch him anywhere else, everything is normal. You get S1 and S2 lighting up and superior parietal lobule, body image lighting up, as you would expect. If you touch him below the line, S1 and S2 light up. Why is that? Because the skin is normal, receptors are normal, everything is normal. But S2 doesn't light up. If you go above the line, S2 lights up. So it confirms our theory, that part of the brain. . . sorry, superior

parietal lobule, has a body image. This is laid down at birth, partly. Little bit malleable, it's laid down at birth. And then . . . but the message from the skin's surface is still intact and is going to S1, the sensory map. So that's sending an output to the region in the brain which has nowhere to go.

So that's why he says things like, "It's overpresent. I can't explain it to you. It's overpresent. It's annoying. I don't want it. I want to be rid of it." And after they get rid of it, they feel a tremendous sense of relief.

ROBERT GREENE

It seems related to people with dysmorphia.

VILAYANUR S. RAMACHANDRAN

It grades into that probably.

ROBERT GREENE

People who feel like they're the wrong gender, something like that.

VILAYANUR S. RAMACHANDRAN

That's correct. That is transsexualism. It may be a related syndrome, but you feel like you're a woman trapped in a male body. The

body image template may be male, but you're internal feeling of sex might be female. Your external morphology may be male.

ROBERT GREENE

It's a little more subtle I guess than wanting to get rid of your arm.

VILAYANUR S. RAMACHANDRAN

Yeah, absolutely.

ROBERT GREENE

So you said you developed a nose . . . how's this an example of you developing a nose for the rich anomalies?

VILAYANUR S. RAMACHANDRAN

Well, it's an example of you are rewarded for what you're good at. So I did phantom limbs, and I did anosognosia, and I did Capgras delusion. Then I say, look, doing pedestrian stuff, dotting the I's and crossing the T's, it needs to be done. Bread and butter stuff. It's not where my heart is. Here is somebody everybody has ignored, apotemnophilia, and I pinned it down to brain structures. Surely this will tell you something about how

the normal brain constructs a body image. The relevance to distorted body image, like anorexia for example. So that's an anomaly that people ignored, and then I say, let me go for it. It's partly conscious and deliberately choosing anomalies which people would ignore by and large.

ROBERT GREENE

And it's based on a hunch that this is going to yield something.

VILAYANUR S. RAMACHANDRAN

It's based on a hunch, because the way in which they speak. They don't speak like crazy people. There are little clues you pick up on. Synesthesia was considered . . . a couple of people who said they were diagnosed as schizophrenic. One of my colleagues here who still thinks it's schizophrenia. Unbelievable.

ROBERT GREENE

Even after all your experiments and everything.

VILAYANUR S. RAMACHANDRAN

His wife is a psychoanalyst.

ROBERT GREENE

I'm trying to generalize across all domains as far as creativity is concerned. Do you think there's something inherently, something about looking at anomalies as a heuristic that we could generalize about, that there's always going to be something there? Or is there a reason why it yields so many . . .

VILAYANUR S. RAMACHANDRAN

Well, I think it's a bit like mutations in evolution. You can evolve a long neck by progressive excretion of elongation genes. If you want rapid change from a land dwelling vertebrate to a whale, you need recessive mutations so you don't kill. And then you want an accumulation of mutations to survive a lot of the elements. You need sudden jumps, many of which are lethal, but the big changes in evolution occur only with mutations. Likewise, the idea of Thomas Kuhn said, the big revolutions come from anomalies. So

given a limited lifetime, you want to pursue dotting the I's and crossing the T's or develop a nose for anomalies.

ROBERT GREENE

Why would there be an analogy between evolution and ideas, or maybe we're . . .

VILAYANUR S. RAMACHANDRAN

Well, only to the extent that big jumps are often spurious anomalies. The one big anomaly that's not spurious is the one that's going to get you a Nobel Prize or make a big discovery. Just like one anomalous mutation, if you want to call it that, but successful in the real world, takes you above the rest of the crowd. It makes you progress in evolution. Same thing with the evolution of ideas. The difference of course, it's just an analogy.

ROBERT GREENE

It's not an analogy.

VILAYANUR S. RAMACHANDRAN

Sorry?

ROBERT GREENE

It is or it isn't an analogy?

VILAYANUR S. RAMACHANDRAN

I'm saying it is just an analogy.

ROBERT GREENE

Well, maybe not. Because if people who write about ideas from an evolutionary point of view and say all mental activity can be tied to evolution and Darwinian theory.

VILAYANUR S. RAMACHANDRAN

Sure. And also Gould speaks of it in evolutionary theory. Gould talked about punctuated equilibrium and evolution by jerks, versus gradualism, which is a different way.

ROBERT GREENE

I should look into that. Is there a particular book? Are you talking about Stephen Jay Gould?

VILAYANUR S. RAMACHANDRAN

Stephen Jay Gould, just Google it. Punk eek, P-U-N-K, E-E-K, punk eek.

ROBERT GREENE

Because even in business when you're looking for a business opportunity, they're always told

to look at things that stand out or that are peculiar or that don't fit the model. It seems something we can generalize about.

VILAYANUR S. RAMACHANDRAN

That's correct. Inventions especially. Like chewing gum. Who would have thought that would catch on? A whole Wrigley empire was created out of that. Somebody had a little bit of a zany idea. But again, you have to remember the number of zany ideas that fizzle out. I have a surprisingly good track record. I would say about 30% of what I pursue.

ROBERT GREENE

And is it getting better over time?

VILAYANUR S. RAMACHANDRAN

Hard to know. I know when to give up. When you start studying something and it looks flaky, you just say, it's a waste of time.

ROBERT GREENE

You had things like that?

VILAYANUR S. RAMACHANDRAN

Oh, yeah. So you have to have tenacity, and at the same time not seek wild goose chases. Now I'm interested in anorexia, but it's not gone anywhere for a long time.

ROBERT GREENE

In your studies or in other people's studies?

VILAYANUR S. RAMACHANDRAN

Both.

ROBERT GREENE

Are you ready to give up, or you think there's something there?

VILAYANUR S. RAMACHANDRAN

Well, sometimes you give up something temporarily. This is an interesting strategy.

ROBERT GREENE

Yes, it is.

VILAYANUR S. RAMACHANDRAN

You give up something temporarily. It's like courtship. And then go back to it fresh. You're less caught up in it. You look at it from a fresh perspective.

ROBERT GREENE

There's been many great books written about that.

VILAYANUR S. RAMACHANDRAN

Is that right?

ROBERT GREENE

Well, have you ever read Hadamard's book about mathematics and creativity and Planck, Kara, and all those people. They call it thinking aside. So when you get so enmeshed in something and you're kind of blocked. You leave it alone for a while. Why, when you come back to it, do ideas suddenly come to you? And people have been speculating about that.

VILAYANUR S. RAMACHANDRAN

I can imagine.

ROBERT GREENE

And they have come up with some interesting answers.

VILAYANUR S. RAMACHANDRAN

Also cross fertilization. I think sometimes it's good to abandon something and go read about something completely unrelated.

ROBERT GREENE

Yes, but why? That's the interesting question.

VILAYANUR S. RAMACHANDRAN

It's about how the brain works. I think there's a strong conformist streak and a whole left hemisphere strategy of dealing with anomalies. It's adaptive. You don't want alarm bells going off every time you see something odd. But for that same very reason, it stifles your thinking. You can use metaphors, like being caught in a rut. Every now and then, you need to detach yourself and look at the big picture. I think it's conducive to doing that to let it go for a while.

ROBERT GREENE

So you're kind of bringing the right hemisphere into play more?

VILAYANUR S. RAMACHANDRAN

You're bringing the right hemisphere into play to reorient. That's what the right hemisphere is involved in. That reorienting process. This is all very tenuous by the way. But it allows you to reorient towards the problem, look at it from a novel perspective, and detach yourself from the problem instead of being totally obsessed with it. There are things like meditation to promote creativity. I don't know. I don't think anybody has studied it.

ROBERT GREENE

I've taken it up. Off and on I've been doing it for years, and I took it up very seriously now about three, four months ago. I think it does. I think there is a definite difference, but I have no idea how I could explain it.

VILAYANUR S. RAMACHANDRAN

You have no idea how to articulate it or how you explain it in neural terms?

ROBERT GREENE

I can articulate it. Because the whole point . . . I don't want to go too onto this, but the whole point of Zen meditation is to block your normal conscious way of thinking. In the process of doing that, all kinds of strange thoughts and different thoughts and different ways of thinking come to you. They're not even supposed to. And that kind of then carries over for the rest of the day.

VILAYANUR S. RAMACHANDRAN

That's interesting. Rather than just . . . I thought the idea was to be completely still and cessation of thought.

ROBERT GREENE

Yes, it is. But you're trying to block the stream of consciousness. You're turning it off. You have a switch, and you're turning it off. Then what happens? You talked about things like when you have dreams or people who see Mickey Mouse, that kind of syndrome. When you block that off, weird things start coming up.

VILAYANUR S. RAMACHANDRAN

That's very interesting.

ROBERT GREENE

So I notice, if I watch a movie, I'm starting to think about it in a totally different way than I would have beforehand. It's hard to articulate, but it definitely has an effect on you creatively.

VILAYANUR S. RAMACHANDRAN

I should try it, coming from India.

ROBERT GREENE

Well, this is Zen Buddhism I'm doing. But I think any kind of . . .

VILAYANUR S. RAMACHANDRAN

Actually Zen Buddhism originated in India.

ROBERT GREENE

Yes, it did.

VILAYANUR S. RAMACHANDRAN

I think I told you it was 50 miles from my house.

ROBERT GREENE

I thought it originated in China.

VILAYANUR S. RAMACHANDRAN

No, it originated in India in Kanchipuram, a place called Kanchipuram. Bodhidharma was the originator, lived in India. Then it migrated from there to Sri Lanka, Southeast Asia, Japan, everywhere else and became much more popular. Buddhism itself doesn't exist in India anymore. It originated in India, but . . .

ROBERT GREENE

It doesn't exist in India?

VILAYANUR S. RAMACHANDRAN

Well, tiny minority, Tibetan expatriates who live there.

ROBERT GREENE

So it originated in India. I didn't know that. I have a collection of books, I didn't bring to you, I'm going to give you. One of them is a book on the neurology of Zen meditation, and it's very interesting.

VILAYANUR S. RAMACHANDRAN

This is the one called "Zen and the Brain" or something like that, right?

ROBERT GREENE

No. This one's called, I think it's called "Zen Thinking." I'm not positive though.

VILAYANUR S. RAMACHANDRAN

Because I'm going to have a conversation with the Dalai Lama in about six months. On stage.

ROBERT GREENE

In six months?

VILAYANUR S. RAMACHANDRAN

On stage.

ROBERT GREENE

Oh, well I'll give you some material if you want.

VILAYANUR S. RAMACHANDRAN

Yeah, I'd love to. I'd love to get some material, because I know so little about it.

ROBERT GREENE

Olay. Well, one thing I wanted to talk about, a big part of this book is the idea of intuition, because it fascinates me. And I don't think anybody's really ever explained, I mean, how can you necessarily explain it? But you

touch upon it a few times where you say that in neuroscience, you're kind of at a stage of tinkering. You're not at the point of a grand unified theory.

VILAYANUR S. RAMACHANDRAN

Correct.

ROBERT GREENE

And then a lot of ideas come in the form of hunches, fishing expeditions, etc. Do you yourself experience these kinds of intuitions on a grand scale, or are they just sort of . . .

VILAYANUR S. RAMACHANDRAN

Well, there are two minds about it. On the one hand, I think that it is sort of a special gift, or whatever you want to call it, to be able to see hidden links. Obviously, I think what intuition is, is partly . . . I haven't thought about this very deeply. It's being able to link things, almost randomly, things people wouldn't normally link. It's as though something blocks you from linking that. So it's almost like a motivational thing rather than an intellectual.

So people are not intellectually courageous enough to say this patient may have something in his right hemisphere. There's a link between somatoparaphrenia, this disorder where people deny ownership.

Here is a guy who everybody thinks is crazy, no stroke nothing. He's saying my arm, he doesn't say it doesn't belong to him, but he says it's overpresent. There's an analogy there. So to be able to see that analogy and push it. So that, you could say I had an intuition or a hunch about what's going on in his brain. So, I think it's about seeing links. The reason I think anybody is capable, once you explain it to somebody, they say it's kind of obvious.

ROBERT GREENE

The actual intuition, the link? Or . . .

VILAYANUR S. RAMACHANDRAN

The link. The intuition. But if you try to do it on the fly, it's very hard. So for example, in my lab, one of the things that happens is I have a lot of students and we exchange

ideas. I find I link things much more often than they do. Sometimes it's boldness. How can this possibly be related to that? I'll give you a weird example. Did I show you my pet axolotl?

ROBERT GREENE

Yes, you did.

VILAYANUR S. RAMACHANDRAN

And I made a weird observation that you can go back in evolutionary time by giving him a hormone. Did I tell you that?

ROBERT GREENE

Refresh me. I think you did.

VILAYANUR S. RAMACHANDRAN

Okay. So basically, these creatures have a phenomenon called paedomorphosis or neotony. So they're frozen in the embryonic or fetal stage, and they have gills. Instead of becoming adult salamanders, they remain larval salamanders. Because they actually mature in the water, so it's basically a new species of salamander. But if you put thyroid hormone in the water, they become the adult

creature which gave rise to them. So you're going back in evolutionary time, maybe a few hundred thousand years. You're creating a nonexistent species that never existed on earth.

So now why wouldn't that shake somebody to the core? It's the only example I know of where you create a nonexistent species, going back in time. It's because it lost its thyroxin hormone producing capacity as a strategy for remain neotonous, maybe because the pools were drying up and they had to live permanently in the water. Put it the other way, maybe it's raining too much, and they had to permanently live in the water. There was no land. And so they remain a larva permanently. Or whatever reason it remained a larva, but just tweaking the hormone thyroxin. That's all it needed to do. Now if you put the hormone, it goes back in evolution.

I said, maybe other things like that happen in evolution, too. I was joking with my students saying, maybe humans are supposed to be neotonous primates. You're hairless, young baby chimps are hairless. You have enormous heads. Baby chimps have enormous heads.

You're playful. We retain our playfulness throughout life, whereas chimps and gorillas don't. So it suggests that we are neotonous apes. We retain our childlike curiosity and playfulness and dependence on mothers, so we can learn more. There are multiple reasons why we became neotonous. So what if you produce a cocktail of hormones, pituitary hormones, and give it to an adult, or even better give it to a child. Would you revert back to *Homo erectus* or *Homo habilis*?

This is completely a joke. It's a joke. First of all, you can't do it. It's unethical. But then I said, you do see examples in clinical medicine. There is a rare disorder called gigantism, where all the pituitary hormones are in excess. Thyroxin and growth hormone

and all that. And acromegaly, where an adult starts developing increased hormones. Can we look at the skull features? We know the skull features of ancient hominids and modern. These are generally atavistic traits. They have high arched palate, prominent eyebrows, prognathis jaw, and diastema, which is gaps between the teeth. Then you've shown that something like this did happen in human evolution. And how easy it is to do this experiment. All you need is to get x-rays of all the giants and acromegalics. And then you need three skulls. A human skull, an ancient hominid skull, and then an acromegalic, gigantic skull.

ROBERT GREENE

You've done this?

VILAYANUR S. RAMACHANDRAN

I haven't done it. I've just put in calls to the endocrinology department. It's nothing to do with my field. It has absolutely nothing to do with neurology. But you need boldness. Anybody else would say that's absurd. Why

would you go back to *Homo erectus*? Well, why is the changing of an infant salamander to a nonexistent species any less absurd if you think about it?

ROBERT GREENE

So you think behind having an intuition is a certain . . .

VILAYANUR S. RAMACHANDRAN

Cockiness.

ROBERT GREENE

But you're kind of exploring, and you're linking things that other people don't link. So you're sort of bold in that you're like an explorer going in areas that no one's gone before.

VILAYANUR S. RAMACHANDRAN

That's correct. You have to be arrogant. Not arrogant with people, but in sense, arrogant with nature.

ROBERT GREENE

Of all the things I've read, no one's ever quite said that. This is very interesting. Link the idea of boldness with intuition.

VILAYANUR S. RAMACHANDRAN

Absolutely. All of my students laughed. Not one of them said if it can happen to an axolotl, why can't it happen to a human?

ROBERT GREENE

I see. I would have said that.

VILAYANUR S. RAMACHANDRAN

You would have said that. It's because you're a creative thinker, because you're a writer. But the trouble is it's all the layer encrustations of culture and tradition and book learning that inhibits that bold step. Saying what if. What if ulcers are actually caused by bacteria?

ROBERT GREENE

I think what we're saying here is, if you are of a bold mind, cocky, arrogant, however you want to put it, you're more ripe to have intuition.

VILAYANUR S. RAMACHANDRAN

That's correct. I'm saying that's not enough to have intuition. A lot of cocky people are not intuitive. But it's one of the key ingredients.

Conversely, maybe you can be intuitive without being bold, but to really bring it to fruition, I think you need that bold streak.

ROBERT GREENE

Can you think of any examples of yourself, probably the most remarkable, intuitive discovery that you've ever had?

VILAYANUR S. RAMACHANDRAN

Well, one example is the face hand, the phantom limb. It sounded like a joke.

ROBERT GREENE

Which one?

VILAYANUR S. RAMACHANDRAN

Referral of sensation from the face to the hand. And the mirror thing was a joke. Then I said if you can look at phantom limbs, what about paralysis and stroke? We had a guy with an arm paralyzed. We really know it's damaged, permanent. [inaudible 39:27] fibers going to the brain. I said, well maybe a component of that is not due to damage to the fibers. Maybe it's a temporary block, and you can restore it with a mirror. The very idea

of a mirror to treat one-sixth of mankind. One-sixth of mankind suffers a stroke. It's so outrageous, people would just discard it for that very reason.

ROBERT GREENE

When people talk about intuition, they say that the idea comes to them. They have no idea where it came from. It would be like, oftentimes it's not falling asleep or they're tired or whatever. Does the mirror thing have any . . .

VILAYANUR S. RAMACHANDRAN

Honestly, I don't remember, but I think that the mirror . . . this is where everything comes from. It's nothing mysterious. The putting together is the mysterious part. There are mirrors lying around my lab all the time. So I must have seen a mirror, and the patient must have come in. So it was sitting in my mind. And then I say, how do you make him think his other arm, his phantom arm is moving? He doesn't have an arm. What if you put a

mirror there and make him see the reflection of his hand?

So that's putting two and two together.

But where did it come from? It came from the mirror leaning on my wall. I also read from Richard Gregory, who's obsessed with mirrors. So some of that obsession rubbed off. Can you believe this? He was England's greatest psychologist. He was at cocktail parties, and he would ask somebody, 'Why do mirrors reverse left right but not top to bottom?'

ROBERT GREENE

It is strange.

VILAYANUR S. RAMACHANDRAN

Everybody would say, isn't that obvious. And he would say, tell me why. They would say it's because you're bilateral symmetrical creature. They come up with all kinds of bizarre reasons, but not the correct reason. The correct reason . . .

ROBERT GREENE

You said Feynman came up with it, but you didn't put it in there what it was. Or was it in the notes?

VILAYANUR S. RAMACHANDRAN

Maybe it was in the notes. Feynman came up with the solution to it. It's very simple. Supposing I'm looking like this, and I show this in the mirror. That's how I typically do it, right. Show in the mirror. Or you hold it, and I'll watch it. Let me take the example that I hold. Easier to understand. It's all [inaudible 41:26]. And then it's hard to read. On the other hand, I hold it like this mirror reverse, like left right reverse, but it's not up down reversed. Why not?

ROBERT GREENE

Well, I don't know. Why not?

VILAYANUR S. RAMACHANDRAN

Okay. I'll tell you why. It's nothing to do with the mirror. It's the way you turned it. You did this. Can I show you how to make it turn to make it up down reverse? Look in

the mirror now, it's up down reverse. It's so breathtakingly simple the answer. Nothing to do with the brain, nothing to do with . . . just plain old optics.

ROBERT GREENE

What about your body being reversed?

VILAYANUR S. RAMACHANDRAN

Well, it's the same thing. You're looking at your body from here. This is my right hand. If I look in the mirror, normally I'm like this. The mirror is behind me. How do I turn? This is my right hand. I turn like this.

ROBERT GREENE

You don't go upside down.

VILAYANUR S. RAMACHANDRAN

That's correct. If I went upside down, I'd see upside down. I mean, this is the most ridiculously simple . . . you know how many people argue about this? Philosophers argue about it. So Richard Gregory's thinking, part of it rubbed off on me. So I was interested in mirrors. There's always something incubating in your head, but it's the putting together

part, that's the intuition part. Where do the ingredients come from is often random.

ROBERT GREENE

I've always been obsessed with mirrors myself, and then I put a chapter in the book that you read about mirrors. But I'm thinking of it in philosophy and what it means. I have something I'm going to write an entire book on, the idea of mirrors.

VILAYANUR S. RAMACHANDRAN

You should. I think even your sense of self awareness may pull a little bit to mirrors.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

Way back to the Narcissus legend.

ROBERT GREENE

But what about the whole thing of when you're in a barber shop, and you see the two mirrors, and they go on for infinity.

VILAYANUR S. RAMACHANDRAN

Right. And you see some of them as being a little bit alien. My student, Eric Altschuler,

published a little note on that, saying that if you start moving, some of those creatures actually seem like really twins of yourself rather than mirror images. That was because normally, when you do something, the mirror image is all synchronized. Mirror image is a left right reversal. But you're used to this mirror over a lifetime. That's why nothing's spooky when you do it in a mirror. It looks like me. But if you look at double reflection, it doesn't do left right reversal. There are multiple creatures, and they are perfectly synchronized with you, and yet they are not the regular, usual mirror. So that looks spooky, and you say it's some other guy who's mimicking me or something like that.

ROBERT GREENE

I wonder if there's some kind of therapy one could use this for?

VILAYANUR S. RAMACHANDRAN

That's correct. Absolutely.

ROBERT GREENE

Perhaps?

VILAYANUR S. RAMACHANDRAN

Perhaps. In fact, my student Liz who you saw earlier, she's trying to implement it for fibromyalgia to see if you can put yourself outside yourself and maybe reduce the pain. You can talk to her later if you want.

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

How did we get onto that? Multiple mirrors.

ROBERT GREENE

Well, we were talking about your hunch, your intuition about mirrors itself. And you were saying there were mirrors lying around, and they were in your mind.

VILAYANUR S. RAMACHANDRAN

And I've seen them in museums, exhibits of mirrors. You must have seen the one where there's a mirror like this, and you do this, and you feel like you're floating.

ROBERT GREENE

No, I haven't seen that.

VILAYANUR S. RAMACHANDRAN

Okay. It's an interesting one. The barber shop one is an interesting one.

ROBERT GREENE

Well, I just know, because when I was four or five years old, I was obsessed. It had a profound effect on me.

VILAYANUR S. RAMACHANDRAN

Or if you look at distorting mirrors, you actually feel tingling in your lips when it distorts in the mirror. Why would that be? There's an anomaly.

ROBERT GREENE

I think your most interesting experiment, I'm going to get onto this, is the one with the table and feeling the table is part of your arm. That was very exciting. I want to get now into your thought process a little bit. I'm trying to see if we can glean something.

VILAYANUR S. RAMACHANDRAN

Shall we go get tea or coffee or something? Did you have a problem last time, did it record okay?

ROBERT GREENE

Well, this one has to be plugged in, but I can use this. Are we going to come back here?

VILAYANUR S. RAMACHANDRAN

Yeah, in about 20 minutes.

ROBERT GREENE

Yeah. That's fine. I'll just have to . . . this is my backup in case something goes wrong, because I've had that happen before. Leave it here. I'll just bring this.

ROBERT GREENE

He knows that there are good counter arguments. He is speculating.

VILAYANUR S. RAMACHANDRAN

Yeah. I think it's fine for scientists to do that, so long as he makes it clear, and he does.

ROBERT GREENE

He does. I'll be very interested to see at some point, if you do ever invite him down, I would love to come and see.

VILAYANUR S. RAMACHANDRAN

Oh yeah, I'll let you know.

ROBERT GREENE

Okay. So what I wanted to get into a little bit with your thought process, which we've sort of alluded on before. So, there was the gentleman, Pons. Is that how you pronounce it? Pons?

VILAYANUR S. RAMACHANDRAN

Pons, yes.

ROBERT GREENE

With the mapping with monkeys and the experiments. And you thought, well, monkeys are very difficult to experiment with. Why not a human?

VILAYANUR S. RAMACHANDRAN

Yeah. That was a critical step.

ROBERT GREENE

Okay. Can you think back and go through the thought process at all? Because I'm interested in how it came to you in a way.

VILAYANUR S. RAMACHANDRAN

Well, I saw a report by a guy named Calford, C-A-L-F-O-R-D. He's sort of a scientist, but he was writing . . .

ROBERT GREENE

You might have to talk up a little bit.

VILAYANUR S. RAMACHANDRAN

Sorry?

ROBERT GREENE

The noise, you might have to talk up a little bit.

VILAYANUR S. RAMACHANDRAN

Yeah. There was a guy named Calford. Do you want to sit out? It was actually worse last time as I recall.

ROBERT GREENE

Was it worse?

VILAYANUR S. RAMACHANDRAN

It was somebody moving. Calford reviewed a paper for Nature on the Pons experiments. He published a little note on it in the News and Views section of Nature, which discusses articles that have been published in that particular issue. So I said this is unbelievable. A monkey with nerves the arm, his face goes to the arm area. This is unheard of. It contradicts everything I learned in medical

school. First of all, what does a monkey feel? So I said you can't train a monkey. So why not just touch a guy and ask him what he feels? Obvious. And [inaudible 02:04] discovered the Pons thing a few years earlier, or a year earlier. And I phoned Pons and asked him has anybody tried it. There was a dead silence on the phone.

ROBERT GREENE

Had they ever tried in on a phantom limb you mean?

VILAYANUR S. RAMACHANDRAN

No. All on a patient with [inaudible 02:18], or damage to the nerve.

ROBERT GREENE

Damage to the nerve?

VILAYANUR S. RAMACHANDRAN

Yeah. I called him up, and he said, "It's funny, because we just applied for a big, NIH grant for \$2 million to train monkeys to report where they're being touched. This is a tedious process. It may take months or years. And then do the brachial plexus damage and

see if they now report something different. I never thought of doing it on a person." The advantage of a person is you don't have to train him. You just ask him.

ROBERT GREENE

Why hadn't anybody else thought of that?

VILAYANUR S. RAMACHANDRAN

I think they stick to their domain. So people label themselves. I am a primate neurologist. I am a primate physiologist. I don't think of neurology. But I'm a neurologist. I don't think of all animals, what happens in animals. I'm a psychoanalyst. People label. One of the things I tell my students, don't prematurely label yourself. These labels are given to you by academic institutions. If you don't label yourself, you open yourself to a much wider range of ideas.

ROBERT GREENE

How come neurologists didn't think of this?

VILAYANUR S. RAMACHANDRAN

Because they don't read the [inaudible 03:19] of animals.

ROBERT GREENE

Primates.

VILAYANUR S. RAMACHANDRAN

Most neurologists, most physicians are very narrow. Even in a medical research setting.

ROBERT GREENE

So that's how that idea came to you.

VILAYANUR S. RAMACHANDRAN

Right.

ROBERT GREENE

What about, you talked a little bit about the mirror. You were thinking of, at one point, maybe some kind of virtual reality type of experiment, but it would cost too much money.

VILAYANUR S. RAMACHANDRAN

Yes.

ROBERT GREENE

Do you remember that thought process?

VILAYANUR S. RAMACHANDRAN

Yeah, I do remember that. I said, why are these people claiming they have this clenching spasm or their arm is immobilized,

frozen in a sling, phantom sling, long after it's been removed. So I said, maybe when the brain sends a command out to move your hand, your hand doesn't move, so the brain learns this in some funny way. And then when it's amputated, it's learning carries over to the phantom. The phantom is equally frozen and painful. I said, what if you now give visual feedback, so every time it sends a message, your hand is obeying you. How do you do that? I thought you'd need to measure brain waves.

ROBERT GREENE

Where would it have come to you the idea of getting that feedback?

VILAYANUR S. RAMACHANDRAN

Well, just from talking to the patient. The patient would say, "If only I could move it, it would relieve the cramp, because it feels like it's cramped."

ROBERT GREENE

They would say that, perhaps. That's what they said. If only I could move it.

VILAYANUR S. RAMACHANDRAN

If only I could move it.

ROBERT GREENE

And then you're thinking, okay, maybe there is a way to make . . .

VILAYANUR S. RAMACHANDRAN

Why doesn't it move? It's a phantom. Why can't a phantom move? Many of these people couldn't move it when it was intact and painful. So the brain has learned, moving it is painful. Don't move it. The command is linked to paralysis. Then I said if you give them visual feedback, he's able to move it with [inaudible 05:01], that might kick in and somehow relieve the pain. The rest is history.

ROBERT GREENE

Well, but then perhaps seeing a mirror triggered the idea of using a mirror. But you know, maybe I'm kind of not so smart in this area, but how do you angle the mirror and how you did it was that . . .

VILAYANUR S. RAMACHANDRAN

Did I show you the mirror?

ROBERT GREENE

I've seen it. I figured it out after reading it.

VILAYANUR S. RAMACHANDRAN

Just put it right here and you look inside here. A lot of people reading, even after reading don't understand. They put the mirror in front of them. Just mirror sitting like, excuse me for a minute, like this. You put your hand here, look in the mirror, and then you see the phantom. It's kind of obvious if you think about it.

ROBERT GREENE

You know a lot of people who are very creative or interesting in the way they think, they think visually or they have a model.

VILAYANUR S. RAMACHANDRAN

I think very visually.

ROBERT GREENE

You do.

VILAYANUR S. RAMACHANDRAN

I don't think mathematically or propositionally. I think highly visual.

ROBERT GREENE

So you were able to see the mirror, perhaps, operating in your mind?

VILAYANUR S. RAMACHANDRAN

Yes, absolutely. What I didn't expect was that immediately it would start moving, and the guy would laugh, chuckle, and say, "My god, it's moving, and the pain is gone."

ROBERT GREENE

You didn't know. So this was sort of shot in the dark. You weren't sure this would work.

VILAYANUR S. RAMACHANDRAN

It's a joke.

ROBERT GREENE

What was your emotional reaction when it did?

VILAYANUR S. RAMACHANDRAN

We may even have the original tape when that happened, if I can dig it up.

ROBERT GREENE

Did you yell out? Were you pretty excited?

VILAYANUR S. RAMACHANDRAN

Yeah. So was my student. Sandy Blakeslee I wrote that book with, her son Matt Blakeslee was my student, and he was there when I did the very first experiment with the mirror.

ROBERT GREENE

Okay. I was really intrigued with the denial patients, the experiments that you came up with, like the tray or the \$10, \$5. Or then the really, what you called demonic time where you're going to paralyze them, but you're not really paralyzed. These are almost like jokes.

VILAYANUR S. RAMACHANDRAN

They are. And you know it's funny, because these are the kinds of questions that first year undergraduates ask. First year undergraduates will ask things like, "What if you ask them to tie a shoelace?" Because they're not constrained. Many of my colleagues won't think of it. It's too simple. That's why they won't think of it. Whereas an undergraduate with no preconception, they'll say, "If he can't move his arm, what if you

reward him for it? Is he just thinking he can't move it, or is he deliberately malingering? What if you give him a trick?" Nobody's asked me this, but I'm saying it's the kind of question that somebody naive would ask and the experts don't ask.

ROBERT GREENE

So was this you or your students?

VILAYANUR S. RAMACHANDRAN

No, no. It was me. But I'm saying I've had occasions when . . .

ROBERT GREENE

Sometimes they will come up with things because they're so . . .

VILAYANUR S. RAMACHANDRAN

They're so patently obvious.

ROBERT GREENE

You had your epistemological experiment, whatever you . . .

VILAYANUR S. RAMACHANDRAN

Neuroepistemology.

ROBERT GREENE

No, the one where you were angry at philosophers. Where you're actually experimenting on the belief system.

VILAYANUR S. RAMACHANDRAN

Right.

ROBERT GREENE

So, do you remember that one, where you're going to give them the injection that's meaningless? Do you remember where that came from? It's just so simple.

VILAYANUR S. RAMACHANDRAN

It's so simple, yeah. I was using a syringe to squirt water in their ears. So maybe the syringe was sitting there and I said . . . these are unlikely sources. But your mind has to be prepared for some intrusion.

ROBERT GREENE

Right. That's another thing I want to get back into, that New York Times article.

VILAYANUR S. RAMACHANDRAN

Some people say this is just an accident, right, the discovery. And I say, well . . . or somebody

will come and say it has not been suggested before. But it's grabbing the opportunity. It's like saying, hundreds of people saw apples fall, but did they all discover gravity? Pardon the lofty comparison. Or penicillin, mold. Hundreds of technicians have seen mold around, but they didn't recognize it could be an antibacterial agent. That's critical. Fleming was prepared for that, because he was looking at saliva. You know that, right?

ROBERT GREENE

I think you explained it or somebody did.

VILAYANUR S. RAMACHANDRAN

He said how come these open orifices don't get infected? So he took tears and put it on bacteria. Killed the bacteria. He put saliva. He said there's a thing called lysozyme in tears and saliva which is killing bacteria. So he was prepared for the possibility that a living thing can kill another living thing. Then he saw the mold.

ROBERT GREENE

So what you're saying is anybody who saw a mirror or a syringe, they wouldn't have had the idea. But you had been thinking about it so much and your mind is prepared that it triggers an idea that nobody else would have.

VILAYANUR S. RAMACHANDRAN

Absolutely. That's right. That combined with boldness. I think it's a bunch of heuristics together. It's not any one magic key. The simpler, the more likely to be successful, rather than elaborate. Don't think in an elaborate way. Think in a very simple way.

ROBERT GREENE

Occam's razor sort of.

VILAYANUR S. RAMACHANDRAN

Occam's razor, yeah. It's funny. Occam's razor is useful, and it actually can be damaging. Crick once said, "Many a young scientist has slit his own throat with Occam's razor."

ROBERT GREENE

Why is that?

VILAYANUR S. RAMACHANDRAN

Well, because in biology, often the most obvious solution . . . we're talking about discovery. In the process of discovery, the obvious is often staring in your face, and you haven't discovered it. But in evolution, it doesn't always come with an obvious solution, because of the mix of natural selection and the opportunistic nature of evolution. Often it's a non-obvious solution, so you can't always apply Occam's razor when thinking about the brain.

ROBERT GREENE

I like that. Who said that about slitting your . . .

VILAYANUR S. RAMACHANDRAN

Excuse me. Francis Crick.

ROBERT GREENE

Oh, Crick. Do you need to get that?

VILAYANUR S. RAMACHANDRAN

I'm just seeing if it's anything important.

ROBERT GREENE

I want to talk a little bit about your propensity to speculate, because I have a theory that I'm going to be putting in the book. I was reading about Faraday, and I got this idea where he was talking about electricity and current. And it seemed like in his thought process, there was almost kind of a current going on that I could generalize. It's a different quality. The mind speculates about a possibility that intrigues it. It then proceeds to make an experiment to see . . . that inspires [inaudible 12:14] speculation. The experiment shows perhaps the speculation was partially correct or whatever. Based on the experiment, you then speculate some more, and then you experiment. And if you keep doing this over and over again, something extremely interesting and exciting eventually comes out. But if you break the current and all you do is look at facts and data and statistics, no speculation, this thing doesn't happen. And you're very open to speculation.

VILAYANUR S. RAMACHANDRAN

Yes.

ROBERT GREENE

All of your great ideas begin with [inaudible 12:52].

VILAYANUR S. RAMACHANDRAN

Right. A combination of playfulness. Playfulness is very important in science. And speculation. Darwin once said, "I love doing fools' experiments."

ROBERT GREENE

Yes, he did. He would do things like blowing trumpets at weeds to see how they would react. Things like that, right?

VILAYANUR S. RAMACHANDRAN

He said, "I'm always doing fools' experiments." I don't know the exact quote. It's in my new book. But going back to speculation, yeah. The experimental process is very important. And Darwin himself also made a point about . . . what does he say? False facts are injurious to the progress of science, but false speculations are important.

And even if they are wrong, everybody takes pleasure in disproving them. And thereby, a new door to truth has opened up. Something along those lines.

ROBERT GREENE

I've seen that. But the thing is I think that people nowadays are very averse to speculation, and that's terrible.

VILAYANUR S. RAMACHANDRAN

Science has become not a great, Victorian romantic enterprise anymore. People abort their own ideas before they're born. They're skeptical because it's considered intelligent. You're intelligent if you're a skeptic. And being skeptical is very easy, whereas being creative is not easy. It's extremely difficult. So the easy way out for somebody to appear smart is to be skeptical. That's at the bottom. And also the funding system punishes the visionary and rewards the conformist.

ROBERT GREENE

People pile up facts without ever wondering what it means.

VILAYANUR S. RAMACHANDRAN

Yeah. Peter Medawar has a nice phrase for it. He says that most scientists are like cows grazing on the pasture of knowledge.

ROBERT GREENE

That's a good one.

VILAYANUR S. RAMACHANDRAN

And he also says, "Great science always begins as an imaginative conception of what might be true, and then proceeding to test it."

ROBERT GREENE

So what is it about you that allows you to be so different? To be kind of a throwback, an activist, as you would say.

VILAYANUR S. RAMACHANDRAN

Well, partly my background in medicine, even though I was knocking physicians, on the one hand it makes you narrow and specialized, but that's modern medical education. When I was educated, the emphasis, a lot of it was on breadth. You learn biochemistry, you learn evolutionary biology, you learn organic chemistry, you

learn anatomy, comparative anatomy. All of that. So especially if you were curious about it, inquisitive. Secondly, the fact that I was traveling a lot makes me a little bit of a [inaudible 15:48] think differently from other people. And lastly, I think that financial independence. My parents were well off, so we didn't constantly worry about starving. And then lastly, the kind of research I do is very low tech. It doesn't require huge grants. I get my grants. I think that if you depend on grants, it stifles your creativity. If your salary depends on it. Because you're constantly trying to suck up to the establishment and conform to what they're saying so that you'll be funded. But if you don't need money for basic research, you tickle somebody's face with a Q-tip, you put a mirror in front of them, then the sky's the limit. You don't have to worry about . . . once you have tenure that is, you don't have to worry about impressing anyone. Background of studying medicine in India makes you

more innovative, because you're forced to be innovative and resourceful, because you don't have equipment. So a lot of the combination of these factors. And reading a lot about the history of science, how arrogance pays. Being wimpy doesn't get you anywhere in science. And it's okay to get things wrong. So long as you don't publish something that's wrong. It's okay to get it wrong nine out of ten times.

ROBERT GREENE

Einstein said he only knew that he was on the right track if his wastebasket was full. All the things he threw out.

VILAYANUR S. RAMACHANDRAN

Exactly. People don't see nine out of ten things I throw out. But at the same time, people often say you must work your butt off. I think we talked about this.

ROBERT GREENE

You're more of the aristocratic approach. But that's okay. But I still maintain it comes from a lot of hard work.

VILAYANUR S. RAMACHANDRAN

Yeah. There's a lot of incubation and obsession. Here's the really important thing about intuition and scientific discovery or any creative endeavor. You have to be obsessed. It has to consume you. You have to be passionate. And yet, it has to be playful. So this is a curious oxymoron.

ROBERT GREENE

There was a student of Freud named Jones. I'll send the article to you. He says exactly what you're saying right now.

VILAYANUR S. RAMACHANDRAN

Really? But how little it's applied to science.

ROBERT GREENE

He applies it completely to science.

VILAYANUR S. RAMACHANDRAN

Oh, to science.

ROBERT GREENE

All the greatest discoveries have a mix of a child naiveté and skepticism at the same time.

VILAYANUR S. RAMACHANDRAN

Well, that's slightly different. Similar. How is it different? Maybe it's not. Okay. Not skepticism. I was talking about obsession. So obsession and perfectionism and tenacity and being consumed by it, and yet being detached. So like Indian philosophy, participating in life would be like a lotus flower, immersed in water and yet not be consumed in materialism. So the same thing with love affairs. You can be consumed. In fact, you have to be consumed, you have to be obsessed. The minute you get obsessive, not detached and playful . . . if you're playful and aloof, that actually works better.

ROBERT GREENE

That's very interesting. Kind of what I'm trying to get at, at the end of my book. But you're putting it in a different way. I'm going to have to credit you with this.

VILAYANUR S. RAMACHANDRAN

Sure.

ROBERT GREENE

Because a lot of what I'm trying to talk about is the kind of knowledge that comes from participating very deeply in something, like the lotus idea. The kind of knowledge that you get. But at the same time, if you're completely inside, you don't have the distance to think about it. So how I can explain those two things together [inaudible 19:45] expressing these ideas. I think you've come up with an interesting way of thinking about it.

VILAYANUR S. RAMACHANDRAN

It's not so much skepticism versus . . .

ROBERT GREENE

No, I know. You didn't use the word skepticism.

VILAYANUR S. RAMACHANDRAN

People usually think about obsessive compulsive as antithetical to playful. But in fact, you can develop that attitude of mind in research or courtship or many of these things.

ROBERT GREENE

Well let's say you have a childlike sense of wonder and playfulness, and you wonder about something. In order to find out whether it's true or not, you then have to become obsessive and study it very hard or you're never going to figure it out. So there will be people who are childlike but never go to the point of doing the detail. So that combination is unusual and what makes a great scientist or even an artist.

VILAYANUR S. RAMACHANDRAN

Yeah, maybe. I wouldn't associate playfulness with art, but maybe it is a component.

ROBERT GREENE

You wouldn't associate playfulness with art?

VILAYANUR S. RAMACHANDRAN

I haven't thought about it in detail. The other thing, by the way, is the ability to grasp metaphor.

ROBERT GREENE

Grasp what?

VILAYANUR S. RAMACHANDRAN

Grasp analogy or metaphor. It's related to what we were saying earlier about creativity. Intuition. I was saying linking seemingly unrelated things, but not random links. Sometimes it's metaphorical links, like the double helix. The complementarity between offspring and parent. That metaphor, grasping that gave birth to modern biology. So being able to see analogy, unexpected analogy. It's true in literature. You know, as a writer, it's true [inaudible 21:25]. And some people may have an inkling of it, but they're not bold enough to say, let me push that analogy. Suppose Crick and Watson had said, "Oh, you know the complementarity. Maybe that's why pigs give birth to pigs." It's idiotic. It's two bloody molecules. What does that have to do with pigs? They were willing to push the analogy forward. So that's another . . .

ROBERT GREENE

And also that's boldness.

VILAYANUR S. RAMACHANDRAN

And boldness. Yeah. So boldness, seeing analogies, grasping them, looking constantly for analogies, making unexpected links. They're not necessarily analogies, but just links. And then playfulness and obsession combined.

ROBERT GREENE

Okay. We've got it now.

VILAYANUR S. RAMACHANDRAN

We've got it.

ROBERT GREENE

I've got to go write this. Thinking about an artist, a lot of people what messes them up is they will have an interesting idea, playful, but they don't know how to execute it. In the execution of your idea, you have to be very compulsive and obsessive. And it's very boring in a way, working on creating a movie or a book. So it's very much [inaudible 22:35] generalize this to all kind of creative processes.

VILAYANUR S. RAMACHANDRAN

That's correct. Certainly in the literature. I don't think there's an obsessive component in literature. I don't think Shakespeare was obsessing over when he said, "Tomorrow, tomorrow and tomorrow."

ROBERT GREENE

But I think you do. I think you'd be wrong there. It's like one little point in one of your books where I disagree.

VILAYANUR S. RAMACHANDRAN

Yeah, that's fine.

ROBERT GREENE

You were talking about Mozart, and it was about idiot savants.

VILAYANUR S. RAMACHANDRAN

Mozart's just trying different things randomly in his head. That's what I said.

ROBERT GREENE

He wasn't.

VILAYANUR S. RAMACHANDRAN

He was not. I say this one claim about some artists. They just practice, practice, practice,

and they get very good at something. And I dispute that, and I say, it doesn't explain why one guy, practice, practice and nothing happens. And Mozart, it's just a sudden efflorescence of amazing talent.

ROBERT GREENE

Yeah, but they are interesting, very [inaudible 23:29] about why Mozart . . . there are ways of explaining Mozart. If you ever want to read them, I'll send you . . .

VILAYANUR S. RAMACHANDRAN

Or you can just give me references.

ROBERT GREENE

I'll give you references. I forget that woman's name. She's a cognitive scientist who wrote a very interesting article, Margaret Boden. First of all, probably when he was in his mother's womb, he was hearing music. People were singing at him. From the moment he was born, his father, he was surrounded with music. It was just in him constantly. And at the age of three, he was absorbing vast amounts of patterns. They have the thing

where people are really brilliant in chess. The amount of patterns that you learn early on and internalize it. Then all of a sudden, you know, after seeing the chess board, all kinds of possibilities open up. I'm not doing a great job.

VILAYANUR S. RAMACHANDRAN

No, no, no. It's constant exposure to the material, the subject matter.

ROBERT GREENE

And the amount of associations you have. So when Mozart was . . . first of all, Mozart didn't actually write what was considered a good symphony until he was about 16. But his father was touring him all around Europe as kind of a showpiece, like a clown in a way. So he'd be in Italy. In Italy, he'd learn all of the new Italian styles. Then he was in England, and he learned all about Handel and then he was in France. He absorbed so many styles that he was able to create all these novel kinds of associations and forms that no one had ever done before, because he knew

the music of eight different countries and different styles. There are ways of explaining him, but I can't remember my original point. Also Shakespeare, I think that there's more method behind people like Shakespeare or Mozart than you think. To write a play like that, all of those plays took an incredible amount of work and detail, and people have shown that there are very few repetitions or mistakes in the course of his plays, where he will have forgotten that somebody said this, and then in the fifth act . . . in other words, they're very intricate and they're very elaborate plays, the construction of them.

VILAYANUR S. RAMACHANDRAN

Yeah, I see what you're saying.

ROBERT GREENE

The ideas that he had phrases, like "tomorrow and tomorrow and tomorrow," where did they come from. We don't know. But the overall construction of the play requires . . .

VILAYANUR S. RAMACHANDRAN

Yeah. What about something like one line? I was leaving my mother when she was old, and every time I left, I sort of felt, you know, will I see her again? Shakespeare says it beautifully. He says, "In each parting, you see the image of death." You can sit here, toss around ideas, try various combinations.

ROBERT GREENE

There's no way I could explain that. I wouldn't want to.

VILAYANUR S. RAMACHANDRAN

So similarly, "When we are born, we cry because we have come to this great stage of fools." I'm not saying anything mystical. Obviously there's an answer to that we don't know. And the savant syndrome, there are two camps. Those who say they just practice, practice, practice. Why in heavens name should a retard sit down and practice prime numbers? They never explain. Why prime numbers of all things? I think it's telling something very fundamental about

operations of the mind. Without going into any mysticism, we don't know yet why it happens. To say that they just memorize prime numbers is ludicrous.

ROBERT GREENE

So that was an anomaly that you were attracted to, idiot savants.

VILAYANUR S. RAMACHANDRAN

I didn't make any headway in understanding. Shall we walk back? But there is an experiment which I tried on one of these so-called anomalous savants. People remember vast arrays of names and numbers [inaudible 27:35]. All of us are pilgrims. We do a lot of editing and abbreviation of [inaudible 27:50]. Otherwise [inaudible 27:53] explosion.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

So there's a process happening in the brain. That editing process [inaudible 27:57] empowers you. [inaudible 27:59]. At the

same time, they are better at remembering irrelevant detail.

ROBERT GREENE

Is it because they're also . . .

VILAYANUR S. RAMACHANDRAN

The idea is that they lack the [inaudible 28:08] and the editing process.

ROBERT GREENE

Oh, I see.

VILAYANUR S. RAMACHANDRAN

So, there's more access to the trivial details, which you can't remember even if you tried. That's a very vague example. But how do you test it? Here's a way which I thought of. There's a very interesting illusion called the . . . I don't know the name of the illusion. I'll give you a bunch of words. Ice, snowman, snowshoes, ice cream, refrigerator, ice pick. Okay. Review that list. I'm going to ask you to remember it. Right? I won't do the experiment on you. But ten minutes later, I give you five words from the list, and then one word that's about ice that's not on the list,

like snowman. That was not on the list. You remember that. Was it on the list?

ROBERT GREENE

I think you did say that.

VILAYANUR S. RAMACHANDRAN

Okay. See, now I'm getting the phenomenon.

ROBERT GREENE

Let's say snowball.

VILAYANUR S. RAMACHANDRAN

Snowball. So then five words like chair, table isn't on the list, couldn't possibly be on the list. They're all related to ice and snow. But then five words that are on the list and one word that is not on the list but related. Most people get that wrong. They say, "I'm sure I saw that." It's because the brain is creating and editing semantic categories of what you learned. It's not slavishly adhering to the details.

Now, what if you tried it on one of these guys? If it's really true they're not editing, they should actually be better, they should be immune to the [inaudible 29:39]. Exactly

what we found. One of the savants we visited. We never pursued it, because it's hard to find them. But I wrote a letter to Scientific American. It was published, but I mentioned this, because they had an article on savants. I mentioned it in the letter. [inaudible 29:57]. Now if we could get a whole larger group of savants.

ROBERT GREENE

You have or you want to?

VILAYANUR S. RAMACHANDRAN

No, I haven't. I want to.

ROBERT GREENE

That would be fun.

VILAYANUR S. RAMACHANDRAN

Oh, that's the other thing, by the way. Here is a very important principle in science. I don't know how related it is to you. Are you recording this?

ROBERT GREENE

Yes, I am.

VILAYANUR S. RAMACHANDRAN

Okay, good. A very important [inaudible 30:15].

ROBERT GREENE

I know, I keep [inaudible 30:23].

VILAYANUR S. RAMACHANDRAN

What were we . . . we were discussing science. Oh yeah. Sorry.

ROBERT GREENE

Savants . . .

VILAYANUR S. RAMACHANDRAN

I know what I was going to say.

ROBERT GREENE

Practice, practice, practice.

VILAYANUR S. RAMACHANDRAN

I was going to say what's called crucial experiment to test an idea. It may seem obvious, but it's not. It's obvious to state it, but people don't implement. I'll give you a good example. Like this example I just told you, to test the vague notion that savants are just better at remembering details because they don't do conceptual editing. Now how

do you test that? You can say, well let me give them all the details and see how well they can remember compared to normal people. You can do conceptual experiments compared to normal people. However many people you test and however many conceptual and literal information, you get [inaudible 31:21]. It's never really clear and it gets mired in statistics and all of that. But this experiment clearly distinguishes between the alternatives. If it's really an editing process, he should actually be better at this task than normal people. He should be immune from the illusion.

ROBERT GREENE

Did you actually do the test?

VILAYANUR S. RAMACHANDRAN

I did do the test.

ROBERT GREENE

And he was . . .

VILAYANUR S. RAMACHANDRAN

And he was better.

ROBERT GREENE

But how do you know with just one person?

VILAYANUR S. RAMACHANDRAN

Yeah. I don't know. That's why we need to do it on more people. But I'm saying the idea is sexy, right?

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

So to give you an example of this, again pardon the lofty comparison. I tell all my students this. Not enough of this is done with students by professors. Newton's scientific experiment showing white light is made up of seven colors. How did he do that? How did he prove that? Take a guess.

ROBERT GREENE

Are you asking me?

VILAYANUR S. RAMACHANDRAN

Yeah. I mean, we all learn it in school. He put a prism . . .

ROBERT GREENE

I was about to say prism. You didn't give me enough time. I remember.

VILAYANUR S. RAMACHANDRAN

He had a little beam of white light going through the window, he puts a prism there, and it refracts it, and he gets seven colors. And he said, "These colors, it looks white, but it's made up of these seven wavelengths." Different wavelengths, different colors, which are refracted to different extents. Now immediately, people pounced on this and said, "We knew this already. That's why we have chandeliers. They produce multiple colors. This is because of impurities in the glass." So then Newton said, "No, it's not due to impurities. It's because it's made up of seven colors." Then critics all over Europe started polishing the glass, making purer versions of glass. Remember, this was 16th, 17th century.

ROBERT GREENE

That would be like the 1680s.

VILAYANUR S. RAMACHANDRAN

1680s, yeah. So they're trying to purify the glass to remove impurities, but however

much they purified it, it was still splitting into the colors. And people said, "Well, you can never get it completely pure." And it took years to make this . . . in fact, Newton said, "I'll solve this in about two hours."

He went and took another prism and put it upside down, and the colors combine and become white again. And he said if it was impurities in the glass, it would be even more colorful. So that's where the word crucial experiment comes from, Newton. So you can do hundreds of experiments making it more and more perfect, refine the technique to see if it was really impurities. Or you can do one crucial experiment to test the idea one way or the other and put it beyond any doubt that this is what's going on. So, I always tell students, somebody's claimed a theory which is vague. Find out the one experiment that crucially tests that idea, and that will tell you the answer without having to do hundreds of experiments . . .

ROBERT GREENE

Can you give me another example? Can you give me an example of one of your crucial experiments?

VILAYANUR S. RAMACHANDRAN

Yes, I can. I haven't done it yet. In fact, I'm going to tell Elizabeth as soon as we go into the lab. Hypnosis is the orphan child of psychology. Half the world believes it's real. Half the world, scientific world, believes it's a flaky phenomenon. In other words, everybody believes it's real in the sense that magicians demonstrate it. But one half of the community believes in an extreme form of suggestion. There's nothing very bizarre or anything. It's just like we all do some role playing when you go sit in the theater. Temporarily, you suspend reality. You get into that person's shoes. So somebody says, do this. You do that. It's just an extreme form of suggestibility where you've surrendered yourself momentarily to that person. How do you distinguish between these two? They're

so close to the same, genuine hypnosis versus just suggestibility. It's just too vague a distinction.

ROBERT GREENE

What would genuine hypnosis be? Okay.

VILAYANUR S. RAMACHANDRAN

We show go to the lab remember. I'm going to show you an interesting illusion. That illusion will help us answer the question of genuine hypnosis or not. This has been a problem for 100 years, to show that it's genuine. I'm kind of overstating it.

ROBERT GREENE

You're going to come up with a crucial experiment that's going to . . .

VILAYANUR S. RAMACHANDRAN

I've already come up with a crucial experiment.

ROBERT GREENE

You're just waiting to do it?

VILAYANUR S. RAMACHANDRAN

To do it.

ROBERT GREENE

I just want to get my regular glasses from the car.

VILAYANUR S. RAMACHANDRAN

Sure.

ROBERT GREENE

And you're going to show me the experiment?

VILAYANUR S. RAMACHANDRAN

I'm going to show you the illusion first, and then I can explain the crucial experiment.

ROBERT GREENE

This would be . . . when are you going to do this?

VILAYANUR S. RAMACHANDRAN

Well, as soon as you find a good hypnotist. You just jogged my memory.

ROBERT GREENE

Want me to help you find a good hypnotist?

VILAYANUR S. RAMACHANDRAN

Yeah, sure. That would be good.

ROBERT GREENE

I know somebody who could probably do that.

VILAYANUR S. RAMACHANDRAN

I mean you can do all kinds of things like that. Let's ask them afterwards, just debrief them. Were you really in a different mental state? Was it really a suggestion thing? None of that is going to give you an answer.

ROBERT GREENE

You're not going to get anywhere.

VILAYANUR S. RAMACHANDRAN

You'll never get anywhere.

ROBERT GREENE

So now I'm very curious.

VILAYANUR S. RAMACHANDRAN

It may not work. It's a long shot. That's true of all of it.

ROBERT GREENE

But it's yet another one of your very low tech . . .

VILAYANUR S. RAMACHANDRAN

Very low tech. It would take a couple of hours to do the experiment.

ROBERT GREENE

But you need a really good, a bona fide hypnotist.

VILAYANUR S. RAMACHANDRAN

You need a very good bona fide hypnotist who can make somebody think that one object is bigger than the other.

ROBERT GREENE

That's a common trick, isn't it? I don't know, maybe not.

VILAYANUR S. RAMACHANDRAN

Maybe not.

ROBERT GREENE

Well what do you . . .

VILAYANUR S. RAMACHANDRAN

You have to [inaudible 37:16]. Let's go back to our discussion.

ROBERT GREENE

So, I'm talking about . . .

VILAYANUR S. RAMACHANDRAN

[inaudible 37:26] That's a skill. People who have the ability to design an experiment that critically and directly tests an idea, rather

than approach it tangentially and vaguely, which is what most people do.

ROBERT GREENE

One thing I want to talk about is speculation. Now you go, you drift off into things about art and religion.

VILAYANUR S. RAMACHANDRAN

Religion, I think you can just rule out. The only thing I ever published was one paragraph in a scientific setting.

ROBERT GREENE

You wrote a whole chapter on the limbic . . .

VILAYANUR S. RAMACHANDRAN

Yes, in the book. Yes. But I make it clear that it may be . . . a lot of people have speculated on the evolutionary basis of religion. Here we're saying that people with seizures in a specific region of the brain have more intense religious experiences. We didn't take it any further than that, other than a hunch.

ROBERT GREENE

Yeah, but even as you said, people can have a false speculation. And now you open up the idea, and people can start discussing it.

VILAYANUR S. RAMACHANDRAN

I have more of that view about aesthetics work, because there are some . . . it's not just one hot idea. There's a lot of meat in it. This is the principle of art. This is another principle. This is another principle. If you have two principles that are contradictory to each other, then science often progresses by resolving a pattern of contradiction. So, one principle would be the principle of hyperbole and excess contradicts another principle, the principle of understatement in art or in literature for that matter. How come this contraction . . . they're both universal laws of art. How can they contradict each other? Here's an explanation of why. So there's a lot of thinking there. It may all be wrong, which I'm the first to admit. But it gets people

thinking. The thing about God and the limbic system, it's just an idea. That's all it is.

ROBERT GREENE

It got me thinking. By the way, are you familiar with Dostoevsky?

VILAYANUR S. RAMACHANDRAN

Yes. I'm sure he had it.

ROBERT GREENE

Oh, you do? That's what I was going to ask you.

VILAYANUR S. RAMACHANDRAN

Saint Paul had it. Muhammad had it.

ROBERT GREENE

He was an epileptic, Dostoevsky.

VILAYANUR S. RAMACHANDRAN

Yes, he was.

ROBERT GREENE

And he had some intense visions that he's written about that are absolutely astonishing to read.

VILAYANUR S. RAMACHANDRAN

I should go back and read. I haven't . . .

ROBERT GREENE

Well, okay. So you're speculating on aesthetics and trying to resolve that contradiction.

VILAYANUR S. RAMACHANDRAN

Yeah, that's a better . . .

ROBERT GREENE

Where did that come from?

VILAYANUR S. RAMACHANDRAN

Well, that came from . . .

ROBERT GREENE

Why are you doing this, in other words?

VILAYANUR S. RAMACHANDRAN

Well, it came from natural curious. He was an artist. He just liked language [inaudible 40:00]. Everybody studies language. There's a whole linguistics department here. Show me one neuroaesthetics department in the entire world. Aesthetics is as much a part of the human experience as linguistics. But people just follow what's already there. I said maybe you can come up with a neurological theory of science. And I got thinking about this, because I took a course from an art historian

here. Here's one of my grad students. Hi,
Laura.

LAURA

Hi, I'm just waiting for a subject.

VILAYANUR S. RAMACHANDRAN

Oh, you are?

LAURA

Yeah.

VILAYANUR S. RAMACHANDRAN

This is Laura who is one of my grad students.

LAURA

Hi.

ROBERT GREENE

Hello. Nice to meet you.

VILAYANUR S. RAMACHANDRAN

Hi.

MAN 1

Hi, how are you doing?

VILAYANUR S. RAMACHANDRAN

Very well. We're just going to go out front.

Oh, you can show him the [inaudible 40:43].

This is what we were talking about.

LAURA
Okay.

VILAYANUR S. RAMACHANDRAN

Or no, you have to wait for your subject. It's
okay. We'll see you around.

LAURA

I do. We're going to do a GSR.

VILAYANUR S. RAMACHANDRAN

Yeah. I'll see you a little bit later upstairs.

LAURA

I'll be upstairs.

ROBERT GREENE

So, a neuroaesthetics department
you're thinking . . .

VILAYANUR S. RAMACHANDRAN

No, I'm saying that to make a comparison.
There are hundreds, maybe thousands of
linguistics, psycholinguistics departments
[inaudible 41:07]

ROBERT GREENE

You said you saw somebody, or you went to a
lecture or you read something.

VILAYANUR S. RAMACHANDRAN

There was a woman named Julia Kindy,
an art historian. Oh, okay. They're actually
working on it right now. [inaudible 41:25] Do
you have the simplest version of the [inaudible
41:35]? I just want to demonstrate without
telling him what it is. Just one of the small
ones.

Elizabeth: I can grab one if you want. Let
me see which ones you could . . .

VILAYANUR S. RAMACHANDRAN

Without giving the name away. And I have a
new experiment which you should do.

Elizabeth: Oh, excellent. Let me just see
which ones I need to grab.

ROBERT GREENE

That's an intriguing title.

VILAYANUR S. RAMACHANDRAN

Which one?

ROBERT GREENE

Reincarnation in Biology.

VILAYANUR S. RAMACHANDRAN

Oh yeah. There's a professor here named Smythies who was in our lab, who is 87 years old, and he started the whole drug movement at Berkeley in the '60s.

ROBERT GREENE

What's his name?

VILAYANUR S. RAMACHANDRAN

John Smythies. He passed the drug mescaline onto Aldous Huxley. He's a neuropsychiatrist, and he writes books and all that. He has some interest in the paranormal and all of that. But I don't think reincarnation is paranormal, but whatever. Philosophical issues.

ROBERT GREENE

What are we doing?

VILAYANUR S. RAMACHANDRAN

I'm going to show you the illusion.

ROBERT GREENE

Should I be taping?

VILAYANUR S. RAMACHANDRAN

Yeah, you can tape it.

ROBERT GREENE

Are these all your things?

VILAYANUR S. RAMACHANDRAN

A lot of them are Dr. Smythies' books. Those are all my things. That's *Voyage of the Beagle*.

ROBERT GREENE

That is the actual Beagle?

VILAYANUR S. RAMACHANDRAN

Yeah, it's a replica.

ROBERT GREENE

I mean a replica. Okay.

VILAYANUR S. RAMACHANDRAN

Hold these two and tell me which is heavier. You have to look at them.

ROBERT GREENE

I have to look at them? Which is heavier?

VILAYANUR S. RAMACHANDRAN

Yeah. Get those two metal things. Are they here?

ELIZABETH

Oh, they're downstairs. I can grab them.

VILAYANUR S. RAMACHANDRAN

Can you go grab them?

ELIZABETH

Yeah.

VILAYANUR S. RAMACHANDRAN

You want to look at them. You don't want to look to the side. You need to look at them. Otherwise it doesn't work.

ROBERT GREENE

I need to look at them?

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

Why look at them?

VILAYANUR S. RAMACHANDRAN

Well, I can tell you later, when we weigh them.

ROBERT GREENE

I look at them first and then weigh them.

VILAYANUR S. RAMACHANDRAN

Well, no. You just do it like this. Watch. That's all.

ROBERT GREENE

Oh, okay.

VILAYANUR S. RAMACHANDRAN

You were doing this. You don't want to do that.

ROBERT GREENE

Just do this?

VILAYANUR S. RAMACHANDRAN

Yeah, just look at them.

ROBERT GREENE

And then say which weighs more?

VILAYANUR S. RAMACHANDRAN

Yeah, which weighs more.

ROBERT GREENE

Well, definitely this one feels like it weighs more.

VILAYANUR S. RAMACHANDRAN

Yeah. Okay. That's the illusion. I'll show you a better version. [inaudible 44:05] It's called the size-weight illusion. They're completely identical in weight. When the brain reaches and grabs them, it expects this to be much lighter, because it's smaller. And then, but it actually is the same weight, so it says it must be heavier. So that's called the size-

weight illusion. Now what's this got to do with hypnosis?

ROBERT GREENE

Well, could it also be that it's more compact, and it makes it feel heavier?

VILAYANUR S. RAMACHANDRAN

That's one way of describing it. Why would a more compact thing feel heavier?

So the brain, I'm asking you to judge the weight, not the density. So you go, the brain automatically says, "Oh, this must be much lighter. Oh my god, it's not lighter. It must actually be heavier." It kind of overdoes it, and you feel it's heavier. Now, it's a very striking illusion, because you can measure it. It's about 30%, the difference. In other words, you need to add 30% more lead pellets to this one to make it the same weight as that one.

ROBERT GREENE

To make it seem like it's the same weight.

VILAYANUR S. RAMACHANDRAN

To make it seem like it's the same weight. So that's the way you measure it. Now what

you do . . . hypnosis, the problem is, is it suggestibility or is it some true generally different brain state. Okay. So you hypnotize a guy, have two identical ones like this, and tell him this is much smaller. Have a green one and a red one. Say the red one is much smaller. I want you to see it as much smaller. "Do you see it's smaller?" He says, "Oh yeah, I feel it seems smaller."

ROBERT GREENE

But it really isn't.

VILAYANUR S. RAMACHANDRAN

It really isn't. "Now, I want you to pick them up. Which one is heavier?" Now if it's just expectation, and if it's just suggestion, he should say the bigger one is heavier. Right? Because that's your expectation. That's a suggestion I planted in your brain. This is smaller. If it's some generally different neural process going on in your brain, you should suddenly say, "Oh my god, the little one feels heavier." So you get the same illusion with a hypnotically induced size difference rather

than an actual physical size difference. Does that make sense?

ROBERT GREENE

Okay. So, the two are the same, they weigh the same. One's a different color.

VILAYANUR S. RAMACHANDRAN

Let's just label it. You can call it A and B.

ROBERT GREENE

He's saying that . . .

VILAYANUR S. RAMACHANDRAN

This is bigger one.

ROBERT GREENE

That B . . . wow.

VILAYANUR S. RAMACHANDRAN

This [inaudible 46:12].

Elizabeth: Yeah.

ROBERT GREENE

Well, now that I know.

VILAYANUR S. RAMACHANDRAN

Yeah, not that you know.

ROBERT GREENE

You said that they're equal.

VILAYANUR S. RAMACHANDRAN

So what you do is you give the guy these two like this. Now these are different unfortunately, but two [inaudible 46:25]. And then make him think that one is much smaller. So there's another one like this, make him think it's much smaller, let's say half the size. And then ask him to raise them. If he's just going by suggestion, then he should say, that's lighter, because it's smaller. If it's changing his brain state in some way, then he should have the counterintuitive feeling that the smaller one is actually heavier, and he should express surprise like you just did. Does that make sense?

ROBERT GREENE

Mm-hmm.

VILAYANUR S. RAMACHANDRAN

So that tells you whether hypnosis is simply a result of suggestion, or is it actually changing your brain state in some way. So we don't know where this illusion occurs in the brain. It could be in the cerebellum, it could be in

the parietal lobe, somewhere in the brain where your brain is involved in measuring weight and things like that, judging weight. If it's some high level suggestibility thing, hypnosis. If I say, "Pretend this is much smaller," and you go pick them up, you should either say, "Oh, they're the same weight," or you should say, "He's telling me this is smaller. This must weigh lighter."

ROBERT GREENE

Now, when you get a hypnotist, and we find a hypnotist to do this, are you going to tell him what this is about, or you're simply going to have him . . .

VILAYANUR S. RAMACHANDRAN

No, he doesn't need to . . . I'll come and ask them. He doesn't need to be here. I mean, he can hypnotize them and leave the room.

ROBERT GREENE

But does he need to know . . .

VILAYANUR S. RAMACHANDRAN

The purpose of the experiment. No, it's better that he doesn't.

ROBERT GREENE

That's what I'm asking.

VILAYANUR S. RAMACHANDRAN

It's better than he doesn't. He just has to make the guy see that smaller. That's the only requirement.

ROBERT GREENE

And is that something that hypnotists can do?

VILAYANUR S. RAMACHANDRAN

We've asked a couple. They said they can do it, but you need to really hypnotize the subjects. So you need to go through about 20 or 30 to find 1 or 2.

ROBERT GREENE

Because there are some people who are more suggestible.

VILAYANUR S. RAMACHANDRAN

You know hypnotists, right?

ELIZABETH

Mm-hmm.

VILAYANUR S. RAMACHANDRAN

Her dad's very connected to magicians and hypnotists. This is Elizabeth, by the way. You just met.

ROBERT GREENE

Hi, Elizabeth. We met. Nice to meet you.

ELIZABETH

Nice to meet you.

ROBERT GREENE

There are all sorts of hypnotists you'll be able to talk to.

VILAYANUR S. RAMACHANDRAN

Let me tell you another experiment. This is one example. Another experiment is . . . do you have a Stroop interference card?

ELIZABETH

There was one. I could pull it up on my computer.

VILAYANUR S. RAMACHANDRAN

Okay. But I don't know if the logic of that is clear.

ROBERT GREENE

It's on the computer?

VILAYANUR S. RAMACHANDRAN

No, no. I'm talking about the weight thing, the size-weight thing.

ROBERT GREENE

It's very clear to me.

VILAYANUR S. RAMACHANDRAN

Okay. Good.

ROBERT GREENE

Yeah.

VILAYANUR S. RAMACHANDRAN

The words, right. Excellent. Read them aloud quickly. Read out the words, ignore the colors.

ROBERT GREENE

Red, blue, green, red, green blue, red, blue, green, red, brown, blue, green, blue, brown, brown, blue, red, red, blue, red.

VILAYANUR S. RAMACHANDRAN

You're reading the words.

ROBERT GREENE

What do you want me to do?

VILAYANUR S. RAMACHANDRAN

Just now what you did was read the words, right?

ROBERT GREENE

Yeah. What did you want me to do?

VILAYANUR S. RAMACHANDRAN

Now name the colors. Name the colors, ignore the word.

ROBERT GREENE

Oh. Name the . . . oh, I see. Green, red, blue, red, brown, green, blue, brown, red. I'm slowing down.

VILAYANUR S. RAMACHANDRAN

It takes about three times as much time.

ROBERT GREENE

Yes.

VILAYANUR S. RAMACHANDRAN

Even though if anything, it should be easier, because it's rattling off the colors. It's because the word representation has evolved in the brain as interfering with the color naming. Okay. So now, what I'm going to do is I'm going to hypnotize you. And regardless of

whether hypnosis is a real phenomenon or not, I'm going to hypnotize you and say it's all in Chinese. Name the colors. And you think they're all Chinese and illegible, suggestibility should make no difference. You still find it hard to read them. But if it's generally changing your brain state and making you blind to those words, you should be able to read them much more fast than normal people. Just as fast as you read earlier. Is that clear, the logic?

ROBERT GREENE

If I think it's Chinese, and you're asking me just to read the colors?

VILAYANUR S. RAMACHANDRAN

You just read the colors.

ROBERT GREENE

And that would be fast.

VILAYANUR S. RAMACHANDRAN

That would be fast. Exactly. Because I've genuinely made you blind to English and made you see it as Chinese. But if it's just suggestibility, and you say, "Oh,

I can't read it," the message is still going through your brain and interfering. So it's another experiment. So the thing of getting hypnotized, even if I asked somebody to hang two identical weights, making the guy, telling the guy that one's smaller. Hypnotize him to see it smaller, and then ask him to raise them and see if the one that looks smaller to him because of hypnosis weighs heavier or weighs lighter. With suggestion, it should weigh lighter. If it's actual genuine hypnotic state, it should weigh heavier. Here's the argument. Under suggestion, there's no reason why he would think the smaller one would actually be heavier. He can't fake that. Nobody knows about the illusion unless he's a psychologist.

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

I was explaining to Robert about crucial experiments.

ROBERT GREENE

When are we going to do this?

VILAYANUR S. RAMACHANDRAN

As soon as you refer a hypnotist to us or . . .

Elizabeth: I have . . . yeah.

VILAYANUR S. RAMACHANDRAN

You need a superb hypnotist.

ROBERT GREENE

I have a friend who might be able to do that. This wouldn't be from me personally, but he knows hypnotists. He's a writer. I'll ask him. But it must be a first rate hypnotist.

VILAYANUR S. RAMACHANDRAN

First rate hypnotist, yeah.

ROBERT GREENE

But I don't want to explain the experiment to him. That's why I'm asking. The hypnotist should be in the dark about what you're doing.

VILAYANUR S. RAMACHANDRAN

That's better. I think that's better.

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

Because he may unconsciously cue the . . .

ROBERT GREENE

Okay.

VILAYANUR S. RAMACHANDRAN

But if he's a good hypnotist, he shouldn't be unconsciously cuing them, but still, you don't want to . . .

ROBERT GREENE

How much longer are you here for?

ELIZABETH

A long time.

ROBERT GREENE

At some point, we have to go up there. Seems to be still working. God, I hope it's still working. You talk about aha moments in art.

VILAYANUR S. RAMACHANDRAN

In a different way. There is at every stage of perceptual problem solving or perceptual processing a little aha signal. So they call art visual foreplay before the climax of optic recognition.

ROBERT GREENE

And it's a pleasure, it's related to pleasure.

VILAYANUR S. RAMACHANDRAN

Yeah.

ROBERT GREENE

Do you think it has any relationship to science in the discoveries itself. Every scientist sort of talks about that eureka or aha moment.

VILAYANUR S. RAMACHANDRAN

Yeah. Well, again, it's an analogy. The question is, how deep is the analogy. When you look at a cube, an ambiguous cube or a mother face figure, one of those ambiguous visual pictures. Suddenly it switches, and then you say, "Aha,, I can now see what he's talking about. There's a mother there." So that aha, looking at something from a novel perspective and yet it makes sense, is common to science and perception. Okay. But as I said, the aha signal might be similar according to the limbic structures of the brain, the emotion centers. But what do you do with it next? Kuhn talks about this, too. He talks about this Einsteinian duck rabbit thing.

ROBERT GREENE

Some people have tried to link discoveries in science with something aesthetic.

VILAYANUR S. RAMACHANDRAN

That's a good point. That's a good point.

ROBERT GREENE

And mathematicians in particular always say that their great discoveries feel right, feel beautiful. They don't know why that is. There's like something aesthetically right about it.

VILAYANUR S. RAMACHANDRAN

Right. A lot of the time, it's true. I think there's something about elegance and simplicity that's aesthetically pleasing. Why is that? It's because it's a more economically description of a larger number. It's Occam's razor. A large number of heterogeneous, unrelated things are more economically described by a much simpler set of observations or set of principles. For some reason, the brain finds that beautiful, because for partly survival. If you can explain a

wider range of things in terms of a smaller number of causes . . . I'm just thinking aloud here. Maybe it's useful from an evolutionary standpoint. Certainly, if you're a diagnostician, you want to understand diabetes. You've got eye changes, you've got gangrene, you've got blood vessel changes, you've got heart, coronary, kidney changes. All of these things going on. The root cause is change in insulin receptor, or change in insulin carbohydrate metabolism. When you find that, then it allows you to cure it. So maybe this has all evolved, the ability, the tendency or the desire to attribute to a smaller number of causes a larger range of phenomenon. If I say 1 symptom is caused by 19 causes, it's not aesthetically pleasing. So maybe that's how it originated in illusion.

ROBERT GREENE

I'm just speculating here, but if it is related somehow to some kind of pleasure, then we're more likely to go through the process,

and therefore we're going to make these discoveries.

VILAYANUR S. RAMACHANDRAN

Right.

ROBERT GREENE

Do you see where I'm going with that?

VILAYANUR S. RAMACHANDRAN

Yeah. But then it still leaves unanswered why some people are very creative and others are not. But they may just be intelligence. There's heterogeneity in the population.

ROBERT GREENE

I'm going to get to that theory, my theory, next time I see you, because that's the whole last part of the book. I have a theory about it.

VILAYANUR S. RAMACHANDRAN

Oh, okay. I'd love to hear about it.

ROBERT GREENE

This time we're talking about you, and then the next time I come, I want to talk about some general ideas and see what you think about them as a scientist.

VILAYANUR S. RAMACHANDRAN

So there's two. One is the economy of description, why that's beautiful, and simplicity and elegance. Like Shakespeare saying that one line, "When we're born, we cry because . . ." That to me speaks volumes, says much more than an entire tome written by an existential philosopher like Sartre or Camus or something like that. To me, that one line says it all. There's something about that. So Shakespeare talking about life in so many different passages of his. In one or two lines, he expresses some great truth about life that's even more true of life than saying life is a heart pumping blood and kidneys producing urine and all of that stuff. A more literal description.

ROBERT GREENE

I'm not going to go into it now, but my idea is that . . . and you talked about it a little bit when you were talking about the qualia and being translated and whether it's immediate. Do you know what I'm talking about? The

gist of my idea is that great art like that or something very beautiful creates an immediate reaction which you can't quite put into words. And it comes from people who have themselves had some kind of experience. So Shakespeare himself had some kind of very deep experience about it, and he's able to give that sense of immediacy through language which somebody else can't.

VILAYANUR S. RAMACHANDRAN

I see what you're saying.

ROBERT GREENE

And it creates kind of a shiver. Something really profound and real gives you a kind of almost scary feeling.

VILAYANUR S. RAMACHANDRAN

That's correct. Yeah.

ROBERT GREENE

And I'm trying to explain that. And I'm going to explain why artists and scientists would do that. But that's a taste of . . .

VILAYANUR S. RAMACHANDRAN

You're trying to get to the core of it, and that's very interesting.

ROBERT GREENE

Yeah. But we'll come to that next time.

VILAYANUR S. RAMACHANDRAN

Sure, sure.

ROBERT GREENE

Then that'll make you, entice you into having another time here, another session.

VILAYANUR S. RAMACHANDRAN

Yeah, I'd be happy to.

ROBERT GREENE

The thing I wanted to get at was this idea of seeing what other people miss.

VILAYANUR S. RAMACHANDRAN

It's staring at you.

ROBERT GREENE

It's staring at you in the face. So you had the thing with the . . . you talked about ulcers and the one man. And then there was the New York Times article about the syringe for patients with neglect.

VILAYANUR S. RAMACHANDRAN

Yes.

ROBERT GREENE

Why didn't anybody else see that? Why did you? It's so strange.

VILAYANUR S. RAMACHANDRAN

That one actually was not me. I think I make it clear in the book too, that it was an Italian. It was discovered by accident. They do water irrigation in the ear. I used it for a lot of novel purposes.

ROBERT GREENE

No, but you're seeing the article and then applying it to something else.

VILAYANUR S. RAMACHANDRAN

Yes, that's correct.

ROBERT GREENE

Nobody else did that.

VILAYANUR S. RAMACHANDRAN

No, nobody else did that.

ROBERT GREENE

So how is it that you're able to see that and other people can't?

VILAYANUR S. RAMACHANDRAN

Again, it's back to the same thing about boldness and sort of a willingness to entertain absurd possibilities. That's the same as boldness. A willingness to entertain absurd scenarios and possibilities. Let me tell you another example of something staring at you in the face. It's staring all of us right now in the face, and most people ignore it, including me because it's not my field. I asked people in the field, and they say we don't know. But I'll give you an example of this. It's been known for 100 years, several case reports, if somebody has high fever, cancer disappears. The guy has a sarcoma, which is a deadly cancer, stage one, stage two, stage three, and has a high fever for a couple of weeks. The cancer just regresses completely and he's cured. And it's not just one case. Since then it's been studied in other cases, and Cooley, a guy whose name is Cooley, actually injected pyrogenic substances and saw regression of

cancers in a substantial number of patients.

Have you heard of this?

ROBERT GREENE

No.

VILAYANUR S. RAMACHANDRAN

Why not? It's published in a reputable journal. In my view, it's just like macular degeneration. It's not part of mainstream oncology. Mainstream oncology, what they do is they take a drug, they test it, and it gives you one extra year. They'll say, five years, we'll extend it by six months. The drug costs \$300 a week. And I don't want to sound paranoid, but the drug companies have invested so heavily in this . . .

ROBERT GREENE

No, no. That's not paranoid.

VILAYANUR S. RAMACHANDRAN

And consequently, the scientists are heavily invested in it, because of all their funding. So you go tell an oncologist, I've told oncologists, "Why don't you go and explore this?"

ROBERT GREENE

There's no money.

VILAYANUR S. RAMACHANDRAN

There's just silence. They're in denial about it. About a week ago, I saw an oncologist, very, very famous oncologist. Not famous, but well known oncologist. And I said, "What about Cooley's treatment?" He said, "What about it?" I said, "Why aren't you guys pursuing it?" "Well, that's not what we study. We study . . ." "Why don't you study this?" "Because that's not what my company is all about. We're trying to develop new drugs." "You're trying to fight cancer, for god's sake, and here is something that is so trivial and obvious." Finally, I pushed him and I pushed him, and I said, "If you had cancer tomorrow, god forbid, would you go in for one of your drugs, or would you go for Cooley's. At least try out giving yourself malaria in a denatured malaria antigen. Very high fever, very uncomfortable for two weeks. Which one would you do?" He scratched his head, and

he said, "I would go for Cooley's." And I said, "You answered my question. Why is there no systematic work on this?"

ROBERT GREENE

You would think somebody would invest in it, because eventually, if it's true, you would make a lot of money off of it, and it would be . . .

VILAYANUR S. RAMACHANDRAN

No, unfortunately not.

ROBERT GREENE

You would not because, it's so low tech and it would put all the pharmaceutical companies out of business.

VILAYANUR S. RAMACHANDRAN

That's correct.

ROBERT GREENE

That's so sad.

VILAYANUR S. RAMACHANDRAN

It's so sad.

ROBERT GREENE

It's really depressing.

VILAYANUR S. RAMACHANDRAN

Now it's plausible if somebody tried it on a large scale, and then they found that only one out of ten it helped. So? Most of these drugs don't even help one out of ten. Right?

ROBERT GREENE

Yeah. Well, so when you saw the New York Times article, did it immediately strike you that you could . . . are these your parents, by the way?

VILAYANUR S. RAMACHANDRAN

Yeah, they're my parents.

ROBERT GREENE

Did you right away, it struck you right away, the possible application of this? The New York Times article about the syringe.

VILAYANUR S. RAMACHANDRAN

Yes. Oh no, wait a minute. That was about my work, the New York Times article.

ROBERT GREENE

No, I thought you said . . . maybe I have it wrong.

VILAYANUR S. RAMACHANDRAN

Yeah, it was my work that was reported in the *New York Times*.

ROBERT GREENE

You said that there was an article in the *New York Times* about the work with the syringe and the Italian.

VILAYANUR S. RAMACHANDRAN

No, it was in a professional journal. I'm almost sure of that.

ROBERT GREENE

Oh, it was in a professional journal.

VILAYANUR S. RAMACHANDRAN

If it was in the *New York Times*, people would have seen it. It was in a professional journal . . .

ROBERT GREENE

Oh, you said, why hasn't the *New York Times* written about it?

VILAYANUR S. RAMACHANDRAN

That's correct. That's correct.

ROBERT GREENE

All right. Now I get it.

VILAYANUR S. RAMACHANDRAN

It was published about a year ago. I learned about it in medical school 20 years ago, and then it was forgotten. But as recently as seven years ago, somebody replicated it. It's not that it hasn't been picked up. It's just not been picked up as much as it should be picked up.

ROBERT GREENE

Well get Mrs. Blakeslee or whatever her name is to . . .

VILAYANUR S. RAMACHANDRAN

I could try.

ROBERT GREENE

Do you read the science times section of the front page?

VILAYANUR S. RAMACHANDRAN

Yeah. Well, the problem is they go for new things. This is not entirely new. It's important and it's been ignored, but it's not new.

ROBERT GREENE

Not the science times. They'll report things that are just suddenly . . .

VILAYANUR S. RAMACHANDRAN

Really?

ROBERT GREENE

Yeah, I think so. Okay. So you saw that in a journal about the syringe.

VILAYANUR S. RAMACHANDRAN

Right.

ROBERT GREENE

Did you have an immediate association about how you could apply it?

VILAYANUR S. RAMACHANDRAN

Well, yeah. One of the first things I thought was, look, you give the syringe injection to this guy, and his neglect goes away. He's also denying that his arm belongs to him, and the denial also goes away. Right? And then also, if it goes away and he starts saying, "I can use my arm again. My arm is paralyzed." He admits it. And then you go back after an hour, he remembers the admission of paralysis. What happens? This is kind of like, any schoolboy would ask this question. Dr. Ramachandran, you put the water in his ear,

and for the last three weeks, he's been saying his arm is working fine, it's not paralyzed. You put the water, he immediately says my arm is paralyzed. (A), is he surprised? And (B), will he tell you why he was denying it earlier? And (C), when he recovers, what's he going to say about why he said it was not paralyzed? And now he's again saying . . . sorry, why it was paralyzed. And now again he's saying . . . did he suddenly become paralyzed with the water? What happened? Is he going to sue you? Any kid would ask these questions. But nobody had asked it, so I said, let me do the experiments.

ROBERT GREENE

Right.

VILAYANUR S. RAMACHANDRAN

Being able to cultivate a naiveté about these things. Not take a very professionalized, in-house view of the whole thing.

ROBERT GREENE

And also to speculate about the possibilities. So the cancer one . . .

VILAYANUR S. RAMACHANDRAN

The importance of that cannot be . . . look at the billions and billions of dollars that are going to cancer. Here's a simple remedy. Why don't they bloody study it?

ROBERT GREENE

I wonder if maybe you'd have better luck in India or another country.

VILAYANUR S. RAMACHANDRAN

Yeah. I could go to India and do it. In fact I'm half thinking of doing it. But India is even more tricky about clinical trials.

ROBERT GREENE

They are?

VILAYANUR S. RAMACHANDRAN

What happened was about 20 years ago, it was very easy to do clinical trials in India. So there's a backlash now saying Westerners are trying to do experiments here and use human guinea pigs and that sort of thing. I can get it done.

ROBERT GREENE

But if you were to do it.

VILAYANUR S. RAMACHANDRAN

But I'm not an oncologist. I'd have to get an oncologist.

ROBERT GREENE

Have you ever heard of an idea called negative capability?

VILAYANUR S. RAMACHANDRAN

No.

ROBERT GREENE

It's something that I'm going to be talking about in there. It comes from an English poet named John Keats.

VILAYANUR S. RAMACHANDRAN

Oh, Keats, of course. Yes.

ROBERT GREENE

Okay. He talked about it in a letter, and it's since become a very famous idea. He says the mark of anybody who's intelligent or creative is that they can entertain two contrary ideas at the same time without being disturbed, without having to grab for certainty. The ability to have doubt and not need to have an answer right away is the mark of genius.

VILAYANUR S. RAMACHANDRAN

That's a good point. I never thought of that. It's about being able to entertain two simultaneous antithetical views.

ROBERT GREENE

Yes. And suppose one or the other could be true, but not hurrying to get an answer. Entertaining them for as long as possible. So he would say that Shakespeare was a genius at negative capability, that he never said one or the other was necessarily true. He could entertain both at the same time. Therefore, his work seems more lifelike, because that is what life is like.

VILAYANUR S. RAMACHANDRAN

The tolerance of ambiguity.

ROBERT GREENE

Exactly. Do you see any relevance?

VILAYANUR S. RAMACHANDRAN

Yeah. Well, I enjoy paradoxes. I think anomalies have a close relationship. This is not very clearly defined in my brain. Again, tolerance for ambiguity. So the

anomalies again are like paradoxes, right? The difference between a paradox and an anomaly, an anomaly threatens the whole edifice of science, the framework. Paradoxes, one clear cut, clearly stated idea contradicting another clearly stated obviously true idea. Two true statement contradicting each other, two apparently true statements. It's a paradox. So paradox is almost like an anomaly on a smaller scale. But I always loved paradoxes, and you enjoy paradoxes for their own sake. Because when you resolve them, that's equally enjoyable. So maybe that tolerance, not just tolerance of ambiguity, but enjoyment of ambiguity, is what he's talking about, Keats is talking about.

ROBERT GREENE

Yes. And you think that you experience that yourself?

VILAYANUR S. RAMACHANDRAN

Yeah, absolutely. Part of my love of anomalies spills over into a love of paradoxes. But I

think that's universally true. I think most people love paradoxes.

ROBERT GREENE

But most people need to have certainty. They don't like ambiguity.

VILAYANUR S. RAMACHANDRAN

You can't be a good scientist if you want certainty.

ROBERT GREENE

Right. Okay. Well, I was going to ask you one last thing before . . . I know we only want to do a few hours. Or do you have time for one more question?

VILAYANUR S. RAMACHANDRAN

One more question is fine.

ROBERT GREENE

I just wanted to ask about your preference for doing things in a low tech manner. I know you say you're not a Luddite, and it's not for its own sake. But is there a link between if you feel like you have less means to be more creative?

VILAYANUR S. RAMACHANDRAN

Yeah. I think so. That's happened in India, for example, when you're doing clinical neurology. You didn't have CT or MR at that time, so that forces you to do a Sherlock Holmes-like deduction. That's certainly part of it. Partly also, I think, there's a search for simplicity and elegance. Like an experiment, like Faraday, reading about the history of science, putting a little magnet behind a sheet of paper and sprinkling it. How can anything be simpler than that? To demonstrate a whole new principle. People didn't know about fields before that. They were abstract mathematical entities. He said, "You can see fields with these filings sprinkled." How did he think of that? Again, you could ask him. He'd say, "I saw a bottle of filings there, and I saw a magnet, and I thought you could maybe make the fields visible. Let me try sprinkling it." After the fact it seems simple. But how the hell did he think of that?

ROBERT GREENE

Right. Well, I wonder if you're so mesmerized by technology that you don't go through a process of thinking about things as deeply and trying to come up with a more creative solution.

VILAYANUR S. RAMACHANDRAN

That's correct. I think technology absolutely constrains you, imprisons you. Now again, as I said, it depends. Without the telescope . . . think of the telescope, think of the microscope. Microscopes opened up a whole new world. But what you don't want is people being taking bits of dust and staring at it through the microscope all their lives. The technology has to be . . . how should I describe it? The research should be question dominated, not technology dominated. And then the technology adapts itself to the question. So, as far as plausible . . . well, the other reason, to put it bluntly, is that I'm lazy. Technology requires a lot of time investment. A lot of people spend years learning a

technique. And then you say, if you can do it in ten minutes, why learn all that technology? These days, students are forced to learn it, because they won't get jobs if they don't learn it. They have to learn that. First thing they go to an interview, they'll say . . . in other words, they're becoming technicians, highly skilled, trained technicians.

ROBERT GREENE

Well for instance, with your hypnosis experiment. If you were thinking of the technology involved, how to prove it, as opposed to trying to come up with a very simple experiment. It forces you to think more deeply about the problem. I don't know.

VILAYANUR S. RAMACHANDRAN

That's correct. Otherwise, you see what happens is they'll say, let me do a brain scan under hypnosis. People have done that. It doesn't get you anywhere. All sorts of patches light up in different parts of the brain, and it doesn't really distinguish between suggestibility and hypnosis. In fact, similar

areas of the brain light up. It doesn't really get to the core of it, and it takes months and months to do the experiment. That's the other thing. This experiment can be done in a day or half a day.

ROBERT GREENE

But you had to think about it. It's almost like a puzzle, and you had to think.

VILAYANUR S. RAMACHANDRAN

Yeah, because I was obsessed, saying here's a problem. Being suggestible and being hypnotized are so bloody close together, how do you disentangle them? And do you even need to disentangle them? Maybe hypnosis is suggestibility. So you get obsessed with it. But there's no way of telling them apart. Maybe they are the same thing. Here's a way of telling them apart. The guy is going to think it's smaller, therefore, I should tell these guys he's very suggestible. I'm very suggestible. He doesn't know he's suggestible. Therefore, I should tell these guys the smaller one weighs less. It's the opposite of the illusion. The

illusion is the smaller one is heavier. So if he picks it up, and he's surprised and he says, "Oh my god, it's heavier," simply by virtue of hypnotically shrinking the object, then you know hypnosis is real. It's not suggestibility. So that single experiment disentangles the whole domain of hypnosis from the domain of mere suggestibility.

ROBERT GREENE

You think. You'll have to see how the experiment turns out. It's speculation.

VILAYANUR S. RAMACHANDRAN

It's just speculation. It might go the other way.

ROBERT GREENE

It might go what other way?

VILAYANUR S. RAMACHANDRAN

He might say it weighs less, and then it's boring.

ROBERT GREENE

He might say it weighs less.

VILAYANUR S. RAMACHANDRAN

The smaller object weighs less. Because he's very suggestible, and he knows what you're

expecting of him. Standard experiment, you know there's a thing called Babinski's sign in neurology. If you have a stroke, damage in the pyramidal fibers that go from the brain to the spinal cord, if you stroke the foot, our toes fan out and your big toe goes up. That's a sure sign of pyramidal tract damage. So somebody hypnotized students into thinking they had a stroke. And then he stroked the foot, and it fans and that. My god, you know. It turned out those people were all medical students. So they know about Babinski's sign, so this is what led to the idea that it's suggestibility. Nothing is changing in the brain obviously.

ROBERT GREENE

So you need subjects that have nothing to do with . . .

VILAYANUR S. RAMACHANDRAN

Yeah. And if you do that, they don't.

ROBERT GREENE

Did you have these weights already? The illusion was already something that you used?

VILAYANUR S. RAMACHANDRAN

Yeah. The illusion is well known. Not that well known, but it's kind of well known. I was exposed to it. To me, just picking that up. When you picked up the metal one. The other one is a bad version. You said, "My god. If somebody told me these are the same weight." Now you had already been primed, told it. But if you hadn't known that, there are people who would refuse to believe it. Then you put it on a scale and show it to them. It's an anomaly of sorts. Visual illusions are anomalies. But people think the illusion is just entertainment to titillate your sensory systems and enjoy it. They're jokes and amusing, but in fact, they're telling very important things about your brain.

ROBERT GREENE

Just like Richard Gregory.

VILAYANUR S. RAMACHANDRAN

That's Richard Gregory's whole career.

ROBERT GREENE

So when you're trying to figure out hypnosis in an experiment and you're obsessing about it, did it just come to you, this illusion?

VILAYANUR S. RAMACHANDRAN

That's correct. I was playing with the illusion, then I said, "Shit." So putting the two things together. Or the other one with the colors.

ROBERT GREENE

All right. Well I've left myself quite a bit for the next time.

VILAYANUR S. RAMACHANDRAN

Sure. Yeah, I enjoy this.

ROBERT GREENE

Okay. I might have to do two short ones or one long one.

VILAYANUR S. RAMACHANDRAN

Either way.

ROBERT GREENE

Okay. So I'm going to finish now and just take a photograph.

VILAYANUR S. RAMACHANDRAN

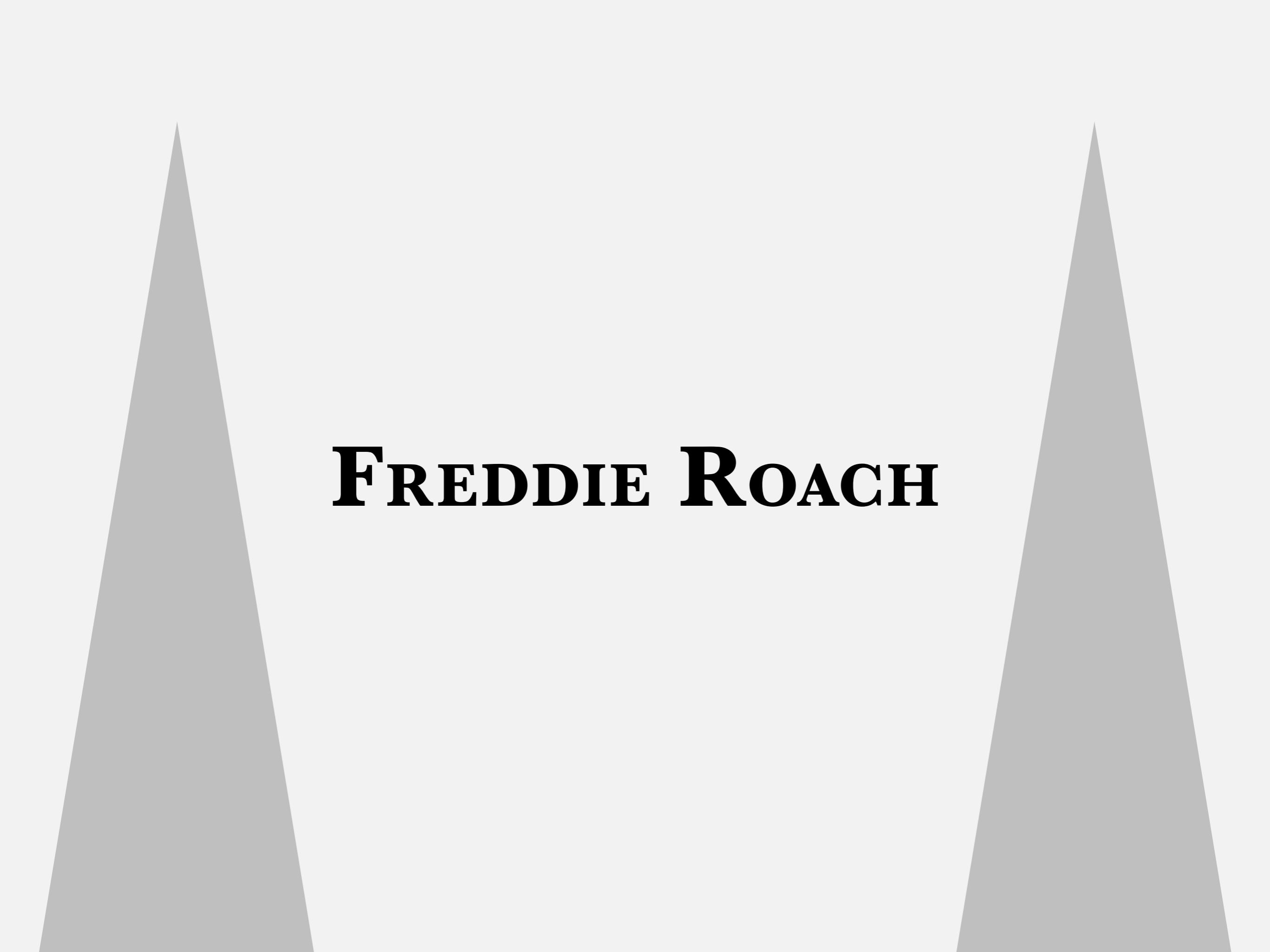
Okay. Sure.

ROBERT GREENE

Then I'm going to come back in January. Will you be back in January?

VILAYANUR S. RAMACHANDRAN

I'll be . . . ♦



FREDDIE ROACH

ROBERT GREENE

[laughs] Well, I was just going to tell in a couple seconds, briefly, what the book is about, and then start with questions. Basically, the book is about mastery, what happens to someone after they've spent years studying one thing or one subject or field. They reach a point where they understand it so well that it's almost like part of their nervous system. They have a feel for it. They anticipate what will happen next. And they just basically have a complete command of their field, to the point where they can be extremely creative with it. And this is mastery in science, I'm interviewing scientists, in arts, architects, artists, and in sports. You're basically my sports person.

I consider you the greatest boxing mind of our era and many [inaudible 03:16] the best boxer of our time. This isn't about anything technical in boxing, so in fact, I hope you're not disappointed I'm not going to be asking you the ins and outs of particular fights or

anything like that. It's the lessons that a common person can take from your story, your life, and apply it to whatever field it is. So I'm not like a boxing expert. I don't pretend to be. I love the sport, but I'm an amateur lover of it. Did you have any questions about it?

FREDDIE ROACH

No.

ROBERT GREENE

No. OK. Cool. There's not a lot of biography here, but I wanted to start with your earliest years getting into boxing. I know that it's pretty much your father. It wasn't by choice. You sort of were forced, in a way, to box. How old were you when you first really started seriously practicing in a gym?

FREDDIE ROACH

Six.

ROBERT GREENE

Six years old?

FREDDIE ROACH

Yeah.

ROBERT GREENE

What was your routine like at that point? How many hours a day would you spend? At six years old. [laughs] Sorry, I just realized.

FREDDIE ROACH

Yeah.

ROBERT GREENE

That's pretty young.

FREDDIE ROACH

We had to run. He used to make us do a mile run and 10 100-yard sprints every morning from six years old. And then my mother would take us to the gym in Norwood, and a guy named Mike Pusateri was the boxing coach there who was a friend of my dad's. My dad was working, so he didn't have time to coach us. He coached us on the weekends. He'd take us to... there was like a civic center in Norwood, and he'd take us there and drop us off. We'd go through the boxing lesson with Mike Pusateri, who was a journeyman fighter at one time. Still a friend actually.

ROBERT GREENE

Oh, that's nice.

FREDDIE ROACH

He came out to Pat Gallo's last fight, or last fight in Vegas at least. Takes us through the little stuff when we get to... So, six years old, fighting in Boston Park Department shows. Smaller shows. But my first tournament, Junior Olympics, I was eight years old. I won the 60-pound division.

ROBERT GREENE

Wow. So like how many hours a day were you practicing at that age?

FREDDIE ROACH

Probably one hour in the morning. Well, not even an hour. I would say two hours a day.

ROBERT GREENE

Two hours a day?

FREDDIE ROACH

Yeah.

ROBERT GREENE

Seven days a week?

FREDDIE ROACH

Six days a week.

ROBERT GREENE

Six days a week. Wow.

FREDDIE ROACH

And one thing my dad was smart with was that he gave us the summer. When we were out of school, we didn't have to go to the gym. We had summers off. But we still fought in the smokers in the weekly shows they had. At that time they had them at the Lynn Harbor House. It wasn't tournaments or anything like that. It was just two guys who were the same weight, and if you were there, you fought. So, we fought in the summertime in stuff like this, but we didn't have to train, because we were always running and stuff anyway at that age, you're a kid. I thought that was very smart of him to do, so we didn't get burnt out or bored of it.

ROBERT GREENE

What was your relationship to all this practice? Were you enjoying any of it, or was it mostly a routine that you were kind of

forced to do? Or were there parts of it that you enjoyed?

FREDDIE ROACH

It was more something I did to keep him happy. I think when I was really young, we just did it because we were supposed to. But as I got a little older, I think I just did it to please him. Then at one point in my life, I was probably 15 years old, my mother told me... I made an excuse not to go to the gym. I said I was sick or something like that, because I wanted to go see my girlfriend. And she said, 'Well, why do you fight anyway? You just get hit all the time. You can't fight.' Me and her didn't get along that well at the time. From that point on, I became the best fighter in the house.

ROBERT GREENE

Just her saying that?

FREDDIE ROACH

Yeah.

ROBERT GREENE

What was the motivation behind it?

FREDDIE ROACH

I had to prove her wrong. Because when she said that, it really... I didn't get upset or anything, but it just set me back a little bit. My brother Pepper was better than me. He was the better fighter in the house, and he was the next superstar they thought and all that. Stuff like that. But I didn't have a passion for it at that time.

ROBERT GREENE

Oh, you didn't?

FREDDIE ROACH

I was doing it to just satisfy him and make life easier.

ROBERT GREENE

Was the passion now to prove your mother wrong? That was enough to get you excited about it, to make you work that hard?

FREDDIE ROACH

Because our relationship wasn't that good at the time, I liked him and not her, even though he was the meaner one of the two. But yes. That was the trigger.

ROBERT GREENE

To prove her wrong.

FREDDIE ROACH

Yeah.

ROBERT GREENE

So, you started working harder?

FREDDIE ROACH

Working harder and starting... really, I think I started to enjoy it more also.

ROBERT GREENE

What part of it did you start to enjoy? The fact that you got better at it?

FREDDIE ROACH

Better and rewards.

ROBERT GREENE

What were the rewards?

FREDDIE ROACH

Trophies. Pepper would always be the best fighter. We'd both win tournaments, but he'd win the Outstanding Fighter Tournament and stuff like that. Outstanding Fighter Tournament, and then I started to join later. By 16, 17, he started going the other way. I

started getting better, and he started getting into drugs. So, that was his downfall.

ROBERT GREENE

Were you the most disciplined of the brothers?

FREDDIE ROACH

100%, yes.

ROBERT GREENE

What do you think that is? Do you think it's something that you're born with or was there something else? Is it because you saw the rewards that you would get from being disciplined, or is it just the way you are?

FREDDIE ROACH

I think it's just the way you are.

ROBERT GREENE

Really?

FREDDIE ROACH

It's funny. Dicky Eklund, last time I saw Dicky, he said, 'Our families are very similar.' I said, 'How do you mean?' He said, 'I was better than my little brother, Micky, and Pepper was better than you.' He says, 'But

me and Pepper went in one direction and you and Micky had more discipline and went a lot further.' They were better skilled than we were, but they had no discipline. So, discipline is like the most important aspect in maybe life, in my opinion.

ROBERT GREENE

I agree.

FREDDIE ROACH

Fighters with talent who have discipline become world champions. Fighters with talent with no discipline maybe become world champions, but they don't have that longevity.

ROBERT GREENE

Did you actually enjoy being in the gym at a certain point in practicing, or was it basically the goals that you had in mind that kept you going with it? Were you a gym rat?

FREDDIE ROACH

I liked being in the gym at that point, yeah. And learning. And when my dad took me to Las Vegas to further my career and we found Eddie Futch in the gym.

ROBERT GREENE

How old was that?

FREDDIE ROACH

18. Eddie was like... I just wanted to learn so much. He was quite a guy. You had to really pay attention and listen to what he had to say and stuff like this, but I really was so eager to hear him teach me and speak. That was where the learning part of it really started coming into play. Getting more technical and getting better at the sport.

ROBERT GREENE

So, what was your dream when you were a boy? Was it to become a boxing champion, or did you ever envision that you would be where you are now?

FREDDIE ROACH

To be world champion is, I would say, any fighter's dream. And that's where I wanted to be. It's funny, because in my yearbook, you know they ask you that question. And I said successful business tree surgeon, because I was a Forestry major at Norfolk Aggie,

Agricultural High School in Walpole. Really, in my mind, I said I wanted to be a boxing world champion, but I didn't have the balls at that time to let the world know.

ROBERT GREENE

You actually did some work with trees, didn't you? Later on?

FREDDIE ROACH

My last tree job was 18 years old. I made enough money to buy a plane ticket to Las Vegas.

ROBERT GREENE

Wow.

FREDDIE ROACH

And that was my last tree job.

ROBERT GREENE

[laughs] How did you ever get by trees?

FREDDIE ROACH

My dad was an arborist, so I was his helper when I was a kid, and then I went to Agricultural High School and I majored in Forestry. So, I used to know a lot about trees.

ROBERT GREENE

The people that I've studied in history and people I'm interviewing, some of them have felt like when they were young that they were almost destined to be something. They felt that they were different from everybody else. Did you have anything like that? Did you feel like you were different?

FREDDIE ROACH

I didn't have a feeling of being different. Odd things happen. I remember, like, this family telling me about their friends of mine. And their father died, and his last words were, 'Freddie Roach will take care of it.'

ROBERT GREENE

What was that again?

FREDDIE ROACH

His last words before he died was 'Freddie Roach will take care of it.'

ROBERT GREENE

Take care of what?

FREDDIE ROACH

I don't know.

ROBERT GREENE

[laughs] Who was this person?

FREDDIE ROACH

Just a friend and a guy that used to fucking discipline me at times. He was a fireman, and he lived across the street from where we used to fuck around, get in trouble at the corner. I thought, for some reason, I was here for a reason at that time.

ROBERT GREENE

How old were you?

FREDDIE ROACH

18.

ROBERT GREENE

Oh, you were 18. What did you think he meant by that?

FREDDIE ROACH

I don't know. Just never really figured that out.

ROBERT GREENE

You thought maybe you were going to be a great boxer or something like that?

FREDDIE ROACH

I was going to make it for sure. I was definitely going to be world champion in my mind at that time.

ROBERT GREENE

So, when did you think that you were going to be world champion? After your mother said that thing when you were 16 or so?

FREDDIE ROACH

When I started getting better. When I started liking it and not doing for my dad, doing it for myself.

ROBERT GREENE

How did you know that you were getting better? What was the feeling like? How did you know that this was happening? You were winning, or you just felt more confident?

FREDDIE ROACH

Yeah, and I used to beat Pepper up a little bit.
[laughter]

FREDDIE ROACH

I could never do that at one time.

ROBERT GREENE

So like the first time that you beat him, that was the turning point in this?

FREDDIE ROACH

Yeah. It was sparring in the gym, because the times I fought him in tournaments, he kicked my ass. So, there's a point in my life when I was so frustrated when I was younger that I couldn't hit him in the three rounds. I couldn't hit him once. He'd beat the shit out of me. But after the incident with my mother, and she hates that I bring that incident up, because she doesn't like my boxing career, my pro career. Amateur was OK, but pro... because pro, it's a living. It was different for her. But I used him as a measuring stick more or less. So, I could do better with him, and I was winning the tournaments a lot easier. And then I was picked to be on the US boxing team and traveling and being with Sugar Ray Leonard and Tommy Harnson, guys like that. I remember when Leonard saw me the first time. He said, 'What do we got,

little fucking kids on the team now?' I told him to go fuck himself.

ROBERT GREENE

That's the first thing you heard him say?

FREDDIE ROACH

Yep.

ROBERT GREENE

Doesn't sound very nice.

FREDDIE ROACH

He's not a bad guy. At the time... you have young, white kids, and then you have 32 kids on the team, and I was the only white kid, and I looked like I was 12 years old.

ROBERT GREENE

I saw pictures of you when you were around 18. You looked kind of young.

FREDDIE ROACH

Yeah.

ROBERT GREENE

How much older is Pepper?

FREDDIE ROACH

One year.

ROBERT GREENE

One year. Was he just bigger and stronger?

FREDDIE ROACH

Yeah, and he was a good boxer. He really was more disciplined than me at the time, because I was just probably going through the motions more or less. He was holding on to what... he had I guess what I wanted later on.

ROBERT GREENE

But then a moment came where it kind of turned around, where you became the more disciplined one...

FREDDIE ROACH

More disciplined.

ROBERT GREENE

... and you could start hitting him.

FREDDIE ROACH

Yeah. I could start beating him up. He came to... sometimes, we'd fight. So, we'd get in fights in the gym so hard that we'd get turned out of the gym and sent home.

ROBERT GREENE

Wow.

FREDDIE ROACH

My dad wasn't there on the weekdays, and by this time, we were at Conley's Gym in south Boston, a pro gym. And we used to just stand in there and just kill each other. The gym would just fucking throw us out, because he thought we were nuts.

ROBERT GREENE

How many hours a day were you practicing at this point in your life, 18 years old?

FREDDIE ROACH

About the same, but just much more disciplined. A boxing workout is probably two to three hours, and it's just nonstop and just work right through. It's not a sport where you can spend six or eight hours in the gym, because it would just be too much.

ROBERT GREENE

About three hours is the maximum?

FREDDIE ROACH

Maximum. Yeah.

ROBERT GREENE

So, I wanted to segue into what I would consider your apprenticeship phase. So originally, your father was your trainer?

FREDDIE ROACH

Yeah.

ROBERT GREENE

And then at some point, Eddie Futch became it. How old were you when you worked with Eddie?

FREDDIE ROACH

18.

ROBERT GREENE

You were 18. So what was the difference between their two styles of training you?

FREDDIE ROACH

They had similar styles actually. But Eddie was a new voice. My dad was someone I was with all my life. If they told me the same thing, of course Eddie's was going to have much more impact than my father, because I was just kind of used to him. Maybe even

bored. But Eddie was more technical, and he was a good teacher. The thing is...

ROBERT GREENE

What made him a good teacher?

FREDDIE ROACH

He was patient, I think, and the way that he knew how to explain it so that you could understand it. Some guys get too technical and stuff like this, but he knew how to explain it, and then he could show you also.

ROBERT GREENE

Can you remember any time that's really clear to you now about a way he explained something that just sort of hit you? That's a real art to be able to do that.

FREDDIE ROACH

It is. He always had that. I'm not if he's just really quiet just because he made you want to listen, made you pay attention more.

ROBERT GREENE

He wouldn't talk a lot.

FREDDIE ROACH

He wouldn't talk a lot, no.

ROBERT GREENE

So when he said something, you pay attention.

FREDDIE ROACH

You paid attention, yeah. He wouldn't overdo things. But he's very technical with it. He'd teach me how to shoulder roll and the upper tuck behind it. And then, I was making the mistake of coming up too high and getting fucking killed making that move at first.

When I finally got that move down, I was killing guys with that shot.

ROBERT GREENE

And he's the one who noticed that?

FREDDIE ROACH

He's the one that taught me that. I noticed it, how effective it was when I could do it right. So then, it's something that I perfected in the gym, but it's kind of funny. I never would use it in a fight that much though, because...

ROBERT GREENE

Why is that?

FREDDIE ROACH

In a fight, as a professional, I think I never settled out. I would get hit, and then I would just fight on natural instinct and not really use my head. I wouldn't really stay in a fight, because I'd get too excited. But I didn't learn that until I'm older, until now. So, the fighters now, that's a big lesson for my fighters, is that they have to be able to stay calm, and be able to see.

ROBERT GREENE

Like be in the moment.

FREDDIE ROACH

Yes. You have to be calm and not just fired up and just fighting off instinct. I know now I could have been much better if I did that.

ROBERT GREENE

Did Eddie try to get you...

FREDDIE ROACH

No. We never got to that point about really seeing it. He was content, or maybe he didn't notice that I was... I was better in the gym than I was in the fight.

ROBERT GREENE

So your emotions would get the better of you.

FREDDIE ROACH

Yeah. But I didn't learn that until later on in life.

ROBERT GREENE

When your career was over, you mean?

FREDDIE ROACH

Of course.

ROBERT GREENE

[laughs] But it's a valuable lesson that you can apply now to you boxers. You wouldn't have known that if you hadn't been a boxer yourself.

FREDDIE ROACH

It's a huge lesson. To be able to... it's why Pacquiao is so good, because he sees things.

ROBERT GREENE

I will definitely get to that. I know of Eddie Futch, because I'm a big fan of the Frazier/Ali matches, and he was Frazier's trainer. He's pretty amazing, considering all the great boxers he trained. He had an

incredible amount of success. Why was he such a successful trainer? Could you see that year that you spent with him? What was his secret? I know that Ali wanted him as his trainer.

FREDDIE ROACH

I think his patience was probably the best thing. He'd never get excited. Just a very calm guy, and really could get you to understand what he was saying. Again, he wouldn't get too technical where you couldn't understand it. He could show you the moves, and he always would use a fighter that he knew that was great at that particular move to...

ROBERT GREENE

You mean like he would go back to Joe Lewis or something?

FREDDIE ROACH

Joe Lewis, he used to spar with. He'd go to Joe Lewis quite a bit. 'When I was sparring with Joe Lewis... I was 135 pounds, and he was 200 pounds, and I used to make this move on him, because I'm smaller and

quicker and so forth.' But I think for me, when I tell my fighters... well, maybe not so much now, but when I first started training, I'd tell my fighters something. And they knew I've been there. With Eddie, I can only guess.

ROBERT GREENE

What do you mean?

FREDDIE ROACH

There was no proof that he sparred with Joe Lewis.

ROBERT GREENE

You're telling me he never boxed professionally, because he had a heart murmur or something.

FREDDIE ROACH

Right. So, I think it was easier for me, because fighters knew that I was... they've seen me do it and so forth. But it was a good way to get your attention. And lessons learned were always through somebody else. I probably do the same thing myself. I try to teach my fighters lessons through my

experiences, but I found out that people want to find out for themselves.

ROBERT GREENE

That doesn't really work when you tell them.

FREDDIE ROACH

When you're teaching a fighter a move or something like that's different. When you're trying to give them advice about saving their money or something like that. Eddie used to give me stories about street fighting, because I used to like to street fight a lot. I used to get in a lot of fights. He used to use one of his friends, Toughy Stevens, who ended up shot and killed. And he told me that's where I'm going to end up if I don't cut it out.

ROBERT GREENE

But you didn't listen to him.

FREDDIE ROACH

No, actually I listened to him a little bit. I did, because the thing is, I quit drinking, and when you quit drinking, the street fights stop.

ROBERT GREENE

Oh, I see.

[laughter]

FREDDIE ROACH

They come together.

ROBERT GREENE

That's true. Is there a lot of Eddie Futch in how you train now, or is it pretty much your own style? Did he influence your style of training?

FREDDIE ROACH

There's a lot of Eddie Futch in me, and there was more Eddie Futch in me when I was younger. I've kind of progressed, and the game is changing, and I'm keeping up with the changes. I don't think I'm changing sports. I'm trying to be smarter about things style-wise for my fighters. I'm using a lot more angles and so forth. Pacquiao was the key to that. Even though I've always been a believer in angles, but I never dwelled on it so much as I do now. Because if you can angle with a person in any sport, you have an advantage.

ROBERT GREENE

Yeah. I want to get to that a little later, talk about your strategies. What was your relationship to pain? Obviously boxing involves a lot of pain, and there's a fear element, and there's defeat and being knocked out. How did you handle that as a fighter?

FREDDIE ROACH

Fear is something... I think that's why most boxers start at the young age and grow up with it. That's why I don't think that those football players that they try to make into boxers, I don't think they'll make it, because the fear factor is something that... this guy is actually trying to hurt me, and at 26 years old, it's maybe hard to accept. But at six years old, it's not hard to accept, because you have no fear.

ROBERT GREENE

Right.

FREDDIE ROACH

At six years old, you'll take your Big Wheels and go down the biggest hill in the world.

Later on in life, if you're older, you won't do that, because you're smarter.

ROBERT GREENE

But some six year olds, when they go down a hill and they have an accident, they get afraid and they don't do it again.

FREDDIE ROACH

Not in my neighborhood.

[laughter]

FREDDIE ROACH

We fucking go again. So, the thing is, the first time I had gloves on, and they were filming me and Pepper fighting, beating the shit out of me when I was like four. And the thing is, he was beating me up and stuff like that, but he couldn't really hurt me.

ROBERT GREENE

He's five and you're four. What's he going to do?

FREDDIE ROACH

Yeah. My dad could hit me a lot harder than that being mad. So, punishment and getting

hit was like... I can't say I was ever hurt by a punch.

ROBERT GREENE

Ever, in your whole life?

FREDDIE ROACH

Like, did it hurt? You know, it might affect me, but I didn't like say, 'Ow' or something like that. But then, when I finally got knocked out for the first time in my life, which I thought was impossible, I didn't see the punch coming, and my ass hit the floor, and that woke me up. I said, 'How the fuck did I get here?' I had no clue.

ROBERT GREENE

How old were you when that happened?

FREDDIE ROACH

I was 22.

ROBERT GREENE

You hadn't been knocked out until you were 22?

FREDDIE ROACH

Knocked down. I was only knocked out from the punch to the floor. I was knocked out for

that moment. But my ass hit the floor and woke me up. It's happened four times in my life. Very similar circumstances.

ROBERT GREENE

Where you don't see the punch coming at all. It's always the same.

FREDDIE ROACH

It's always the same. It's only punches...

ROBERT GREENE

You can't prepare for it.

FREDDIE ROACH

Right. So if you see it coming, you'll roll. Maybe you'll get a piece of it. Usually, that's the only punch that would knock the guy out that has a good chin. And a good chin to me is balls. You just fucking...

ROBERT GREENE

So were you ever at the point early on where it's almost good to get hit, to get some pain, to get knocked out to kind of toughen you so you'll know what to expect next time?

FREDDIE ROACH

I don't know. I never thought of it in that way. No one wants to get knocked out, because that means you lost. The thing is, you just had to accept it, because if you thought about it, you might get hit five more times. You get hit, you react. It's just reaction. So if I get him once, and I hit him back twice, that was like more so my game plan than being smart and making the moves that maybe Eddie had taught me in the gym. But it's funny. Eddie never criticized me for... or he never saw that I was fighting with too much emotion. Because I did fight emotionally. You could see it on my face. My expressions were definitely there. So once I get hit, the fight would start.

ROBERT GREENE

So you were never afraid in the ring. That was long gone by that time.

FREDDIE ROACH

Never afraid.

ROBERT GREENE

Do you think it was good to go through adversity, to lose sometimes? Have the failures or the times you lost kind of helped you in a way?

FREDDIE ROACH

Yeah. That's definitely true, and I've seen it many times in my career that losses have helped guys. Amir Khan getting knocked out, could've been the best thing that ever happened to him, for his career, to better himself. Right now, I'm trying to rebuild... who's coming in?

JOHN

Danny Jacobs.

FREDDIE ROACH

Danny Jacobs. He just got knocked out in his last fight. So they sent him to me to rebuild him. I told him yesterday, I said, 'You're talented. You've got great power, great speed, great moves and stuff like this, but you're fucking lazy.' And I says, 'If you're this lazy

tomorrow, you can go home, because I don't have time.'

ROBERT GREENE

Right.

FREDDIE ROACH

Again, the discipline. Guys with talent and no discipline and no drive. It just makes things difficult. But losing can be a great lesson, because I lost my 10th pro fight, and I won 17 straight after that, because it made me go in the gym, and it made me work harder. So, that loss, again, that was my first loss as a pro.

ROBERT GREENE

Which loss was that?

FREDDIE ROACH

It was my 10th pro fight against a kid from Phoenix, Arizona. I used to know his name.

ROBERT GREENE

You didn't expect to lose, and you lost, so it was kind of a shock.

FREDDIE ROACH

Yeah. He had fought for the world title once and stuff like that, and he was making a

comeback. But the commissioner in Arizona said, 'I knew you were going to lose that fight.' He always tells me. He says, 'I knew you were going to lose that fight.' Beto Nunez.

ROBERT GREENE

Oh, it was Beto Nunez. I was thinking that's who it was.

FREDDIE ROACH

He said he had too much experience. He said, 'You were too young. Didn't have the experience.' So, I lost that fight, and then it made me work harder. It made me work harder, and I won 17 straight after that before I broke my hand. Then things started going a little sour after that.

ROBERT GREENE

Do you want to take a minute break here?

FREDDIE ROACH

Whatever you want.

ROBERT GREENE

We're going at a good clip.

FREDDIE ROACH

Great.

ROBERT GREENE

Can Manny read English? Does he read English?

FREDDIE ROACH

Very well.

ROBERT GREENE

He does?

FREDDIE ROACH

Yes.

ROBERT GREENE

I want to give him a copy of the... because he's in politics now. I want to give him a copy.

FREDDIE ROACH

Manny can read English, yeah. The first thing I bought for Manny was a Dido tape, because he liked that song "White Flag." And you know what. He wrote down every word in that...

ROBERT GREENE

To understand the meaning or just so he could sing?

FREDDIE ROACH

He looked up each word in the dictionary to find out what that song meant.

ROBERT GREENE

Oh, wow.

JAMES

What that song meant, because he liked the tune of it so much.

FREDDIE ROACH

He was singing that song at the time. He loves it.

JAMES

He's so brutal, but he has that sweet spot where he just sings.

ROBERT GREENE

He's got a singing career.

JAMES

Yeah. Oh yeah.

FREDDIE ROACH

He has a platinum album out.

JAMES

Does he play the guitar? Was he playing the guitar for a while?

FREDDIE ROACH

Yeah, but he never really mastered it.

[laughter]

FREDDIE ROACH

Played a guitar with three strings.

PETER

Manny Pacquiáo doesn't have to...

ROBERT GREENE

But he can sing.

PETER

...be able to sing to have a platinum album.

FREDDIE ROACH

He can sing to karaoke. I've asked people in the Philippines, because I don't really understand people in the Philippines, and it sounds good to me. I'm not a singing expert, but I said, 'Can he sing?' They said, 'For karaoke, he's average.' Because most Filipinos can sing though, because it's a big part of their life.

ROBERT GREENE

I didn't know that.

FREDDIE ROACH

Every person in the Philippines has a karaoke machine.

ROBERT GREENE

Really? In their house.

FREDDIE ROACH

I don't give a shit how poor you are or how you rich you are

PETER

Born with a microphone in his hand.

ROBERT GREENE

So if he wasn't Manny Pacquiáo the album wouldn't have gone platinum.

FREDDIE ROACH

If he wasn't Manny Pacquiáo, the album wouldn't have gone anywhere, wouldn't have been made. That one song though, "My Fight is Your Fight". It's the best seller. It's why it went platinum. It's like, I fight for you, the people.

ROBERT GREENE

Oh, that's nice.

JAMES

Sounds like a Kenny Rogers cover. My fight is your fight.

ROBERT GREENE

Well, I wanted to go down to the period when you're first sort of apprenticing as a trainer. So after you kind of retired from boxing, you went sort of in a lost period?

FREDDIE ROACH

Yeah. For maybe a year.

ROBERT GREENE

Like drinking and bad jobs and stuff like that?

FREDDIE ROACH

Yeah. The bad jobs were always there.

ROBERT GREENE

The telemarketing. I've done it myself. I did telemarketing.

FREDDIE ROACH

I was telemarketing as a main event fighter, I was a telemarketer also. I was an electrician. I was a busboy, and I was a dishwasher.

ROBERT GREENE

This was in Vegas?

FREDDIE ROACH

Yeah. So from my first job as a busboy, which is the worst job I've ever had in my life, because people are assholes. You go to restaurants, it's like, they want to be served, and people like Stewart. [laughs] Stewart's a friend of mine, but...

ROBERT GREENE

He treats people badly?

FREDDIE ROACH

Yeah. And he doesn't tip well, because he says, 'Don't spoil them.' I said, 'They've got to put up with you.' But yeah. I had bad jobs, but the thing was, I never had a manager much, and so I took care of myself. I didn't have somebody paying my way. I worked a job my whole career, and telemarketing is like... telemarketing is kind of a fun job. A lot of crazy shit goes on there.

ROBERT GREENE

You had the full script and everything.

FREDDIE ROACH

Yeah, yeah. It's funny. When you learn the script, and then you start to go on your own and add things in and stuff like that.

JAMES

Do you ever... sorry I don't mean to interrupt.

ROBERT GREENE

No problem.

JAMES

Did you ever keep a tape of any of it? A recording?

FREDDIE ROACH

I did not. That would be funny.

JAMES

That would have been great.

FREDDIE ROACH

My phone name was Joe Davis.

ROBERT GREENE

Your what?

FREDDIE ROACH

My phone name.

ROBERT GREENE

Oh, your phone name was Joe Davis?

FREDDIE ROACH

Back then you didn't have to use your real name.

ROBERT GREENE

Can you give us a pitch or something that you would do on the phone?

FREDDIE ROACH

Yeah. 'Hey Kevin, how are you doing? You sound chipper.'

ROBERT GREENE

[laughs]

FREDDIE ROACH

That was the pitch. [laughs] 'Kevin, you're guaranteed one of five prizes.' I says, 'Now which one we don't know, but one of the five is yours. You could buy the small box of pens and throw them away and still come out ahead in this.'

PETER

It's like a game show.

FREDDIE ROACH

'At this level of promotion, I'm going to hand walk you through this myself. I'm going to

make sure you take care. And if you win that Cadillac,' I said, 'I want a bottle of champagne, and I don't mean the airplane bottle. Hahaha.'

[laughter]

ROBERT GREENE

Wow, you remember it. That's pretty good.

FREDDIE ROACH

The people that hung up on you did you a favor, and the people that waited until the end of the pitch and picked the big box and I get them excited and stuff like this, and then at the end say, 'Fuck you.'

ROBERT GREENE

[laughs]

FREDDIE ROACH

So you call them back and say, 'OK, Evan. You won the chrome plated tow truck. Now, when it gets out there, strap it to your shoulders and pull your fucking head out of your ass.'

[laughter]

ROBERT GREENE

You would say that?

FREDDIE ROACH

I used to get in trouble for that one.

[laughter]

ROBERT GREENE

That wasn't on the script.

FREDDIE ROACH

No, no.

ROBERT GREENE

If you even want to torture a telemarketer who's bothering you, keep him on the phone for like half an hour, and then say something. That's the worst.

FREDDIE ROACH

Those guys that hang up on you right away are doing you a favor. So, telemarketing. We were hard sales. We weren't reloaders. We were working out of phonebooks.

PETER

Did you have any success as a telemarketer? That's a question for both of you.

FREDDIE ROACH

I made like \$300 a week. And Joey and Pep, Pep was making \$250, \$300,000 a year.

ROBERT GREENE

As a telemarketer?

FREDDIE ROACH

He had a wife, kids, and three houses at one time. And Joey used to make a half million a year. Like Joey said, he says, 'I could sell...'

PETER

Snow to an Eskimo or something like that?

FREDDIE ROACH

He could sell an Eskimo an icebox. I couldn't sell... if you had three flat tires, I couldn't sell you a spare. So, they moved me to verification, because that was a flat rate. You just verified the orders. It was a lot easier. But then, of course, I canceled my brothers orders. He got fucking pissed at me. Because verification is all tape recorded.

ROBERT GREENE

You were doing it with your brothers?

FREDDIE ROACH

I did it with my two brothers. I got them both into it.

ROBERT GREENE

Wow.

FREDDIE ROACH

And my brother Joey, he died two years ago, but brother Al is running his telemarketing...

ROBERT GREENE

He's still doing it?

FREDDIE ROACH

Yeah. I mean, he has over 130 employees.

ROBERT GREENE

Wow. Well if the training career doesn't go well, you can always return to working with your brother.

FREDDIE ROACH

Yeah. I don't know about that. Maybe if I could go back to be the tree surgeon or something. [laughs]

ROBERT GREENE

I had a job as a skip tracer. I don't know if you know what that is.

FREDDIE ROACH

A what?

ROBERT GREENE

A skip tracer.

FREDDIE ROACH

No.

ROBERT GREENE

I worked for a detective agency, and it was my job on the phone to trace people who had skipped their payments or whatever it was. Sometimes it was crime. So you had to call up the family or a friend or a girlfriend and pretend that you knew this person. You couldn't tell them what you were doing. In other words, you had to lie and see if they would inadvertently give you a clue.

FREDDIE ROACH

Is that legal?

ROBERT GREENE

Yeah, it is. That's how detective agencies find people. But it was kind of telemarketing on steroids, because you had to be really clever,

and it was pure discussion. So, did you call Eddie or did he call you?

FREDDIE ROACH

How it really happened is Virgil Hill, my last year pro was his first year pro, so we knew each other. And Virgil was sparring with James Schueler, getting ready to fight Tommy Hearns. I went to watch in Caesar's Palace. Virgil didn't have anyone in his corner, and Schueler had 10 guys in his corner. And Virgil was just by himself. And I went up and gave him a drink of water in between rounds and gave him a little advice.

ROBERT GREENE

Where was Eddie?

FREDDIE ROACH

Eddie was training Schueler. He was training both guys, but Schueler was getting the attention because he had another fight coming up. That's always the way. So the guy with the big fight coming up will get the attention. So, I gave him some advice. He beat the shit out of Schueler the next round.

He got fired as his sparring partner, and I get hired as a trainer. Virgil asked me, he said, 'Mr. Futch is really busy with all these big fighters.' And he said, 'Why don't you come help him?'

ROBERT GREENE

So it was Virgil that got you...

FREDDIE ROACH

Virgil was the one. Yeah. So, I just started showing up at the gym every day. I never called him Eddie, Mr. Futch. I just showed up. I just started showing up every day. That was the most important thing in my life. I wasn't late. I showed up to the gym every day. So I'd go from telemarketing in the morning...

ROBERT GREENE

You were still doing telemarketing. Wow.

FREDDIE ROACH

Yeah. So I'd go from telemarketing, working from 4:00am until 8:00am and then going to the gym, and then going to the bar.

ROBERT GREENE

Going to the bar?

FREDDIE ROACH

Yeah.

ROBERT GREENE

Afterwards.

FREDDIE ROACH

I was still drinking.

ROBERT GREENE

OK.

FREDDIE ROACH

I hadn't quite quit yet.

[laughter]

PETER

You were drinking but you still kept that discipline?

FREDDIE ROACH

Yeah. It was really important to me. But I'd be drunk by... I'd get out of the gym 3:00, 4:00, go get drunk. I was drunk and in bed by 7:00.

ROBERT GREENE

And up at 4:00, or 3:00.

FREDDIE ROACH

Yeah. 3:30 to get to work by 4:00. Four hours on the phone is a long shift. Before all the telemarketers had watch lines and so forth, we just had local lines. The rates were cheap between 4:00am and 8:00am, and 4:00 west coast time is 7:00 east coast time, so you hit the construction guys and those types, landscaping. I used to call my friends up and sell them sometimes... the landscapers and stuff like that that I knew. I was Joe Davis. I'd sell them fucking baseball hats and coffee mugs. The guy would say, 'I poured hot coffee in the mug and that fucking thing melted.'

ROBERT GREENE

The one that you sold them?

FREDDIE ROACH

The mugs were terrible.

[laughter]

FREDDIE ROACH

You sold the sizzle, not the product, of course.

ROBERT GREENE

Was Eddie fine with you now, showing up at the gym? How did he take to this?

FREDDIE ROACH

Me and him got along great. When he told me to retire, I remember crying in his office, fucking just devastated. I put everything into this and didn't get nothing out of it. And I told him, 'No, I'm not ready to retire. I'm going to fight on.' I fought about five more fights and lost four of the five. So then I did retire. He never asked me to be his assistant. A lot of stories are out there that he did that for me and stuff like this. I just started showing up and being loyal. And that was enough for Eddie.

ROBERT GREENE

You had to show him...

FREDDIE ROACH

...that I was dependable, because his other assistant at the time was Hedgemon Lewis, who wasn't dependable. Hedgemon wouldn't show up at the gym if Eddie wasn't there.

So he made me look good. The thing is, I was loyal. I knew them all very well, because we trained together just less than a year before. So I took over Eddie's, pretty much his entire stable. The only ones I didn't train were Larry Holmes and Michael Spinks. But I trained Virgil and all those guys. My first world championship fight, I was 27 years old when Virgil was in the world title. I trained him through that fight completely. Eddie came in and worked the corner. It was the start.

ROBERT GREENE

Did you have to learn to be a trainer, or was it just something so natural because you'd been boxing for so long?

FREDDIE ROACH

No, it was different.

ROBERT GREENE

OK. What did you have to learn?

FREDDIE ROACH

You catch on a lot easier and a lot faster than most people would because of my background

and what Eddie taught me. So if Eddie said something, I understood exactly what he meant. It wasn't foreign to me, where to somebody else, they wouldn't understand. It might be slang or something like that. Make 'em roll was a shot. I know exactly what he means by the roll and so forth. So, I caught on really quick and stuff like this, but the thing was... I was the last guy that Eddie would catch mitts for. Mitts weren't like they are now. Mitts back then were one punch at a time and executing that one punch. So, Virgil had learned how to punch mitts in Cuba when he went to Cuba. So he showed me the Cuban style of catching. It was...

ROBERT GREENE

What was he doing in Cuba?

FREDDIE ROACH

He fought the Cubans. He beat the Cuban, and that's how he got the berth to the Olympic team. That's how he made it to the Olympic team, Virgil. So, he taught me a different style of mitts which was much more

aggressive and much more activity and so forth. Mitts have replaced the heavy bag nowadays in boxing. So Virgil would show me, and I caught on really quick, and I could catch. That's the best thing I do. I still think it's the best thing I do. I know I'm getting older and so forth, but I still think I'm good at... like I tell Peter, 'If I ever fucking look like an old man in mitts and it's embarrassing, please tell me, because I want to be aware.' I think I can still do that. So I still think it's the best thing I'm doing, and to me it's the best way to gauge my fighters. I know exactly where they're at from that. So, I just started showing up every day. And the thing was, Eddie's a good guy and stuff like this, but he's a very, very tight guy. Always tight.

ROBERT GREENE

Tight with...

FREDDIE ROACH

Money.

ROBERT GREENE

...money.

FREDDIE ROACH

So I had to have a job.

ROBERT GREENE

He wasn't paying you?

FREDDIE ROACH

No. I only got paid when the guys fought. And then Virgil was making \$1,000 at that time, because Virgil was an Olympic silver medalist, but we had nine gold, two silver, and one bronze in that Olympics. We took the back row with Virgil kind of and just fought all these small shows and built his record up, and then he was the first one out of those Olympians to win the world title. Evander Holyfield was second. Holyfield could have been first. One or the other was the first one to win the title.

ROBERT GREENE

That's pretty amazing you were doing this without being paid. You sort of saw this as your big chance, didn't you?

FREDDIE ROACH

Yeah.

ROBERT GREENE

This or being a telemarketer.

FREDDIE ROACH

Right. It's funny, because then, Eddie got in a car accident. So I ended up working... was it Marlon's fight or Virgil's fight when I worked by myself for the first time?

JAMES

When Eddie had the car accident with his knee?

FREDDIE ROACH

Mm-hmm.

JAMES

It was Virgil.

FREDDIE ROACH

It was Virgil. I remember, I said, 'I know Mr. Futch is really going to take care of me this time, because he didn't even show up for the fight this time to work the corner and stuff like that. I'm going to make some money for the first time in my life.'

ROBERT GREENE

Right.

FREDDIE ROACH

And I didn't. [laughs]

ROBERT GREENE

Why?

FREDDIE ROACH

Because Eddie was tight.

ROBERT GREENE

But you stuck with it. Why did you stick with it? Because you knew you were learning from the best?

FREDDIE ROACH

Yeah, but then I did go to Virgil after that time, and I said, 'Something's got to change.' And he said, 'What do you mean?' I said, 'I can't afford to train you.' I said, 'I need to make more money,' and stuff like this. And telemarketing was not working out that well, but the telemarketing schedule worked out well for training. So I had time to train and so forth, so I said, 'I need to make more money.' So Virgil went into a meeting with Eddie and was going to tell Mr. Futch that Freddie needs to make a higher percentage of

the money and stuff like that. So Virgil went into the meeting paying Eddie 10% of his purse, and he came out of the meeting paying him 15.

ROBERT GREENE

That five percent going to you?

FREDDIE ROACH

No.

[laughter]

ROBERT GREENE

All going to Eddie?

FREDDIE ROACH

Yep.

ROBERT GREENE

Wow. He's a good businessman.

JAMES

Not so much. He's broke.

ROBERT GREENE

No, not Virgil. Eddie.

JAMES

Oh, Eddie. Yeah.

FREDDIE ROACH

I was fucking amazed. So that's when me and Eddie's relationships started to deteriorate. Between the two champions that I was training for Eddie at the time, Marlon Starling and Virgil, Marlon was the first to fire Eddie and then Virgil was the second, and they both did it because... they both said, 'You know Mr. Futch, you're a great trainer and so forth, but for you to train us, we need you to be there.' Because he wasn't showing up. He was taking heavyweights and making big... Eddie loved the heavyweights. If he had his choice of working at a heavyweight contender or Virgil's world title fight, he would like to go to the heavyweight.

ROBERT GREENE

What weight was Virgil?

FREDDIE ROACH

Virgil was light heavyweight. So especially because he grew up with Frazier and so forth. In that era, the heavyweights were everything. They were making the money.

So, when they fired Eddie and hired me, Eddie wanted me to leave them and go with him and I chose not to. I said, 'No. I like these guys. I'm going to be loyal to them.' And I chose them over him.

ROBERT GREENE

Really? Just the two fighters, Virgil Hill and Marlon?

FREDDIE ROACH

Mm-hmm.

ROBERT GREENE

How many years had you been with Eddie up to that point?

FREDDIE ROACH

Five.

ROBERT GREENE

Five years. And he wasn't paying you?

FREDDIE ROACH

The most I ever made was \$1,000.

JAMES

He's broke now.

FREDDIE ROACH

Virgil?

JAMES

No, Eddie. Isn't Eddie broke now?

ROBERT GREENE

Eddie's still alive?

JAMES

No. I'm sorry. Eddie's wife. She's broke?

FREDDIE ROACH

She's broke. It's funny because... I had trouble cashing the check one day, and I had this check I couldn't cash. I told Mr. Futch, I said, 'I can't get this check.' He said, 'Come to the bank with me.' And the guy cashed my check, and he says, 'You brought the right guy.' So Eddie had some money. But he didn't make the money that I make because the time is different. But he did pretty well, but yeah, she's trying to sell his memorabilia and stuff like that.

ROBERT GREENE

Did you feel that this was the thing that you were meant to be doing right away? Like this was it, it felt just right being the trainer.

FREDDIE ROACH

I caught on really quick, and I knew that this was my new job. Yeah.

ROBERT GREENE

Yeah. Pretty quickly, right away.

FREDDIE ROACH

Very quickly. Yeah, I knew.

ROBERT GREENE

What was it about... were you a good teacher? You felt like teaching was a good fit.

FREDDIE ROACH

I never thought of it like I was a teacher. I never thought of training people, especially when I was bitter over that first year when I drank a lot and stuff like that. I wanted nothing to do with the sport, but obviously, I went to watch Virgil's fight with Schueler that day, so I was obviously still interested in the sport. But I didn't want any part of it though, because I put everything into it and didn't get nothing out of it. Once I started working mitts in the gym and stuff like this, and I was

good at it. I know I'm good at it. Everybody wanted to work mitts with me.

Panama Lewis says, 'Will you work the mitts with my fighter Mike McCallum?' and stuff like this. I said, 'Why don't you work him?' He said, 'I don't know how.' I said, 'What do you mean you don't know how?' Because I thought this guy was... he was portrayed as one of the greatest. He was going to be a great trainer, because he was taught by Freddie Brown. Then I found out, you talk to this guy, he's just a fraud. He couldn't even do the work. And I was just like... that was a disappointment in my life, me meeting that guy.

ROBERT GREENE

Which guy?

FREDDIE ROACH

Panama Lewis.

ROBERT GREENE

Oh, right.

FREDDIE ROACH

Because I had heard a lot about him and how great a trainer he was and stuff like this. He fucking couldn't train a dog to piss on a tree.

[laughter]

FREDDIE ROACH

He was all fucking hype. I was so disappointed. That was my first disappointment in training at least. I thought I was going to learn something, but I didn't.

ROBERT GREENE

He was like a well-known trainer?

FREDDIE ROACH

Yeah.

JAMES

He's the one that put Paris on the gloves, and they ended up...

FREDDIE ROACH

Suspending him for life. The bigger one is, 'Give me the bottle. The one I mixed.' Aaron Pryor. So he had some good fighters. And he's still around fighting. They can't stop him from training, but he can't work the corner.

JAMES

What was it, HBO that did the documentary on him just recently?

ROBERT GREENE

Yeah, they did. They did. I saw that.

FREDDIE ROACH

I was very surprised that they tried to fucking hurt the sport that they support. I was very surprised that they put that on, because that was a negative thing for boxing, but it was good.

JAMES

Yeah, I agree.

FREDDIE ROACH

Because I know him well, because when I trained Tyson, he was part of Tyson's camp. And I said, 'Mike, why do you keep this guy around?' He says, 'He makes me laugh.' That's the truth. That's what he told me.

ROBERT GREENE

Are you still friendly with Tyson?

FREDDIE ROACH

Yes. We're both not the type of people that we're going to call each other up and say hi. When we see each other, we're very cordial, very nice to see each other. He'll talk to me about Manny Pacquião. 'Freddie, he's going to fight in a couple days. He's working too hard.' I says, 'This isn't hard.' I said, 'This is easy compared to what he usually does.' I actually like Mike Tyson. When I tell people he's a nice guy, a lot of people, mostly girls, think I'm crazy.

[laughter]

FREDDIE ROACH

He has his dark side, but I think we all do. His is just more publicized than ours.

ROBERT GREENE

I like him. So before you got disillusioned, what were the main things that you learned from Eddie as a trainer that you still use, that you incorporated?

FREDDIE ROACH

The timing shots I still use with all my fighters, which Eddie taught me. Really precise. I was going over the shots, the timing shots with an MMA fighter.

JAMES

Which one?

FREDDIE ROACH

Mike Bocek. So the timing shots, I teach that. Like with my own fighters, I put them in with lesser opponents sometimes, because two-way fighters sparring, you're not going to be able to make that move right away with another A fighter. So sometimes when you get sparring that's maybe not on your level, and you feel like you're getting nothing out of it, I think you get something out of it. You practice the timing shots. And those timing shots are what Eddie taught me. They're very small, and you don't notice them a lot and stuff like this, but they're a big difference. But the thing is, you have to be settled, and you have to see them.

I don't teach Pacquiáo a lot of the timing shots, because actually, from the south paw side, they don't work quite as well, and I'm not so fluent with it from that side. So the timing shots that I teach Manny, they're completely different, because it's like goofy footing on the opposite side. But those things are probably the things that I... they're the only things I still teach that Eddie did.

ROBERT GREENE

What about in general, like handling the boxers and managing them. It sounds like he was pretty hands on.

FREDDIE ROACH

No, you know, the thing was... Eddie was a great trainer and a very bad manager. And he was both to me, because I didn't have a manager, so he took that role. So with that role, he took 15% of my purses, and I remember making \$1,000 and him taking \$150. I needed that \$150 a lot more than he did. If you owed Eddie \$10.10, don't forget the dime. [laughter]

FREDDIE ROACH

He was just that way. He's very business. But he taught you to be businesslike from day one. I think he did it just to teach you, so if you ever make big money, don't be surprised that... it was just about business. It was just what the deal was. He was tight with money and stuff like this, but I like guys who are tight in boxing, because fucking most boxers are broke. So I'd rather see a guy tight than broke. I'm cheap with myself and stuff like this, but I give money to people all the time. I get asked 10 times a day for loans. It sucks that people cut you money in this world, but that's part of life. My lawsuit yesterday was my third one now?

ROBERT GREENE

Lawsuit?

FREDDIE ROACH

Yeah. I had to go to court for a deposition yesterday, because this guy can't sleep at night because I threatened to kill him. Fucking...

ROBERT GREENE

I think I heard about this.

FREDDIE ROACH

Fucking ridiculous.

ROBERT GREENE

He can't sleep at night because he's got a bad conscience for this lawsuit.

FREDDIE ROACH

So, the things that I teach right now. I don't teach fundamentals and stuff like that that much, because... we always get back to them, but the thing is, most of my fighters are beyond that. I've had like 30 world champions and stuff like this, but I didn't make 30 world champions. I didn't start them out. It's not like that. So, but they give you credit just by working the corner with the guy. You're his trainer for that fight, so they give you that credit. But the thing is, I'm better at finishing a guy, which Eddie was also. And Eddie would take a guy and just make him better, and I think that's what I...

ROBERT GREENE

I keep reading about that. How would he do that? What was the secret? Because you obviously are able to do that. How was it for Eddie?

FREDDIE ROACH

I think Eddie had that gift to get inside the person's head, and I can do that, too.

ROBERT GREENE

Can you tell me a little bit more about that gift? It's hard to explain.

FREDDIE ROACH

It's hard to explain, but I think it's a combination of dedication, trust, being there for the person, dying for the person if you have to. Just doing whatever it takes to get them to that point and make sure they know you're on their side every step of the way. Manny Pacquiao fighting Oscar de la Hoya. Schaefer and Oscar obviously were kind of good friends of mine. After that fight, that wasn't so, because I will do anything for my fighter.

ROBERT GREENE

Right. They know that.

FREDDIE ROACH

And I will take away anything. I tried to take something away from Oscar in that fight. It went so far that I stood up with my fists closed at Schaefer and says, 'You better shut your fucking mouth.' I wasn't going to hit him or anything like that. I did it to mentally get him. I had that thought in my mind. I said, 'I'm going to put fear in this mother fucker right now. He's not even fighting, but I'm going to fucking...'

ROBERT GREENE

Manny sees this?

FREDDIE ROACH

Everyone hears about this. Manny wouldn't see it. I don't get excited in front of Manny too often, because he's like the guy that says, 'Freddie, calm down. I'll take care of this.' He tells me that. Like at the press conference, the other trainer is speaking and I'm next. And

he'll tell me, 'Freddie, don't get mad. Don't worry, I'll take care of it.'

ROBERT GREENE

He's a trainer for you when it comes to...

FREDDIE ROACH

Yeah. If I'm attacked, I will attack back. If I'm not attacked, I'll be cordial and stuff like this. But Manny tells me to be calm and stuff like that. A couple days before the fight, for his benefit, I'll be calm. But when he's not with me, I will mouth off. But the thing is... so if I find out that you need something, an opponent needs something, and it's maybe controversial, I will do my best to take that away from you just to fuck with you a little bit, because that's part of my job.

ROBERT GREENE

Eddie was like that?

FREDDIE ROACH

No. That confidence came later in life. That confidence came when me and Peter, we'd been working on this for a long time. I'm so much better a trainer now than I was. Even

from the day I got Pacquiao to now, I'm so much better, because I'm not sure if it's just confidence.

ROBERT GREENE

I think you've learned a lot, too.

FREDDIE ROACH

I've learned a lot, too, but I'm trying to change the game a little bit. I'm trying to teach people, why do we stand right in front of each other and fucking fight in that style when you can be over here taking that angle? And the thing is, again, other people aren't picking up on it and stuff like this. Maybe some are, but the thing is, there's better ways to do this. And the thing is, Eddie's old school ways, like the counter moves and stuff like that, they're still very effective and very good and stuff like this, but most of what Eddie taught me is out the window now.

ROBERT GREENE

So it sounds like you decided five years into it to move on, that you felt like you could create

your own style. Eddie's was sort of a thing of the past. You could be your own style trainer.

FREDDIE ROACH

Yeah, but I wasn't quite there yet. I think the fighters I got and the more confidence I got, the better I got. I think it took time. I knew I was ready. I had to go on my own.

ROBERT GREENE

You did.

FREDDIE ROACH

I definitely knew that. And he really didn't want me to go. He talked very badly about me in the press. A lot of press called me up and tried to get me to say bad things about him, because it's in my nature to lash back, and people know that. And they said, 'Eddie said you're a piece of shit,' and stuff like that. 'What do you have to say about that?' And I know better. There are certain people that you can't attack in the world.

ROBERT GREENE

That's right.

FREDDIE ROACH

Eddie's one of them in the boxing world, because he's too well-liked. So if I attacked him, I would get fucking killed. So I was smarter than that, at least for that subject. I was smart enough not to ever say anything bad about Eddie. But talking to Peter and talking about the history and so forth, I'm a completely different trainer than Eddie Futch at this point. We have some similarities. I still give Eddie a lot of credit though, because without him, I wouldn't be here. I needed that start.

ROBERT GREENE

Right. But you realized you weren't going to stay working for Eddie for the rest of your life. There was a point where you break out on your own.

FREDDIE ROACH

Yeah. And it's funny, because I understand that my assistants... there's going to be a point when they have to go on their own, because I did the same thing, and I know that. I'm

up front with them. I tell them, 'When you want to go on your own and stuff like this, when you're ready,' I says, 'Let me help you, because this way you can make some money with me, and you can get some of your own fighters.' But it never works, because they want to fucking steal your fighters.

[laughter]

ROBERT GREENE

There's nothing you can do about it.

FREDDIE ROACH

No. But I'm so tired of it that I don't have a real assistant that I can count on right now. It's something I desperately... not desperately need, but I do, because I do have to go away sometimes. There's nobody that I can leave my fighters with that I trust.

JAMES

Close to desperately.

FREDDIE ROACH

Close to desperately.

ROBERT GREENE

What about Michael Moore?

FREDDIE ROACH

I can trust Michael Moore, but he doesn't get along with the fighters. Like Amir says, 'Freddie, don't let him fucking lock me in that room again.'

[laughter]

JAMES

He's missing one little chip.

FREDDIE ROACH

And then Pacquião, as soon as Manny's a congressman, now he's a best friend out of it.

ROBERT GREENE

He needs to read 48 Laws of Power.

FREDDIE ROACH

I like Michael Moore. I do. I think he's a nice guy, and he's a very good boxing... he knows the game. He's a good teacher, but...

ROBERT GREENE

He's just not good with people.

FREDDIE ROACH

He's not good with people, and his mood swings are every 15 minutes, not every day. Like one minute, you'll get a good guy, and

15 minutes later, wow. He's hard to be with. But I like Michael, but the thing is, I couldn't jeopardize my relationship with my fighters, because he was affecting that.

ROBERT GREENE

So you still need to find an assistant.

FREDDIE ROACH

Basically, I would...

ROBERT GREENE

You need like a protégé, like a Freddie Roach junior.

FREDDIE ROACH

I had some good ones, but...

JAMES

Loyalty is I think the biggest issue when it all comes down to it.

ROBERT GREENE

Well some of the agents have all that.

JAMES

Yeah. I think it's an issue in any field.

ROBERT GREENE

Well I wanted to get to your relationship with Manny and segue into that. I was talking

to Peter about it, and he was telling me the story that Manny came to the United States looking for a trainer, manager, and such. And I don't know how many, but eight different people turned him down.

FREDDIE ROACH

Right.

ROBERT GREENE

And you were the one that saw something there. What was it that you saw? It was with the mitt work, right? That the others missed.

FREDDIE ROACH

I think the others were more concerned... I think they passed on Manny because of his size. Again, the heavyweights were still kind of in control.

ROBERT GREENE

Back to '01?

FREDDIE ROACH

A little bit, yeah. The clip shows were just coming on and taking away the American champions and stuff like this. You still had Lennox Lewis. So, the 122-pound division

wasn't making a lot of money at the time. But I think that's why guys were passing on him more so than... Eddie would have passed on him because he's small, because there was no money in that division.

ROBERT GREENE

So why didn't you pass on him?

FREDDIE ROACH

I never caught a guy on the mitts that could fucking have the explosion that he had on the punch. It wasn't intensity or the hardness of the punch. It was the explosion of the punch, the snap on it. It was like fucking like hitting a home run. You can just hear it, you know? They way they hit the ball, it's clean. Every punch was like that, and after one round, I went over to my assistant and I said, 'Wow. This mother fucker can fight.'

ROBERT GREENE

So it wasn't the power, it was the snap, the speed of the...

FREDDIE ROACH

Speed.

ROBERT GREENE

Speed?

FREDDIE ROACH

Mm-hmm. It was a combination of everything together I would say, but I never saw that so... because Virgil Hill had great speed, but not a lot of power. And then I had some guys with good power and not a lot of speed. But Pacqui  o had both. He went over to his manager after one round, and he said, 'We have a new trainer.'

ROBERT GREENE

What did he see in you? Do you know?

FREDDIE ROACH

I could catch him. The Filipinos, they're pretty good at catching. Manny has a couple guys that can catch and stuff like this, but he just liked my style. We got along really, really well in that moment, and it's like... I tell people, if I didn't build the Wild Card Boxing Club I would have never met Manny Pacqui  o.

ROBERT GREENE

So you have Mickey Rourke to thank.

FREDDIE ROACH

No, Mickey has nothing to do with that gym.

ROBERT GREENE

Oh, that's right.

FREDDIE ROACH

He says he helped me.

ROBERT GREENE

He gave you the equipment.

FREDDIE ROACH

No, he didn't. That's a lie, too. [laughter]

FREDDIE ROACH

Mickey Rourke sued me for the equipment. He won and he put that equipment all in storage, and then he never paid the storage bill, so he lost all the equipment. There's nothing in my gym that Mickey Rourke has ever bought.

ROBERT GREENE

That story is still out there.

FREDDIE ROACH

I know, but I don't care. I'm not going to kill him, because I like Mickey a little bit.

ROBERT GREENE

A little bit.

FREDDIE ROACH

Well, he sued me. I don't forget that. But then he paid my lawyer bills the day after the trial.

ROBERT GREENE

He did?

FREDDIE ROACH

Yes. So that's nice. My famous quote, right?

We were in the judge's chambers trying to settle this, and he says, 'Well, he has Parkinson's so he can't remember.' And I said, 'So what? You suck dick.' [laughter]

ROBERT GREENE

You said that to who?

FREDDIE ROACH

To everyone in the room. [laughter]

PETER

Wait, the judge said that you have Parkinson's and you can't remember?

FREDDIE ROACH

No, Mickey did.

ROBERT GREENE

Mickey said it. And he said it to Mickey in front of the judge.

JAMES

I believe the response was, memory has nothing to do with Parkinson's, and also he sucks cock. [laughter]

ROBERT GREENE

That's pretty memorable.

FREDDIE ROACH

So I lost that case. [laughter]

ROBERT GREENE

But you won something now.

FREDDIE ROACH

Yeah, I got that out there.

ROBERT GREENE

Did you feel betrayed when he sued you? That's kind of...

FREDDIE ROACH

Yeah. You know, I was mad at Mickey for a while. But he paid the bill, and he did

apologize. So I let him come in the gym and stuff like this. He comes around and stuff like this, but I will never forget he sued me, and I will never let him get that close to suing me again. But Mickey Rourke has nothing to do with my gym. His gym was on Cole. He gave me the equipment. I opened the gym on Highland and Hollywood, and then he sued me at that moment.

ROBERT GREENE

What was he suing you for?

FREDDIE ROACH

The equipment, because he gave it to me I said. It was mine, and he wanted it back because I had thrown him out of the gym.

ROBERT GREENE

Oh, I see.

FREDDIE ROACH

He's hot and cold. He does some stupid stuff sometimes, but we all... I'm sure I do stupid things, too.

ROBERT GREENE

So you wouldn't have met Manny if you didn't have the gym, right?

FREDDIE ROACH

Right. Because Eddie told me to never open a gym. He told me it's a pain in the ass, and there's never been a gym in the world that makes money.

ROBERT GREENE

So why did you do it?

FREDDIE ROACH

I knew I could fucking make it work. And the thing is, the gyms that I ran, like Mickey's gym and the gym with Mickey's equipment, I had two partners in that one. I can make it work. I know how to make a gym work. I just have been doing this my whole life. The structure of the way my gym is run is so fucking stupid and crazy and maybe not money making, but it's why it works. It's why it works. Because everybody... 'You pay your gym due?' 'Yeah.' That's all you have to say. It's a trust system. Because I know, like, after

three times, I'm going to say, 'You haven't paid in three months,' because I will know that, too, especially when I'm in the gym all the time when I'm not traveling. But lately that's been happening more and more. So the thing is, I knew I could make it work, so I found the right spot. It cost me \$10,000 to build the gym.

ROBERT GREENE

Wow. And look what it's paid off.

FREDDIE ROACH

It's paid off a lot.

ROBERT GREENE

So, it was the mitt work that made you decide about Manny. You could feel the power, which the other people who...

FREDDIE ROACH

I kind of gauge everyone off of mitts at this point in my life. I learned to be able to gauge them from the mitts. I just get the feel for it.

ROBERT GREENE

Watching him, which is probably what the others did, watching him fight is much different than feeling the punch.

FREDDIE ROACH

Yeah. Much different. So, that's how I get close to my fighters, too. I'm in the ring with them. I don't like... like Tyson, he said I was too small to catch him. So he says he's going to have this other guy catch the mitts, bigger, and he wants me to just be in the ring and order him around and tell him what to do. So, for two days, I did it. I watched him, and the fucking guy that was catching was terrible, because he was so scared of Mike. He was like pulling away. Mike was hypersensitive and stuff like this. And I says, 'What the fuck am I doing here? Let me do my fucking job.' So I fucking threw him out of the ring and I got on the mitts with Tyson, and we just hit it off. Almost like Manny. Tyson is mad at me because I sold him plane. You know that one?

ROBERT GREENE

No.

FREDDIE ROACH

All right. We're going to the right. There's 11 of us at the airport. The captain comes up, 'Who's in charge?' Everyone points at me. We have 30 minutes to leave. If we don't leave in 30 minutes, my restrictions won't allow me to fly, and you'll get charged for the plane anyway. Do you want to go or stay? I says, 'Well, is there another plane for Mike when he comes?' He said, 'Yeah.' I said, 'Let's go.'

JAMES

This was before cell phones or anything like that. You can't get him anywhere.

FREDDIE ROACH

I'm not going to call him anyway. He's the one that's late. So I took his plane, and then the plane that he came on later was an old piece of shit. It had no food on it and stuff like this. We're like in the G4 or something like that. Food and shit. And he brought his daughter with him, tried to impress her and

stuff like this. They had to order Chinese take out for the plane and shit like that. He wouldn't talk to me for two days leading up to the fight. So then, I'm in the dressing room. I wrapped his hands, and he got the assistant to start catching the mitts. The first punch he throws he hyperextends and he missed. I says, 'Hey, you fucking sit down.' So I started working Mike with the mitts. I remember... he calls the girl his sister. I'm not sure if it's his sister. She goes, 'Who is that? Bruce Lee?' Because she never saw anything like me.

ROBERT GREENE

She said you were Bruce Lee?

FREDDIE ROACH

Yeah, because me and Tyson... because he puts combinations together and I can catch them. One day he hit me in the chin.

ROBERT GREENE

How did that feel?

FREDDIE ROACH

Not too good.

[laughs]

ROBERT GREENE

Maybe that might be the only time I was hurt by a punch.

ROBERT GREENE

Really?

FREDDIE ROACH

Because I was older. That punch, I didn't go down, but that punch fucking really, really made me wobbly, and everything was going black. I just knocked out. [laughs] So I started bouncing up and down and came back. That was a bad day.

ROBERT GREENE

Yeah. So it's true about his power, I'm sure.

FREDDIE ROACH

Power and speed. Very similar to...

ROBERT GREENE

Pacquiáo.

FREDDIE ROACH

Yes.

ROBERT GREENE

So I want to talk about this mitt work, because it seems to be the key to your success in a way. So, you said earlier that this was something that the Cubans sort of advanced in a way.

FREDDIE ROACH

They were way ahead of everyone else with mitts. Emmanuel Short says that he invented mitts. This guy...

JAMES

Emmanuel says that he popularized it, and then the Cubans take credit for it, and then the Soviets take credit for it.

FREDDIE ROACH

Ukrainians.

JAMES

And the Ukrainians.

FREDDIE ROACH

Everyone claims to be the inventor.

ROBERT GREENE

Well it makes more sense with the Cubans, because they have a much more fluid style, and it's more like...

FREDDIE ROACH

But yeah, the Cubans had a great style. They dominated amateur boxing for so long. For a small country to have as many good fighters and gold medalists as they did... they technically have... I mean, there's Cuban trainers all over the world now. People hire them to come. They're all the same, but they're all counter punches. They're all the same. Counter punches, and being a counter puncher in today's market is not that great.

ROBERT GREENE

You mean the Cubans? You're talking about the Cubans?

FREDDIE ROACH

Yeah.

ROBERT GREENE

But...

FREDDIE ROACH

But their style of mitts and stuff like that was very good. That was my learning process, and then I went into my own style.

ROBERT GREENE

OK. So, Virgil kind of turned you onto this.

FREDDIE ROACH

Virgil's the one that turned me onto it first.

ROBERT GREENE

Did it immediately strike you that this was something worth exploring, worth taking it on?

FREDDIE ROACH

Definitely. It was definitely worth it, yes.

ROBERT GREENE

What was it? What were you thinking about, that this could be more like a simulation of an actual fight? You can ingrain it more, make it more automatic?

FREDDIE ROACH

When I do mitts and I know the opponent that we're fighting, I try to become the opponent, and I show you what he does in

situations. And that's why when I watch tapes and study, I try to pick up the characteristics of the opponent and simulate what he does and show the habits. The thing is, habit's the best thing in the world, because that's something they can't not do.

ROBERT GREENE

Right.

FREDDIE ROACH

Mistakes, anyone could make a mistake, but bad habits are what you take advantage of.

ROBERT GREENE

Simulating the opponent, that wasn't something that you started right away with Virgil. That's something that you kind of evolved?

FREDDIE ROACH

Yes.

ROBERT GREENE

How did that happen? How did this whole mitt work thing sort of evolve? I'm sure it's growing all the time.

FREDDIE ROACH

You get more and more as video gets available. At one time, there was no video. You barely...

ROBERT GREENE

That's interesting.

FREDDIE ROACH

My whole career, 53 fights... I thought it was 54, but my PA says it's not.

ROBERT GREENE

[laughs]

FREDDIE ROACH

There's one missing. But I never saw a tape of my opponent. The only guy I saw before was Camacho or something like that. But mostly in my era, you went in blind. You really didn't know. And now you have tapes available of everybody. So you can study them, and so it's really changed the game a lot, because you know what you're up against a lot more now.

ROBERT GREENE

So you kind of put together watching tapes and mitt work.

FREDDIE ROACH

Yes. So, I try to become what he is. And sometimes it's like a southpaw, and sometimes I'm not really great at it, but they'll get the idea. It works.

ROBERT GREENE

So, is it something that's constantly evolving, the mitt work?

FREDDIE ROACH

It's always adapting to what our opponent is. Like me and Manny Pacqui  o, we're not like inventing the wheel right now. We're just coming up with great game plans. I show him what he's going to do in certain situations, and Manny knows what to do to counter it. But like, at one time, I would teach Manny, and that would be the end of it. But now it's both of us, because he'll show me...

ROBERT GREENE

You look at tapes as well.

FREDDIE ROACH

Yeah, and he'll show me where... he shows me a little different... he'll make an adjustment sometimes.

ROBERT GREENE

So, this is something that you kind of invented, because no one does mitt work like this. No other trainers use mitt work this way.

FREDDIE ROACH

There's trainers out there now that I think try, but they don't seem to see it, because it's not working.

ROBERT GREENE

And mostly do you sort of practice particular punches, or combinations? Or it's a bit more static?

FREDDIE ROACH

And like Mayweather's mitt work, it's a pattern. It's just something anyone can learn. It looks good for TV and stuff like that, but the thing is, that would never happen in a fight. I'll do like 30 minutes sometimes when I go up and down with Manny, but those

are just conditioning drills. And I explain to my fighters that this has nothing to do with the fight. But when we're doing mitts, everything we do will happen in the fight. There's nothing that I do that won't happen in the fight.

ROBERT GREENE

And what do you think is the function of this? Why is that so much more successful doing this? Why do you do that?

FREDDIE ROACH

I think it puts us closer together. I can get inside their head, because we're both in that ring for a long period of time working really hard.

ROBERT GREENE

You know what to work on, what's weak, what's strong. You can adapt your strategy to what you feel in the ring?

FREDDIE ROACH

Yeah, and I know what Manny needs, and I know what I need to do to be that opponent. So, I'm working on both.

ROBERT GREENE

And does it also give the fighter a better feel for what the fight will be like? You know how repeating something over and over again, so once you get in the ring, you almost feel like you've had the fight already.

FREDDIE ROACH

Well, you kind of know what's going to happen in the fight. The thing is, obviously styles may change. Everyone's trying to improve and change. That's why you can't dwell on the tape too much, because again, just because he fought this way with this particular style doesn't mean he'll fight this way with you. But the habits and so forth are the things he'll do every time. Like Mayweather, he has one bad habit that I know of. Just one. But it's going to work.

ROBERT GREENE

Are we going to have this fight?

FREDDIE ROACH

I don't know. I don't think so.

ROBERT GREENE

Really.

FREDDIE ROACH

It would have happened by now, I think.

ROBERT GREENE

So do you think that you've created something with the mitt work that people will be using 20, 30, 40 years from now? Have you changed the business?

FREDDIE ROACH

You know...

ROBERT GREENE

You see other people copying it?

FREDDIE ROACH

All the time. I hope they have success, because again, I'll show anyone... if anyone wants to come ask me about it, learning and stuff like this, I'm very open. I want to teach guys. I've had a couple of assistants that work off my style and stuff like that. I hope to be known for that, but I'm not so sure. It's just how I can measure them and how I can get

inside their head. I don't know how I get inside their head...

ROBERT GREENE

Well it's also unique for you, because you're capable of doing the mitt work. How many other trainers can physically sit there with Mike Tyson or Manny Pacqui o and work that way?

FREDDIE ROACH

I was a young trainer at one time. Now I'm getting older, but I can still do a lot of mitts and stuff like that. A lot of guys don't want... the guys who don't want to do mitts are just lazy.

PETER

Is it like an out of body experience a little bit in that you're catching all these things, and maybe you're not even paying attention? It just kind of happens.

FREDDIE ROACH

It just happens, yeah. I don't have to see the punch to catch it. That's why I'll get hit sometimes. Out of body... I don't think I

would go that far. It's just something that gets me... I think the biggest thing about mitts, besides the strategy and all that and stuff like this, the biggest thing is that they know I'm here with them the whole way, and I'm in there working as hard as they are.

ROBERT GREENE

There's a bond between you.

FREDDIE ROACH

100%.

ROBERT GREENE

A connection.

FREDDIE ROACH

Connection.

ROBERT GREENE

It's like tactile, it's physical. You don't even have to say anything.

FREDDIE ROACH

Nothing is said. It's just there.

JAMES

One more question from me. Do you continue to improve with your mitt work, or

did you reach a level and it's just like you're at that great level, and then that's that?

FREDDIE ROACH

No. I'll still get better.

JAMES

You will.

FREDDIE ROACH

The thing is, the better is more or less adjusting to the opponents. So you see something that you can take advantage of, so you have to come up with something that's going to work for that. And some of it I haven't done before. Like Mayweather. He's very difficult. His style is so hard... everybody's waiting for that fight, waiting for that fight. I want that fight, too, but there's a part of me that doesn't want that fight. There's a part of me that thinks we may not win that fight.

ROBERT GREENE

Well he's fought a perfect match. He's not very hittable.

FREDDIE ROACH

Manny, you know, Manny will have trouble.

ROBERT GREENE

He's defensive.

FREDDIE ROACH

He's defensive, and he's a great counter puncher. If you just walk to him like Manny can do at times, he'll get hit on the counter side.

ROBERT GREENE

But why is Mayweather afraid of this fight?

FREDDIE ROACH

He shouldn't be afraid. He wants to be undefeated so he can say he's better than Sugar Ray Robinson. Robinson has a loss and he doesn't, and as long as that stays that way...

ROBERT GREENE

Yeah, but Robinson fought the best.

FREDDIE ROACH

I know. It's absurd that he says he's better than these guys. But he can argue the point

with that zero on his record. If he gets that one loss, he can't argue that anymore.

PETER

He's in his own head. He writes his own script. If he's undefeated, it's an easy script to write. 'I am the best. I'm undefeated. Do you see any losses on my record?'

ROBERT GREENE

I just have one more card for today. It would be another half hour. Do you have another half hour in you?

FREDDIE ROACH

Yeah.

ROBERT GREENE

...and we could stop for the day.

ROBERT GREENE

So there was one thing where Manny, for all of his strengths, he didn't have a right hand, and you really wanted to develop that.

FREDDIE ROACH

Yeah.

ROBERT GREENE

So is it just a matter of the hours and hours of repetitions at work that developed Manny?

FREDDIE ROACH

A hundred percent.

ROBERT GREENE

Yeah.

FREDDIE ROACH

I didn't tell Manny that we were doing drills for that for at least an entire training camp. I probably didn't tell him until after the fight with [inaudible 02:02], I think it was. I think we'd started working on the drills before the Diaz fight.

ROBERT GREENE

Why didn't you tell him?

FREDDIE ROACH

Why didn't I tell him? I didn't think it mattered. I knew that usage was the key. And I wasn't going to be happy or satisfied until his right was as good as his left. And that started happening after that fight, so then I told him somewhere along the line there that

they're just drills. And we still do the drills, but I don't even know if he understands. On the mitts, he'll do what I tell him. Again, if there's a move that he's not comfortable with, he'll show me what he is comfortable with. So it is a working relationship between two people now. At first, it was just me, because I would dictate what he does, but now he's progressed. He knows the game as well as I do, so now it's a collaboration.

ROBERT GREENE

Is it mostly just the hours spent practicing? Is it muscle memory?

FREDDIE ROACH

Yeah, and right now I'm trying to do that with all my guys. I don't do it as much with my fighters now as I did with Manny. Me and Manny have a special relationship. It's probably bad for me to say, but I care more for Manny than the rest of my fighters.

ROBERT GREENE

Well, sure. He's like your son.

FREDDIE ROACH

I still think that's really changed me and helped me. I tell my fighters now, I say, "You know what? If you were in the NBA, you wouldn't be playing too much because your left hand is weaker than your right." You've got to be equal with both sides. To me, at this point in my life, there's no reason why both hands shouldn't be equal. You shouldn't have a strong side or a weak side.

ROBERT GREENE

You mean like in dribbling? You can only dribble to the left?

FREDDIE ROACH

If you can't dribble with both hands in basketball, you're not going to make it on TV on Sundays.

ROBERT GREENE

No.

FREDDIE ROACH

The thing is, why do boxers have a dominant hand and not equal? So I work with the guys on development and I talk to them about it.

Usage of the hand will develop it. But I don't push them really as hard as I did Manny.

ROBERT GREENE

Is this something that's going to happen in the future, where fighters are going to be equal with both hands?

FREDDIE ROACH

Yes.

ROBERT GREENE

Is that another one of the things you're changing?

FREDDIE ROACH

A hundred percent. That's definitely . . . there will be a point where if you're not equal with both hands, you won't be world champion.

ROBERT GREENE

Uh-huh.

FREDDIE ROACH

I've seen guys win titles with one hand, but there's no reason why they shouldn't be equal.

ROBERT GREENE

There's a thing called deliberate practice that they talk about in sports or in chess or in

any type of competitive thing, where a lot of people tend to practice the thing that they're good at.

FREDDIE ROACH

Yeah.

ROBERT GREENE

And they avoid the thing that they're weak at. What you really need to do to really become a master or to reach the top level is to actually practice the thing that you're weakest at.

Is that something that you're doing or you believe in?

FREDDIE ROACH

It's something that I've always done. Their strengths will come into activity in the [inaudible 06:31] by the flow and stuff like that, but I don't work on their strengths. I work on their weaknesses. I have a lot of fighters, 10 to 12 different guys right now.

The thing is, I know who needs what.

ROBERT GREENE

So like, Amir Khan, what would be his weakness?

FREDDIE ROACH

Well, everyone thought it was his chin. His weakness is he was looking for knock-outs instead of setting them up. He was just going in there and spreading himself and getting wide, and then he'd get knocked out. He got caught looking for knock-outs. He was successful for a short while, but then the first time he fought a good fighter or smart fighter, he got knocked out.

ROBERT GREENE

So you've worked on that?

FREDDIE ROACH

I've worked on that a lot. He's right-handed. He has a real good right hand, but his left hand is his best shot. I think he lacks confidence in his right hand because of an injury.

ROBERT GREENE

He's right-handed?

FREDDIE ROACH

Yeah. That's still his power shot, but everything else is set up from his left jab and

left hook. His jab is his bread-and-butter, to me. That left jab is harder to get through.

ROBERT GREENE

So you work on his right, then?

FREDDIE ROACH

I work on his right quite a bit, but I have to be a little bit careful with that because he does have ligament problems and does get really sore. So with him, I think the usage part is not going to be so effective because of the damage. They want to do surgery on it. They want to get a bone from his tailbone and put it into his hand. It sounded real complicated to me. I said, "I think that'll ruin your career." So we came up with a way that we wrap it to at least maintain it, but he still doesn't have full confidence in the right hand, because he knows he might break it.

ROBERT GREENE

There's nothing you can do about that, I guess.

FREDDIE ROACH

No, not much.

ROBERT GREENE

So what about Julio Chavez, Jr.? What's his weakness? What are you working on with him?

FREDDIE ROACH

I tell you, he's a real good student. The thing is he was always the boss and never let anyone be the boss, but he does let me be the boss. He's getting better and better as a fighter, but he's still young. I know he has 40 something pro fights, but 35 of those, they're not fixed fights or anything like that, but they're like opponents who don't belong in the ring and stuff like that. So he doesn't really have a lot of experience at a high level, but he's very teachable and he wants to be like Manny Pacqui o.

ROBERT GREENE

Oh, okay. That's a good thing.

FREDDIE ROACH

He saw Pacqui o work out one time and he told me he wants that.

ROBERT GREENE

Who wouldn't want that?

FREDDIE ROACH

I've seen him do the footwork that Pacqui o does, but again, he's tall and not as coordinated as Manny, but he's trying. His problem is he doesn't have enough discipline to stay in the gym for a long time. For him to win that world title fight, he needs to come to America and start working for that fight.

ROBERT GREENE

And you told him this? He does know?

FREDDIE ROACH

Yeah.

ROBERT GREENE

Oh, okay. We'll see.

FREDDIE ROACH

But he's said that many times. Well, in the last two times I've been training him, because in the last training camp, we trained for three weeks, which is not long enough to get ready for a fight, and that's why he didn't . . . he did

okay in the. He won the fight, but he should have done a lot better.

ROBERT GREENE

Maybe he needs to get knocked out. Maybe he needs to lose it.

FREDDIE ROACH

You know what? Him losing? Loss will do two things. It will make you better, or make you quit.

ROBERT GREENE

See what he is made of.

FREDDIE ROACH

Yeah. So it depends on how the people roll with it.

ROBERT GREENE

Who's he fighting in June?

FREDDIE ROACH

Zbik, yeah. Is he from Germany?

JAMES

[inaudible 11:13] Hungary and fights in Germany or something like that.

FREDDIE ROACH

But they say that the fight's going to be in Mexico City.

ROBERT GREENE

What's it like fighting in Mexico City with the altitude?

FREDDIE ROACH

The thing is that means we have to train at altitude for like a month before the fight.

ROBERT GREENE

It's a little tricky there. You don't realize it.

FREDDIE ROACH

Especially that high, say 10,000 feet. I'm sure it'll be advantage Chavez, because he's going to live there for a month before the fight, and the opponent will come in two weeks before the fight.

I've seen the opponent. I haven't studied him yet, but I've seen him fight, and I have an idea what we're going to work on with that.

ROBERT GREENE

Yeah, I want to get to that a little later, in the next interview, about your studying the

patterns. How important is the ability to focus and concentrate in practice and in fighting? Is it something that can be taught, or is something that somebody has?

FREDDIE ROACH

The good fighters have to have that. The fighters that are boxing and looking around and stuff like that, I just shake my head and say, "They're not going to make it."

ROBERT GREENE

Everybody can focus for a few minutes, but it's over time. And when you get tired, and in a fight, and it's the sixth, seventh round and you're starting to get tired, or when you're practicing, is this something that you work on? Or is this just a gift, like Manny just has totally focused animal and you can't teach that?

FREDDIE ROACH

Yeah, you're born with that. Like Manny in the gym, he's not focused. Manny in the gym, he is only going to give you like 30% or 40%, because that's all he needs. And

then when he turns it on for a fight, when he's fighting 100%, he's just a whole different guy. Manny's gifts, I think the speed and the power are really good, but his focus is really, really good. His eyes are burning through you.

ROBERT GREENE

During the fight?

FREDDIE ROACH

If you watch his eyes, he's focused when he's laying those on you. When they're apart, he can relax a little bit. But when he's engaging, he's very focused, and he sees. Eyes are probably one of the most important things in boxing.

ROBERT GREENE

How so?

FREDDIE ROACH

They have to see what's happening. Not everybody can do that.

ROBERT GREENE

Because the game is so fast?

FREDDIE ROACH

It's so fast, yeah. James Toney was the most natural guy at it that I've ever seen.

ROBERT GREENE

How so?

FREDDIE ROACH

He could measure you and see . . . he knew distance and he had great vision. He had great focus when he was in the fight. Manny Pacquião has great focus when he's in a fight. He knows distance. He knows when to strike and when not to.

ROBERT GREENE

Is this something that can be somewhat developed with practice?

FREDDIE ROACH

I think, yeah, you can practice it, but it's probably more of a gift though.

ROBERT GREENE

For this book, I'm doing a lot of work on the human brain, and I'm interviewing a neuroscientist. There's a part of the brain that handles spatial relations and measuring

distance. It's called the parietal lobe. Some people are more developed at it.

FREDDIE ROACH

Mm-hmm.

ROBERT GREENE

They've taken taxi drivers in London, who have to navigate without any kind of map, and they have measured and they have much larger parietal lobes. They've developed . . . it's like a muscle that can develop. I'm just wondering if you've ever had any experience with being able to make somebody a little bit stronger in that area? Or do you think it's a natural gift?

FREDDIE ROACH

I would say it's somewhat natural, but I think we can improve it, again, by mitt work and concentration and combinations. That's definitely part of it. The focus on the mitts is very important also. If a guy's wearing the mitts with me and he looks somewhere else, he'll get hit, because I'll say, "What the fuck you doing? What the fuck you're

looking at? What's going on over there that's so important?" On the mitts, they're with me the whole time. If they go off, they better be out of striking distance because they will get hit.

ROBERT GREENE

You pay a price in boxing for a lapse of concentration. It's pretty immediate.

FREDDIE ROACH

It is immediate.

ROBERT GREENE

We were talking about this earlier. Do you think that discipline and determination or tenacity is more important than talent in becoming successful in boxing? Or do you need both? Obviously not just on talent.

FREDDIE ROACH

Discipline is, I think, number one. Ability is number two. Because if you have, well, if you hit a guy like James Toney, who was a great fighter at one time, but he has no discipline, before I trained him, when he was middle-weight champion, I'm not sure, I think he

had more discipline than than he did later on in life. He got less and less because his success was . . .

ROBERT GREENE

Slow.

FREDDIE ROACH

Yeah. If James Toney had the discipline of a Manny Pacquião, he would've been the greatest fighter of all time, to me, because he's naturally a great fighter. He knows distance and he measures really well. He's got that gift of distance, which is probably the most important thing in boxing – distance.

ROBERT GREENE

Really? Distance.

FREDDIE ROACH

If you're too far away or too close, it's not going to work. Distance is something you develop over time, and everyone's a little different. You can't teach exact . . . there's no exact distance.

ROBERT GREENE

But you work on that in the mitt work.

FREDDIE ROACH

Yeah. Sometimes I'll get away a little bit, and call a jab and put my hand up. And if they throw the punch, I'll counter them and I'll hit them, because they started with a punch from too far away. I'll tell them, "Don't punch until you're in range."

But I don't think James Toney was taught distance and stuff like this. I think he just . . .

ROBERT GREENE

Just has an eye for it. A feel.

FREDDIE ROACH

Yes. Like he says, "You mother fuckers have to train. I was born to fight." And half that's true.

ROBERT GREENE

Only half?

FREDDIE ROACH

Only half.

ROBERT GREENE

And the other half is what kept him from being a great fighter. Well, he is a great fighter.

FREDDIE ROACH

No, he's not.

ROBERT GREENE

He's not? Well, he had success.

FREDDIE ROACH

Well, he had success, but the thing is he could have been so much fucking better. Yeah, he's a hall of famer for sure.

ROBERT GREENE

Did you train him?

FREDDIE ROACH

Six years.

ROBERT GREENE

I didn't know that. Wow.

ROBERT GREENE

Do you think that being disciplined is something you're born with?

FREDDIE ROACH

No.

ROBERT GREENE

Well, tell me . . . you can develop it?

FREDDIE ROACH

Yeah, I think like my mother saying, telling me that, it made me more disciplined in my training. I just did it to keep my dad happy when I was younger. The thing is she hit a nerve that made me want to be better and so forth. When I lost my first pro fight, my discipline got much better after that. I knew I had to work harder. I was a hard worker too, before that, but I turned the discipline up a notch. I think you're partly born with it, but you can improve it.

ROBERT GREENE

Do you think one aspect of seeing the rewards of your work makes you realize that discipline brings you some pleasures? That some of the pain brings you these incredible benefits?

FREDDIE ROACH

Definitely. The larger purses, the more money, the more press and stuff like this, it all adds to your confidence. Discipline is so important because it's such a disciplined sport. If you don't have discipline, you might

end up dead. But every fighter knows that, but not every fighter practices that though.

Or like with Amir Khan, when he got knocked out. I think Amir got too confident, because he was knocking guys out, but he wasn't knocking out anyone special. But still you kind of get caught up in that.

ROBERT GREENE

Is Amir Khan disciplined?

FREDDIE ROACH

Khan is very disciplined. He's younger than Manny. You can push that fucking kid so hard and he can respond. It's almost impossible to overtrain either one of those guys, but I've got to be careful a little bit with them now because there is a line there. I think Amir and Manny were both overtrained in their last fights.

ROBERT GREENE

Who were?

FREDDIE ROACH

Manny and Amir.

ROBERT GREENE

Oh, really. They were overtrained? That was my next question. How do you kind of keep it fresh for them, so that the fight itself is still exciting and that they're not burned out or bored?

FREDDIE ROACH

Manny, he's just will to win. It's for his country. We try to make it exciting by changing the runs, going to different areas, and not doing the same thing. Manny's a creature of habit. He likes what he likes and does the same thing over and over. Every day he comes through those doors in the, I'm waiting for that guy to be not disciplined because of the success that he's had.

ROBERT GREENE

Has it happened yet?

FREDDIE ROACH

It hasn't. He works harder today than he did the first day.

ROBERT GREENE

That's great.

FREDDIE ROACH

He knows he has to.

ROBERT GREENE

But are you a little bit concerned about over-sparring and things like that?

FREDDIE ROACH

I cut it down a little bit in the last fight, and I'll cut it down more in this fight because he doesn't need it. But the thing was, he didn't work that hard in the Philippines for his last fight. There were a lot of issues with typhoons and weather, colds and stuff like that. The last few weeks we were in L.A., he told he wanted to do his thing. He didn't want to listen to the training coach. I said, "No problem, do your thing. You know your body." But he did too much in that short period of time, so he burned himself out a little bit. It's nobody's fault, I don't think.

ROBERT GREENE

Working out?

FREDDIE ROACH

He just ran the hills every day.

FREDDIE ROACH

The thing is he doesn't want to go anywhere else. So his training coach was pissed off and stuff like that. But I say that Manny knows his body, he knows what to get in shape, but I think he pushed it a little bit too much, too close to the fight.

ROBERT GREENE

Because you have to keep it fresh and keep it so that you're still kind of [inaudible 29:47].

FREDDIE ROACH

What keeps it fresh for us is that the game plans are varying. Some will have similarity, of course, but they're never the same. I think that's really refreshes it. With Amir, we do a lot of different stuff with him. He's a lot younger than Manny, so you can push him a lot harder, and he'll respond and so forth. But I definitely think he was a little flat in the last fight. I don't believe in killing the guy every day. And I think he was killed in his last fight.

ROBERT GREENE

Okay. Last question of the day. It's gotten to the point where it sounds like you're almost learning from Manny – well, not as much – but you're learning from him as well as he's learning from you.

FREDDIE ROACH

A hundred percent. Yeah.

ROBERT GREENE

What are the kind of things that he teaches you?

FREDDIE ROACH

He has the ability to make, to do the moves that I teach him. So he makes it cleaner and faster, but he's like my role model right now. He is. I teach a lot of people through him.

ROBERT GREENE

That's nice.

FREDDIE ROACH

I use him as my example. These people aren't as talented as him and aren't as fast as him. But the thing is, you really don't have to be fast to make the move. The moves aren't that

hard. To try to get them to understand, I'll use Pacquiao as a learning tool a lot, and nobody can really argue with that.

ROBERT GREENE

No, they can't.

FREDDIE ROACH

The thing is me and Manny have a good rapport. Everyone's waiting for him one day to get on the bus and we're going somewhere, and they can't get Manny in the bus. I walked up and say, "Hey Manny, what's up?" And he said, "Let's go." And he got up and came in and said, "How'd you do that?" I said, "Do what?" They said, "How did you get him to get him to come?" I said, "I asked him."

ROBERT GREENE

He'll listen to you.

FREDDIE ROACH

More so than most. He still has a lot of respect. Again, he's gotten so big. I'm not his father figure anymore, but he still has respect for me. I can get him to do more than most I would say. But the thing is, he's one of those

guys that you actually have to slow him down rather than . . .

ROBERT GREENE

What is he? 31, 32?

FREDDIE ROACH

He's 32 now.

ROBERT GREENE

He's not slowing down?

FREDDIE ROACH

No.

ROBERT GREENE

Well, that's good.

FREDDIE ROACH

No. His speed is still . . .

ROBERT GREENE

But I mean also just discipline and practice-wise, desire and hunger.

FREDDIE ROACH

When Manny Pacquiao hits the heavy bag, the whole gym stops because it's like a fucking firecracker going off.

ROBERT GREENE

I just wanted to talk about how you communicate with your fighters as a teacher and trainer. Do you directly criticize them if there's something they're not doing, or do you find that you have to be careful or manage each different ego or personality? What's your style when talking to them?

FREDDIE ROACH

There are always egos involved. You have to be a little bit careful. You can't embarrass them and stuff like that. I'm really hands on and quiet with them. Mostly it's in the mitts. Nobody else cares but me and them when I criticize them for doing something.

Some of the guys, their egos are so big and so forth, I have to make them think they invented the move. Remember that move you made the other day? Then I'll show them, they'll say yeah every time. I want you to do that again.

ROBERT GREENE

They didn't make the move.

FREDDIE ROACH

They never made the move.

ROBERT GREENE

You have to show it to them?

FREDDIE ROACH

Yeah. I'll show it to them and say, "You remember that move?" They'll say, "Yes." I'll say, "Okay. I want you to make that move again. It's working, that move. I like that move." You have to almost trick them into thinking that they invented it. Steve Collins was the main guy. His ego was so big. It's funny because he would tell me, "I could look at myself in the mirror for hours." He honestly would say that. He lost his mouthpiece one time and I said, "Look in front of the mirror." He fucking found it. He loved himself.

ROBERT GREENE

That's not good for a fighter because you're afraid to get your face . . .

FREDDIE ROACH

He used to tell me, "What a success story." I said, "What?" He says, "Me." He went from nothing to making millions. It was a great success story. It really was. He would say that, and most guys wouldn't say that about themselves but he's like that. Manny has an ego and he's a little bit, I can trick him into making moves by . . .

ROBERT GREENE

Can you give me an example of what you would do with Manny?

FREDDIE ROACH

Same thing. Remember that move he made the other day where you took that double hook and then you got out on the second one? Yeah. I said, "Okay. Let's do it again." We'll do it a couple times in the mitts. I said, "That move's really good. Remember you do it in sparring the other day?"

ROBERT GREENE

They don't catch on?

FREDDIE ROACH

No. It's funny because last week Wendy was really upset because she doesn't get credit for what she does and her boss does. She was having this problem with this one writer. I said, "Make them think they wrote it and it was their idea." She said, "It fucking works."

ROBERT GREENE

That's one of the laws of power in the book that I get. It's a pretty good trick.

FREDDIE ROACH

People with egos, it's somewhat easier. People that think about it will say no. The egos in boxing pretty much [inaudible 09:08]. I can get to them that way all the time. The thing is our communication is very respectful. I'll use psychology to get inside their head. It's something that I can do. I get them to trust me and to make the moves. Sometimes they don't like the move. Most guys will do it just to please me, but they'll never do it in the ring. Pacquiao, our relationship is good enough where he'll make an adjustment

somewhere, and if the adjustment's good, I'll go with it. And if it's not, we'll get rid of it. Sometimes just going into their head and letting their egos get to them and teach them that way. I have success with that. Overall, I think just the trust. I'm very quiet. I'm not so sure I if I got that from my trainer. Probably because that's the way he was. It's something I don't do on purpose. I'm not a loud person. I don't yell at my fighters because I don't feel like anyone responds to being yelled at especially grown men. Lessons you learn.

ROBERT GREENE

Also overloading them probably with verbal instructions can get very confusing. It's more like it's got to be . . .

FREDDIE ROACH

In the corner, I'm going to give them one or two things. The first thing I do when they come in the corner. . . it's funny because HBO is saying, "You're not saying nothing in the corner." It's because I'll have them take two deep breaths before I'll speak to them

because I want them to be able to absorb what I'm saying. They come back to the corner and my first job is to calm them down. Then my second job is to give them one or two things they can understand that we've worked on. It can't be something that we. . . if I didn't work on it in the gym, then you're not going to do it in the corner.

ROBERT GREENE

Are all the fighters that you take on open to learning, or are some more open than others?

FREDDIE ROACH

Some more open than others. Some are experts. You show them the move and they'll compliment themselves on how they do it and how they make their moves. They're all a little bit different with that. Some want to learn that move and some say, "Oh, yeah, I know that move," and make it. The learning curve is so different with every fighter. Manny, if I show him something once, he'll get it and pick it up. When I trained

Oscar, it would take 10, 15 days. He's a very slow learner.

ROBERT GREENE

Is that right?

FREDDIE ROACH

It's not good or bad. When he gets it, he does get it. That's why he won the first five or six rounds in the Mayweather fight because I taught him how to cut a ring off. When I was teaching him how to cut the ring off and he didn't know how, I said, "Stop fucking around." He's had some good trainers before. Someone had to show him how. He said, "Freddie, no one's ever taught me that in my life."

ROBERT GREENE

Cut the ring off? What's that mean?

FREDDIE ROACH

It means staying with your opponent and not following him. If you follow an opponent, you'll be behind him. That's why he lost the fight with Mayweather. He cut the ring off in the first six rounds and then he started

following him. He couldn't see it. I couldn't get him to make the adjustment.

ROBERT GREENE

What are you doing instead of following him?

FREDDIE ROACH

You're cutting the ring off.

ROBERT GREENE

You're making him follow you?

FREDDIE ROACH

Yes.

ROBERT GREENE

Who used to do that? Was it Frazier?

FREDDIE ROACH

Frazier cut the ring off well. Ali, he could have cut him off a little better because Ali would always move to his left in a very predictable motion where Frazier could have cut him off a little better on occasion. His style was effective at that.

ROBERT GREENE

Manny is good at that?

FREDDIE ROACH

All my fighters are good at that.

ROBERT GREENE

It's something you have to teach them?

FREDDIE ROACH

Okay. They're not all good at it. I made a mistake because I had a fighter fight the other night and his biggest problem is cutting the ring off. We worked on it. It's one of his weaknesses, so we would work on it all the time in the gym. He's getting better and better and better at it in the gym and so forth. He fought the other night and he fought a guy that ran, and he didn't cut the ring off once in a 10-round fight.

ROBERT GREENE

The other guy ran? So he's following him?

FREDDIE ROACH

He was following him. He's one step behind the guy all night long. Most people thought he lost the fight but he won the decision. But a lot of people thought he got a gift. He told me, "It's okay. I won." Then I blasted him for saying that because with that attitude, he's not going to have any improvement.

ROBERT GREENE

They have to be able to criticize and be aware and be open.

FREDDIE ROACH

I will criticize them after a fight especially if something they know they don't do. I waited for all the reporters and everyone that wasn't part of the camp to leave.

ROBERT GREENE

You don't do it front of the other people.

FREDDIE ROACH

No. His manager was there and people close to him. I'll do it in front of them just because I have him for that moment. They'll back my story up. The next day he apologizes. Now he's back to square one and back to learning it.

ROBERT GREENE

Is this something that you do at mitt work or with sparring?

FREDDIE ROACH

Mitt work.

ROBERT GREENE

Just hours and hours of getting the rhythm down or how to get the person follow you?

FREDDIE ROACH

How to cut the ring off. It's funny, because when I trained Oscar and taught him how to cut the ring off, then he lost sight of it in the Mayweather fight. That's why the jabs stopped working in the Mayweather fight. Instead of the opponent being in front of you, he was one step behind him. You're following him. You're not cutting the ring off. The jab was missing. It wasn't anything that Mayweather did. It was Oscar's mistake. I knew that in the Pacquiao fight somewhere along the way he's going to start following me and Manny can walk him into shots. Evidently he didn't work on that at all when he was getting ready for Manny Pacquiao because it started happening in the first round. Manny just kept walking him into shots. I knew that was going to happen

somewhere in the fight, but I didn't know it would happen that quickly.

ROBERT GREENE

I think Mayweather would be a hard person to cut the ring off, to do that with.

FREDDIE ROACH

The thing is, speed can help you but it's so easy to cut the ring off in basic. You can cut the ring off with anybody. That's part of the game plan of Mayweather of course. The thing is, like Pacquiao, he's a southpaw so it changes the dynamics of how to cut the ring off completely. The way southpaws move and the way right-handed fighters move is . . . again, it's not a complicated move. It's very simple. Most guys end up following guys somewhere along the way. If you follow a guy, you will get hit because you'll walk into the shot.

ROBERT GREENE

How much of your job is to motivate them and get them in the right mind frame for the actual fight or is that up to them?

FREDDIE ROACH

Most of my guys I don't motivate because they chose this sport and they better deal with it. If I have to motivate somebody . . . I'm sure there are certain days where I do that because everyone can't be on every day. If it's part of them, I'll pass on them. I'll send them home. You picked this sport. If you're not motivated to win or get in shape, you got to go. It's like James Toney came to my gym last week to get him ready for a fight. He wants me to get him ready for a fight and the fight's two weeks away. He didn't look like he's trained a day. I told him I just can't do it. It's just not right.

ROBERT GREENE

What about for someone like Amir Khan where they have confidence issues? Is it more a matter of who you match him with?

FREDDIE ROACH

Yeah. Amir got knocked out in the fight before I took him over. They came to me when they first turned pro but they chose

somebody else. When he got knocked out, they came back to me and asked me if I could work with them. I trained him for about three weeks to a month before I put him in the ring and sparred him for the first time. The first time I put him in sparring, I put him in with Manny Pacquiáo.

ROBERT GREENE

You trained him for three months before he had any sparring?

FREDDIE ROACH

Three weeks.

ROBERT GREENE

Then you put him with Manny.

FREDDIE ROACH

Then I put with Manny. Then people said, “Freddie, why are you doing that? He’s going to get killed. He’s going to get knocked out again.” I said, “Well, if he gets knocked out, he doesn’t have a future.” I knew I had him ready to do well with Manny. I said, “If he does well, we’re going to erase that knockout loss and get his confidence back.”

ROBERT GREENE

It worked.

FREDDIE ROACH

It worked.

ROBERT GREENE

You didn’t say anything to Manny like, “Take it easy,” or anything like that.

FREDDIE ROACH

I would never do that. No. Sometimes the last day of sparring and stuff like this, I’ll tell the guys, “Just time yourself. Don’t go all out.”

Once a guy gets hit, you get him prepared for action at all times. My rule in the gym pretty much is if you hurt a sparring partner, you don’t knock him out. You don’t finish him. You let him off the hook. That’s the only rule. Up to that point, you’re 100%.

ROBERT GREENE

You wanted to test Amir Khan and see . . .

FREDDIE ROACH

I wanted to see if he had the heart, yes. He passed the test. He actually gave the best to Manny that day. His [inaudible 22:33] for

Manny. Manny got him back the next time. It was a knock down but it was a flash, real quick. He was done and out right away. He came back really well.

JAMES

The story has been exaggerated.

FREDDIE ROACH

The story has been exaggerated since that.

ROBERT GREENE

What did they say, that he got knocked out?

FREDDIE ROACH

Yeah. I think his knee hit the ground and he got up and finished his combination right there.

ROBERT GREENE

That must have done a lot for his confidence after facing Manny maybe.

FREDDIE ROACH

Like I told him, I said, “Okay. You do that with the best fighter in the world, you can do that with anybody.” The mistakes he was making, looking for knockouts instead of letting them happen and setting them up.

It was more his fault. The opponent just got lucky more or less because Amir walked right into the shot.

ROBERT GREENE

One thing I'm really interested in is the level of thinking that can go on during a fight. I'm fascinated on this in sports. Like in basketball where things are happening so fast, you don't really have time to think. It has to be automatic. Or like a fighter pilot in a very fast jet.

FREDDIE ROACH

It's all reactions.

ROBERT GREENE

How much thinking can go on in the ring? Is there any margin for that, or is it just all automatic?

FREDDIE ROACH

A guy like me, I never get to the point where I was thinking. In the gym, I could do it because I was the most settled. In a fight, once I get hit I get excited and it was just all automatic. Guys like Manny Pacquião and

James Toney and the guys that see things and make the moves, they set those punches up. World champion caliber fighters think.

ROBERT GREENE

Just a little bit.

FREDDIE ROACH

Mostly reactions, because if we haven't covered it in the gym and made it a response, then basically they're not going to make that move naturally or by accident. It had to be something that we covered for the most part. The thing is, some guys will make a move just to see what the reaction from the other person is. They don't have to act on it right away, but they learn when I make this move what he's going to do. They can wait and set that up. Guys like Pacquião and James Toney will do that. They won't always act on it right away. They're thinking. They're using their brain.

ROBERT GREENE

They are?

FREDDIE ROACH

Yeah.

ROBERT GREENE

I don't remember if it was John Elway or Joe Montana, but one of them was saying when they were really keyed in and in the zone, the game would slow down and that's what it was like.

FREDDIE ROACH

We talked about Pacquião before, he seems to be able to do that.

ROBERT GREENE

He does?

FREDDIE ROACH

Yes. I've never asked him, but he seems to be able to slow that down and react to that. I would say I think some people might have that gift.

ROBERT GREENE

You think it's just something that you're born with?

FREDDIE ROACH

Yes.

ROBERT GREENE

Okay.

FREDDIE ROACH

I don't think it can be taught.

ROBERT GREENE

It was something that you found hard to do.

FREDDIE ROACH

I found very hard to do. In the gym, I could do it. I would think my way through the gym fight unless I really got mad. In a fight, once I get hit. . .

ROBERT GREENE

That's because your emotions would take over?

FREDDIE ROACH

Yeah.

ROBERT GREENE

Maybe these other fighters, their emotions are more in control?

FREDDIE ROACH

One hundred percent yes. Guys like Pacquião's emotions are in control. Manny won't react back to it, but he'll tap his gloves and say, "Okay. Here I come." It's a see what you can deal with kind of deal. He'll let you

know you hit your good shot but now he'll act on it. After that, he tells you that he's . . .

ROBERT GREENE

He's telling who? You or the other fighter?

FREDDIE ROACH

The opponent and the fans. He does that quite a bit.

ROBERT GREENE

You don't think that quality that Manny has can be taught at all?

FREDDIE ROACH

No.

ROBERT GREENE

Really?

FREDDIE ROACH

I think he's born with it. I'm sure we can improve it and give him reassurance and stuff like that. I think you either have it or you don't.

ROBERT GREENE

In the war book, in warfare it's called "presence of mind." It's the ability of a general, in the middle of a terrible battle, to

keep his head together and be able to think and not let his emotions get the best of him.

Lord Nelson was famous for it. There was an element. . .

FREDDIE ROACH

Were there guys that were failures at that, that you know of?

ROBERT GREENE

Definitely. Most generals are terrible at it. It's the few that are great. . .

FREDDIE ROACH

They get killed?

ROBERT GREENE

They get killed. They get afraid. They overreact to something bad that happens. They're not able to think in the moment and adjust their fight plan. Napoleon was great at it. Lord Nelson was great at it.

FREDDIE ROACH

Hitler had to be good at it, right?

ROBERT GREENE
No, because Hitler wasn't a field general. You have to be out there with the bullets flying at you.

FREDDIE ROACH
He was never in combat.

ROBERT GREENE
No. He was in World War I.

FREDDIE ROACH
He just got a whole country behind him though.

ROBERT GREENE
That's a different thing. He probably did have presence of mind early on. You're right. In the actual battle, Rommel had it. He was a great general. There is an element where you could, at least I write in there . . . it's a matter of compensating for an emotional reaction. If you feel fear in the ring, you manage to go the opposite direction and feel extra confident. You compensate for any kind of emotion and go the other direction. Boxing is probably too fast. You can't teach that kind of thing.

ROBERT GREENE
I watched an interview that you did with, is it Steve Kim? Is that his name?

FREDDIE ROACH
Ex-boxer?

ROBERT GREENE
The reporter.

FREDDIE ROACH
Yeah, Steve Kim.

ROBERT GREENE
He was saying that Manny's ring IQ has just gone way up ever since he's been training with you. You sort of agreed with that. What does that mean?

FREDDIE ROACH
He's progressed from a kid who had just knockout power in his left hand and just looking for the knockout with one shot at all times to someone that sees things and sets things up. Footwork's improved quite a bit. His defense has improved, but it's still not 100%. He still can be hit with right hands. He's come a long way. I think a lot of that

is just experience and maturity also. I hope to say that I helped along the way. Just by listening to me . . . we worked on improving his right hand. I just made him use that more and more and more, just usage. He always had a good one, but he didn't have any confidence in it. The usage gave him confidence to use it.

ROBERT GREENE
A lot of it is setting things up. But that stuff you just practice. You recognize what he's weak in and you practice it so that he can use it. That's what it means in the end. His IQ has gone up. I don't know. You've given him a bigger repertoire of . . .

FREDDIE ROACH
Yeah. You've got one hand and now you have two and so many different combinations and punches you can land with that shot. It gives him a bigger arsenal of course. He's come a long way from day one until now just as a person also.

ROBERT GREENE

What do you mean by that?

FREDDIE ROACH

He's more mature. He's more of a man. He was more of a kid back then. He's come to me for advice. He'll make his own decisions.

ROBERT GREENE

Is that something you had a role in as far as him maturing?

FREDDIE ROACH

I helped along the way when he came to me and thought he was being taken advantage of and got the lawyers and stuff like that. We had a lawsuit. We did 14 days in federal court and beat the guy that was ripping him off. Slowly though he matured. The more he matured and the more experience he got at life, the less control I had. I still have control in the gym. I don't get too close to my fighters because I learned . . .

ROBERT GREENE

Virgil Hill. You got too close to him?

FREDDIE ROACH

Yeah. I'd tell him to do something and he'd laugh or something. I said, "fuck it. I'm not playing. Do it." It just didn't work.

ROBERT GREENE

You became friends and that was what the problem was?

FREDDIE ROACH

Yeah. We'd go out together and have a drink together and stuff like that. It's not a good thing.

ROBERT GREENE

That's law number two in the book.

FREDDIE ROACH

That's law number one with me.

ROBERT GREENE

Law number one is don't outshine the master which is what Wendy Willis had to do what you were teaching.

FREDDIE ROACH

The last couple days, I'll go on the track with the guys and race them, but I'll never win.

ROBERT GREENE

On purpose?

FREDDIE ROACH

Of course. I have a big advantage because they run an 800 and I only run the last hundred yards. I'm just jumping in there pushing them at the end and stuff like that. I have an advantage because they're tired and I'm not. It's like sometimes when a sparring partner, a guy that's running with him wins the race. I'll say, "What are you, a fucking idiot?" I won't tell him [inaudible 38:41]. They just don't understand. You want him to win now every time. If you play pool with Manny Pacqui  before a fight . . .

ROBERT GREENE

I'll remember that if I ever get in that situation.

FREDDIE ROACH

. . . you got to let him win because he's in winning mode.

ROBERT GREENE

I beat [inaudible 39:04] at pool and that was probably a mistake.

FREDDIE ROACH

You outshined the star, right? He probably remembers that stuff.

ROBERT GREENE

He probably does. I don't know if this is too philosophical, but I'm interested in the connection between the mind and the body. For instance, how much is tiredness a factor of something mental like your losing confidence in yourself? Do you think the mind and the brain are so connected that if you're feeling like you're losing then it affects your body so you can .

FREDDIE ROACH

I definitely agree your mind will control the body. I think tiredness is mostly mental.

ROBERT GREENE

You do?

FREDDIE ROACH

Yes.

ROBERT GREENE

Is there anything you can do to compensate for that? Do you work on the mind of your fighters?

FREDDIE ROACH

Like Pacquião, as hard as he works and so forth, that instills to him. His mind is strong. If you get the mind strong enough to believe that they're there, I think that'll control it on the positive side. It's just hard work. Pacquião's determination and dedication is great. Virgil's was also. He did hard work and stuff like this. James Toney, he was so cocky that his mind wouldn't go that way. He'd be cocky and confident all the way through.

FREDDIE ROACH

My dad used to tell me, "Boxing is 90% mental." Everyone gets ready for a fight. Everyone gets in shape and all that. It's who can pull it off.

ROBERT GREENE

Is that something you're born with or you can work on? It's just training and being

confident and being prepared. You said, "No. Everybody's prepared." How do you get that little 10% edge?

FREDDIE ROACH

I think that extra push, that extra work. You have to actually stop him from training. Sometimes with Pacquião, I'll turn the bell off so he can't go any more rounds. I got guys that didn't worry about overtraining. Guys that worry about overtraining are not mentally strong. Guys like Pacquião that doesn't think that's possible seem to be mentally strong. It's the individual obviously, but most of your world champions have similar tactics. They have discipline and they have talent.

ROBERT GREENE

It's not something necessarily that you're teaching.

FREDDIE ROACH

It's not teaching but you're reinforcing it all the time. You're like, "You're in great shape.

You're running hard. You boxed 150 rounds this fight." It's reassuring.

ROBERT GREENE

You feel really prepared. What happens if you feel really prepared and then that first punch comes and it's not something you were prepared for? That was the Mike Tyson quote.

FREDDIE ROACH

That happened to me once. I would say I was prepared for the fight but deep down I really wasn't. The guy hit me with the first punch and hurt me. I said, "Wow. What the fuck? Does this guy have rocks in his gloves or something?" I had a pretty good chin and stuff like that. He hit me with a jab and it hurt me. I said, "What the fuck?" I lost the fight right there. My confidence went out the window.

ROBERT GREENE

Is it a matter of you start thinking?

FREDDIE ROACH

Thinking too much.

ROBERT GREENE

Yeah.

FREDDIE ROACH

The thing is, when you're seeing stuff and seeing openings and so forth, you're thinking in one way. Then when you're thinking about, wow, this guy hits hard, and stuff like this, it's positive and negative ways of doing this. The positive way is going to make you better, and the negative is going to destroy you. I still wait for the day that Pacquiao comes into the gym and doesn't really have that discipline.

ROBERT GREENE

That'll be a sign of something?

FREDDIE ROACH

Yeah, definitely.

ROBERT GREENE

Is it better for a fighter to be specialized in one thing or to be skilled at several things?

FREDDIE ROACH

Skilled at several.

ROBERT GREENE

Okay. That's the answer I wanted.

FREDDIE ROACH

Manny was one dimensional at one time.

It was good for most of his opponents but not all of the opponents. If Manny hadn't progressed, he would have never beaten Oscar. The thing is, he was that same guy who was still knock people out and winning world titles, but if he didn't get the head movement and the footwork and the fakes and put that all together. We worked on all that stuff for a long, long time. It didn't happen until the David Diaz fight. Since that fight, he's almost fought perfect fights. Claudio was a little different because he was so defensive. Margarito had a little bit of success with Manny, but not too much because I think of his size. Manny, again, pre-Diaz he was okay. Diaz was the first fight where you can really see where he's thinking and setting things up. He kind of evolved.

Since then, he's been on the biggest roll in boxing.

ROBERT GREENE

Having a wider arsenal of skills that are pretty solid is much better than just having one really solid.

FREDDIE ROACH

He had one really good one. He could knock anyone out in the world if he lands that left hand. But it wasn't enough. My job was to make both hands equal. I'm working on that with Amir. Amir's left is better than his right because he has more confidence in it because he hurts his right when he throws it.

ROBERT GREENE

I wanted to get to the whole business of breaking down the patterns of the opponent, because that seems to be your key strategy, if I could say that there was, or no?

FREDDIE ROACH

Yeah. It's just more things they cannot do is what we're working on mostly. Like Ricky Hatton. He would be here and before he threw a combination, he would spread every time.

ROBERT GREENE

How long did it take you to see that?

FREDDIE ROACH

About a month.

ROBERT GREENE

Why did it take so long to see that?

FREDDIE ROACH

I wasn't looking at the right place. I was concentrating more on his feet and not on his hands. I was kind of disappointed with myself when I found that and I said to myself, "How the fuck did I miss that?"

ROBERT GREENE

Do you remember the moment when you recognized it? Was it like a eureka moment?

FREDDIE ROACH

I was just sitting on that chair there and then, fucking, I said look at it. Then it was every time he threw, he did it, not just sometimes. It was embarrassing that I didn't pick it up quicker. That's how he knocked him out with it because we knew that he would make that move first.

ROBERT GREENE

Well, take me through the process then. You just gather all the material you can, and you just sit here and watch hours of tape. Are you looking for something, or just kind of your mind is open?

FREDDIE ROACH

My mind's open. I think that's why I don't catch everything the first time and that's why I'll watch it more than once, the same fight. I'll have to watch more than one fight so I can make sure he's not just making that move because of the strategy dictating that style, that he makes this move with everybody. It's a lot of different tapes. It's like reading a book twice. You will get more out of it, they say, even though I've never done it. My little brother reads books two and three times. He likes to read, and he says that it's a huge difference the second time around.

ROBERT GREENE

It's very true. Or a movie. You can see a movie sometimes and see new things in it.

FREDDIE ROACH

The good thing about movies for me is that the end always surprises me because I don't fucking remember. I don't remember movies because they're just entertainment, they're not real.

ROBERT GREENE

Oh, I see.

ROBERT GREENE

So each time you come to an opponent, you don't know what you're looking for. You're just with an open mind kind of seeing. And it's different each time. It can be footwork or opening, right?

FREDDIE ROACH

Yeah. You have to watch it over and over, because sometimes you're going to watch the footwork, sometimes hands. It's like Shane Mosley. I know him really well. I've been around him a lot and I've seen him fight a lot, but I still haven't studied him yet.

ROBERT GREENE

You haven't studied him? You haven't gone through that process? Not yet?

FREDDIE ROACH

No, by the time training camp starts, I'll have . . . I have an idea right now. I'll have a better idea. By the time training camp starts, I'll have the game plan down.

ROBERT GREENE

How many hours of tapes do you have to watch for this? Or it depends? You've gotten better at it, I imagine.

FREDDIE ROACH

I've gotten much better at it. You just, you know, mostly before training camp, I'll get a good idea, and then as training camp's going on, there's a lot of down time in training camp. I spend 12 hours a day in the gym, and I have something to do with the fighters and running the gym and so forth. When I'm on the road and I'm training one fighter, there's just a lot of downtime. There's a lot of time to watch video.

ROBERT GREENE

And every fighter has this? There's not anyone that doesn't have this? You're not going to be able . . . they all have some kind of habit that they don't . . . that is a weakness?

FREDDIE ROACH

Everyone has habits, yes, and stuff that they may do, a move they make in situations that they make all the time. My job is to create that situation, how to make that happen and take advantage of it.

ROBERT GREENE

And you've never been wrong? It's worked every time?

FREDDIE ROACH

So far. My game plans are much better now than they were when I was younger. Again, because I watch more tapes, that's available now in a wide margin. When I was a fighter, there's like two fights in my life that I could watch tape on the guy, out of all of my opponents, because it just wasn't available.

ROBERT GREENE

That's amazing.

ROBERT GREENE

Since you've been doing this for . . . how long have you been doing this studying tape? Since Manny or before?

FREDDIE ROACH

I did some tape before, but really since Manny, I've been really watching a lot more and learning.

ROBERT GREENE

I see. Are you much better at it and faster?

FREDDIE ROACH

Yeah.

ROBERT GREENE

Yeah?

FREDDIE ROACH

It's just sometimes. Like the Hatton thing, I'm still embarrassed about and that took me a month. Yeah, I'll pick things up a lot faster now.

ROBERT GREENE

Is it a function of how many of these things you've watched? Or it's just your eye is more acute, you know what to look for?

FREDDIE ROACH

I know what I'm looking for.

ROBERT GREENE

Well, it sounds like you kind of are like Napoleon, in the sense that you're arming your fighter with more knowledge than the opponent. You're more prepared, strategically, than the opponent for things and that gives you, perhaps, the advantage, a big enough advantage to win. It helps, obviously, that you have Manny Pacquiao.

FREDDIE ROACH

Yeah. I definitely think that the game plans we've had for the last . . . since the Diaz fight have really helped a lot also and his evolution of using those weapons that we've been working on has obviously helped a lot too.

ROBERT GREENE

Other fighters aren't doing the same thing that you're doing? Other trainers?

FREDDIE ROACH

No.

ROBERT GREENE

Is that weird?

FREDDIE ROACH

Yeah.

ROBERT GREENE

They probably will, eventually.

FREDDIE ROACH

I tell them to. I don't make it a secret.

ROBERT GREENE

I know it's not a secret. It's the first thing I saw when I watched the HBO special.

FREDDIE ROACH

Either the knowledge of the right thing or they're just being lazy. Or maybe they just don't see it quite like I do. I don't know.

ROBERT GREENE

It's probably laziness.

PETER

I don't think a lot of them have the ability on the mitts that Freddie has. So it's hard for them to mimic another fighter's style.

ROBERT GREENE

Well, that's the whole thing. You're kind of mimicking like Hatton's thing with the arms in the mitt work.

FREDDIE ROACH

Yup. Because maybe it's not the strategy so much as what to do with the mistakes they make.

ROBERT GREENE

Well, that is the strategy.

FREDDIE ROACH

Yeah. But the thing is I can duplicate what they do.

FREDDIE ROACH

It was just with the MMA guys it was just like it was so easy for them to take people down and so forth from the back. I started with Andrei Arlovski on the angles a lot. But again, I saw it in the Foreman fight, but I

didn't . . . when I was teaching Manny, it just ended up because the other guy was coming straight ahead and Manny, I didn't want him to get stuck on the ropes again, so I had him slide off and attack him from the angle. That was the beginning of it, but then I started really working on angles more with Andrei Arlovski, and then it was so effective that I started really preaching it with every fighter I have.

ROBERT GREENE

So other things that you adapt or learn from MMA fighters that you can adapt for boxing? Is that the future to make it a little bit more fluid sport?

FREDDIE ROACH

I think . . .

ROBERT GREENE

More arsenals?

FREDDIE ROACH

Yeah, more arsenals. The MMA helped me a little bit with the idea of getting behind a guy, behind or to the side, to me, ended up being

the same because it's all offense and you don't have to worry about being hit back. Again, I saw it with Foreman and I remember that was a great move, but I never taught off that move. Probably I should have because it was one of the cleanest moves I've ever seen. And then Manny did it and then I realized that it's just so much easier to fight on an angle than head to head.

ROBERT GREENE

It's an old warfare strategy. It's called indirection or the side attack or the flank maneuver. Napoleon was a genius at it, because the defense is all geared toward the front, and when you attack from the side, they're not prepared for it. It's . . .

FREDDIE ROACH

It's very effective.

ROBERT GREENE

Yeah.

FREDDIE ROACH

All my guys work on it now. The thing is, depending on how he reacts to you and what

you do on the angle, is going to dictate how you react to it. It's usually offensive, but it can be used defensively also. You can just get a nail and get out if you want.

ROBERT GREENE

Yeah, because he's not prepared to punch.

FREDDIE ROACH

No. Basically, what the idea was, was that Manny, if you can keep the guy picking his feet up and turning, you've got the fight, you've pretty much got it won. Because if a guy's picking up his feet constantly, he can't set and he can't punch.

ROBERT GREENE

So you're just giving him more weapons than the opponent has.

FREDDIE ROACH

Yes. But the thing is, it's just having the confidence to make the move is what I'm having trouble with. Not everybody is confident to make a movie. And then sometimes they'll start making the move and then they won't punch though because

they're not . . . it's new to them. It's coming. Amir Khan's getting better at it. Martel and the guys are picking it up quicker, of course. The younger guys don't see it quite as clearly yet. I'm working with that girl, Hannah, the girl. She actually made the angle twice in her last sparring session, but she hasn't got the idea to attack off it yet. It's right there. I think eventually she'll get it.

ROBERT GREENE

Let's say that picking out the patterns and attacking that is one of your main strategies. What else? Do you have any other kind of strategic principles? I know speed is a strategy of itself.

FREDDIE ROACH

Speed's a gift though. You can improve speed, but basically you have it or you don't. You can improve it by experience and looseness and confidence, but the thing is, like Pacquiao's type of speed, Amir's speed, it's born. You can't teach it.

ROBERT GREENE

How about any other sort of strategic principles?

FREDDIE ROACH

A big part of my training is when you hit the ropes, which is going to happen in a fight, so I put my guys on the ropes so they're prepared for it, so they know what to do when they get there. It's like, who was it . . . was it the last fight? Margarito? When he went to the ropes and his feet were square. Was it Margarito?

PETER NO, CLOTTEY.**FREDDIE ROACH**

When his feet were square, he was defensive. When his feet were in, he was setting a punch up.

ROBERT GREENE

So recognizing that?

FREDDIE ROACH

Recognizing stuff like that. Like, Manny, when he hits the ropes, the mistake he makes is that he gets square. Most of his punches are the kind of arm punches off the ropes and

so forth, but he still has that fucking power where his feet are just tangled up. He's getting better at not getting them tangled so much, but he still has power. He can still knock you out even though he's square in the ropes. So, I prepare them to be on the ropes and to be under the gun because it's going to happen and the biggest thing is don't panic. It's okay.

Setting up a counter shot off the ropes is very effective because usually the guy's going to come with his best weapon because he thinks he has you in a bad spot. It usually is a bad spot, unless you have the confidence to make the counter shot. The counter shots are always available, especially, I think, when you're on the ropes because the guy's really going for it.

ROBERT GREENE

Aggressive?

FREDDIE ROACH

Yes.

ROBERT GREENE

Opening himself up?

FREDDIE ROACH

100%.

ROBERT GREENE

Does that sound like a problem? Panicking when you're against the ropes?

FREDDIE ROACH

With some guys. With young fighters, yes. It's like they know they're not supposed to be there, and they panic when they get there. Sometimes they'll make the mistake of going with their biggest shot as well as the opponent is making the same mistake. Putting guys on the ropes, what to do when you get there, what to do when you're on the ropes, that's a big part of my strategy also.

ROBERT GREENE

Can you do that with mitt work?

FREDDIE ROACH

Yeah. It's very easy to put myself on the ropes.

ROBERT GREENE

Or put them on the ropes.

FREDDIE ROACH

Vice versa. So the thing is, ring generalship is something that nobody teaches anymore.

ROBERT GREENE

Yeah. Tell me about it. Do you teach it?

FREDDIE ROACH

Of course. Eddie's biggest thing.

ROBERT GREENE

What does that mean briefly?

FREDDIE ROACH

Keeping yourself in good positions is going to make you much more effective and less vulnerable, less chance of getting hit.

ROBERT GREENE

Does it mean controlling the space?

FREDDIE ROACH

Controlling the space, 100%. The thing is, if I get you against the ropes in the corner and you've got like a foot to work with, room-wise, and I've got 22 feet to work with, I'm in a better place than you. Unless you get a talented guy that can fight off the ropes, which doesn't happen too often in our

lifetimes. You have James Toney, Wilfred Benitez, guys who have that timing and it's just born, natural instinct to fight off the ropes.

Usually, guys like that, that fight off the ropes, they're usually losing until they knock the guy out, because being on the ropes is still a place where it looks bad for the judges. Even if you're blocking half the shots and so forth, it still doesn't look that good. If you have a close run, the aggressor usually gets the edge. The guy leading the fight, not the guy laying on the ropes. So very few people can fight off the ropes.

ROBERT GREENE

So the ring generalship, is that something you just inculcate with just a lot of mitt work?

FREDDIE ROACH

Mitt work and then I get them cutting the ring off, which is the ring generalship and controlling the ring, not pivoting and not putting themselves into . . . like the angles.

Big lesson. This is the corner, right? So I can show some of the angles. I've got left to right. Now, I won't tell them which angle to make. I tell them to use a decoy and set the angle up. Sometimes the guy will use decoy and come here and make the angle on the left side. Being this close to the corner is the wrong choice. So I say, "Why'd you go that way?" I say, "Doesn't it make more sense to go the other way and put me in the corner?" And so that's how I teach it.

ROBERT GREENE

I see. I see. So there are ways to maneuver the opponent into the actual corner and not let, you know.

FREDDIE ROACH

Depending on where you are in the ring. Choosing the right move is what I'm more interested in. Most guys will favor one side or the other, so they'll go to that side almost every time and make that mistake every time, and then I'll put them in the corner and say, "Okay, now what are you going to

do?" So I'll show them it's a mistake. Ring generalship is controlling the ring. You didn't control the ring. You put yourself in a bad position. So the thing is, I work on not letting that happen. And then I have a rule that I say, "Okay, there's a circle two feet from the ropes. Your job is to stay inside of that circle and not be outside it ever."

Like Pacquião going to the ropes, I never want him on the ropes because that's where he's going to get hit the most. When he's boxing in the middle of the ring, he's . . . but he's kind of . . . he has to prove me wrong and the world wrong by saying he can go there and he can take that guy's punch. In his last two fights, he did it and he paid for it, but then after he paid for it, he got back into the middle and boxed. He just had to show me that he can take it.

FREDDIE ROACH

I think the thing is, I just don't think . . . most guys now don't know because they were never taught because of those Johnny-come-lately

type guys. The good trainers out there just being lazy.

ROBERT GREENE

They're not as disciplined and determined as you are.

FREDDIE ROACH

No one's going to spend 12 hours a day in the fucking gym, but I like it. I mean, it's fun to me. Even the last four or five hours of the day, I'm just babysitting Shane and the rest of the guys. Then I'll do mitts with the amateur kids sometimes and make their day a little bit.

ROBERT GREENE

So it's not difficult to figure out why you have so much success. It's pretty simple.

FREDDIE ROACH

I just try. I work harder than they do. That's probably . . . people get bored with stuff, I'm sure. Sometimes I'll get a little burnt out and stuff like this.

ROBERT GREENE

It's natural.

FREDDIE ROACH

It's natural. Once I get a challenge or a new fighter or a style that I have to improve, I like that.

ROBERT GREENE

Do you have like, as far as coming up with ideas and strategizing and looking at tapes and all of this, do you have like a thinking style? Are you more sort of visual? Do you see the whole fight in your mind, or are you kind of tactile? It's not, probably, verbal for you. Do you think in terms of images and stuff?

FREDDIE ROACH

Um . . .

ROBERT GREENE

Like, can you see a fight in your mind as it evolves and that helps you kind of figure out what to do? Or is it more in the ring using the mitts?

FREDDIE ROACH

Using the mitts.

ROBERT GREENE

So you're a tactile person.

FREDDIE ROACH

Yeah. I'll dream about fights at times. I've had occasionally and the outcomes and they've come true. But not too often. Most of the thing is tactical and the mitts. I don't . . . but when I'm watching the tape, I can see the counter.

ROBERT GREENE

Yeah.

FREDDIE ROACH

I can see the mistake and I can see what's going to work against that mistake and then I'll take that to Manny. I'll take that to anybody and they'll do it, but with Manny it's a little different because he'll make an adjustment where he's more comfortable, which is actually good.

ROBERT GREENE

So when you communicate this idea that you've gotten from watching the tapes, do you just tell him? Or is it more like you have to show him in the ring?

FREDDIE ROACH

100% show him.

ROBERT GREENE

That's what I'm getting at. Okay. I'm interested, just briefly, in this whole idea of you telegraphing your strategy to the opponent as far as like exactly what you're going to do. Did you do that with the Ricky Hatton fight? Did you reveal the whole . . . you don't reveal that part. But what do you reveal?

ROBERT GREENE

Those are real things.

FREDDIE ROACH

Yeah. So if I can take those things away, I will.

ROBERT GREENE

But that's getting in their head.

FREDDIE ROACH

Oh yeah, 100%. But it's more. Ali was just fucking mind games completely. He was just doing it with his mouth. He wouldn't take things away from them. But what style of

gloves they use or what the hand wrap rules were and stuff like that. I will take anything I can get, I'll use. People might think it's petty, but I don't give a fuck. Winning is everything. Losing sucks.

ROBERT GREENE

I have in a war book, I have a section on dirty warfare. It's like the last third of the book, the history of dirty warfare and I saw, any advantage you can find, go for it. It goes back thousands of years.

FREDDIE ROACH

And the guy that takes advantage of it always wins.

ROBERT GREENE

Generally so, yeah. It's how the little English army defeated the Spanish Armada, this giant, just all these kind of tricks and mind games. Do you use the press for this? You know how to plant things. You've cultivated relationships with people in the press and stuff like that?

FREDDIE ROACH

They'll write whatever I say. Yeah, I mean, I'm so open with the press. I guess that guy, we had one guy, he thanked me for being honest because I had said that Shane should retire after his last fight. He says, "Are you going to say that all of a sudden he's good again to try to sell this fight?" I said, "No. I still think he should retire, but obviously we live in a free country and he's choosing to fight and I'm sure he's going to do the best he can." I says, "He's dangerous for four rounds, and then we're going to fucking kill him."

ROBERT GREENE

So they think you're being honest, but you're kind of playing a game.

FREDDIE ROACH

Yeah.

ROBERT GREENE

They kind of love that honesty or the fact they can get a story from you.

FREDDIE ROACH

They love it. The guy thanked me like three times for being honest.

ROBERT GREENE

So are you still learning? Are you still evolving? Are you open to new ideas?

FREDDIE ROACH

I'm still learning and the new ideas, I'm not getting from anybody though. I don't look for like training to be around trainers. That really . . . back in the day, like when I was a kid, there were certain people I looked up to and certain people I was fascinated with and certain people I was disappointed in. Most of them disappointed me. There's no one out there right now that I want to learn from.

ROBERT GREENE

What can you learn . . .

FREDDIE ROACH

I can teach myself.

ROBERT GREENE

Teach yourself?

FREDDIE ROACH

Mm-hmm.

ROBERT GREENE

You're open?

FREDDIE ROACH

I'm open. But, you know, the thing is, like strength coaches and stuff like that, it's just like I'm coming to the point where I was accepting them for a while and the more I work with them and the more their egos grow, the more I say, "What the fuck do I need this for?" You know, because I don't . . . because I know how to get somebody in shape, a boxer in shape, better than they do, at least in my mind. You know that Chavez Jr. wants to fight [inaudible 1:18:07], right?

ROBERT GREENE

Do you feel like over the years you've gained kind of a feel for the sport that you didn't have, let's say, 10 years ago.

FREDDIE ROACH

Yeah. Everything is easier now to pick things up on tape and so forth. It's easier. I know

how to watch it more, because before I used to just watch the style of guys and stuff like that and work on that. But then different styles are never the same exactly. It took me a while to realize that. It just comes a lot easier to me, and it's like watching people work out and stuff like that. I have a good sense if they're going to make it or not.

ROBERT GREENE

Really? Can you explain that at all? Can you put it into words, or is it just like a feeling you have? What is it that you're seeing?

FREDDIE ROACH

Yeah. You see them get hurt in the gym a couple times, and their chins are a little suspect. Or their dedication or their work ethic. Because I'm not like watching them all the time. I'll do this sparring and then I'll put them on the heavy bag to do five rounds there and stuff like this. But I'm paying attention to what they're doing even though I'm not right on top of them and stuff like that. Some guys will half ass through it. Some guys will

go work hard. I know which guy is going to be better and which guy is going to make it. Again, I think it's something inside them that . . . champions are born and not made, but I think I can help them get there. But they have to have the ability and the desire to work.

ROBERT GREENE

So they talk like in chess, like the grand master in chess, they've studied their brains and their minds, and they call it chunks. So the beginner at chess kind of just sees each piece and learns where each piece goes. When you get to the point after 30 years of playing chess and you're a grand master, you don't see individual moves. You see chunks. You see patterns. Ten moves together is what you see in an instant. Do you have anything like that in boxing where now you're not looking at individual punches? You see whole patterns before your eye. Something like that. You don't have to say it. Only if it's true.

FREDDIE ROACH

I'm thinking. The thing is, when you're watching tapes and stuff, I think you pick up patterns of opponents. Everyone has patterns, but it's like . . . Manny has patterns, but he comes and goes at different . . . he's not exact. Manny's the type of guy that you don't know when he's coming or going. But the similarity of that motion is what makes him so deceiving. But he definitely has a pattern, but the thing is he varies the timing of that pattern. So it works for him. I think you can see patterns in other opponents.

ROBERT GREENE

It doesn't sound like it's the same.

FREDDIE ROACH

It's not the same. The thing is it's not exact.

ROBERT GREENE

It sounds pretty difficult than chess.

FREDDIE ROACH

No.

ROBERT GREENE

There are not like squares.

FREDDIE ROACH

No. The thing is, can Manny slow it down and see them folding a couple seconds before it happens? I think he can.

ROBERT GREENE

How about the boxing ring itself? So people who play the piano for many years, the piano becomes like inside their head. It's part of their body. Or chess, the board. Do you feel like the boxing ring itself . . .

FREDDIE ROACH

The ring is like . . . I know where I'm supposed to be at all times, and I try to teach them that. I know the ring, and I know where I want to be and where I don't want to be. If I put myself in a bad position, it's for a reason, because I'm trying to set something up. I know that like the back of my hand.

ROBERT GREENE

Do you feel where you are in the ring? You don't even have to think about it.

FREDDIE ROACH

No, I don't. The thing is, when I'm working mitts with high caliber fighters, I make sure that the ring is usually empty, so I have the whole ring. Because a lot of times I'll share the ring with people, with lesser guys, I'll share the ring, because it's not important. But with the high end, like the best guys and the guys that are going to make it, I know the ring, and I keep trying to put them in bad positions. If they let me, that's how I teach them. "Okay. Why did you choose that side, or why did you make that move? It put you in a bad position." I say, "The only reason you should be there is if you're setting a counter punch up." I'll ask them, "Why did you pick that?" They tell me, "So I can set you up with a counter hook." Then I'll know that they're understanding.

So, it's funny. You teach them though, like Power the other night. I worked on this one buddy. He has trouble with guys that move away from him. So we work on that every

day, on guys moving away, moving away, moving away. And then he knows how to cut the ring off and knows the adjustment to make. But he fought the other night, a 10 round fight, and the guy ran all night long and he never made the adjustment once.

ROBERT GREENE

So you are seeing larger patterns and incorporating them.

FREDDIE ROACH

Especially with that style, with Amir. Comparing the two styles generally, so we have an idea of what type of fight we're going to fight. But then as we break it down into individual moves . . . but it's pretty much the game plan throughout. Taking the styles [inaudible 0:17:09] those small adjustments you have to make along the way. I can see that better than most, the small adjustments that they have to make. But the thing is, I'm so sure that what they're going to do that I prepare the guys for that, for what they're going to have to do later in the fight. So, I

do see a bigger picture. We have a general strategy, but then small adjustments along the way. So, the overall game plan is . . . but the thing is, I usually come into the fights with at least two game plans just in case.

ROBERT GREENE

Oh really? Is this for adjusting if you have to adjust?

FREDDIE ROACH

Well, because he's watching tape also, and he's trying to . . .

ROBERT GREENE

You don't know.

FREDDIE ROACH

I'm not sure what he's going to . . . you know, like Mosely, he's going to try to hit Manny with the lead right hand, left hook is what I'm thinking. But maybe he's going to just lay back and try to counter Manny instead.

ROBERT GREENE

Does Manny know both of the game plans as well?

FREDDIE ROACH

Yes.

ROBERT GREENE

And you're just going to wait and see what happens in the first round and go from there?

FREDDIE ROACH

Pretty much.

ROBERT GREENE

That's very Napoleonic.

ROBERT GREENE

He called it a tree with branches. He had branches leading to the goal. So depending on what the enemy did, he would adjust. But he planned out two or three options.

FREDDIE ROACH

Shane is going to try to not be predictable and not be what he usually does, but there are habits that he's kind of stuck with, because again, he's not going to change that in two months time.

ROBERT GREENE

Have you ever been surprised in a fight where you've had to adjust literally there on the moment, where you hadn't planned it?

FREDDIE ROACH

Yeah.

ROBERT GREENE

And you're able to do that?

FREDDIE ROACH

Many times.

ROBERT GREENE

Really?

FREDDIE ROACH

Yeah. But for the most part, they'll go on. But there's been many times when a guy's changed and tried changing their style.

ROBERT GREENE

You mean the opponent?

FREDDIE ROACH

Yeah, the opponent. So then, the small adjustment to make . . . when I'm working with Manny for a fight, in this situation, he can definitely do this. But in this situation, he

might run away or he might come to you. So, again, because they're making adjustments also. So the habits I can count on, and the style I can't count on. So I have to have him ready for . . . that's why we watch a lot of tapes, because it gets different types of fighters because like fighting southpaws, guys will make certain adjustments for it, especially in the footwork.

ROBERT GREENE

Well, you do pretty good. You're pretty much prepared for anything.

FREDDIE ROACH

Yeah. You have to be.

ROBERT GREENE

So it's not really any total surprise during the fight that you need to completely adjust it. It's something you've seen.

FREDDIE ROACH

Yeah. It's something I've seen and something I've told . . . I won't tell any of my fighters to do something we haven't worked on.

ROBERT GREENE

I see.

FREDDIE ROACH

I can't, because they would fuck it up.

ROBERT GREENE

So you have to be as focused as the fighter in watching the fight from the corner to pick up anything so that you . . . it's almost like you're fighting it yourself.

FREDDIE ROACH

Yeah. The thing is, you have a better perspective than they do, because they're in the moment and you can see it a lot easier. But that's the big thing about it is if you get the fighter to listen to you. So, like Manny, he's looking up. Somebody asked me, "Is he looking for God or something like that?" I said, "No, he's looking at the fucking monitor."

ROBERT GREENE

When is that? In between rounds?

FREDDIE ROACH

He wants to see the replay. He wants to watch himself. But he's listening to me. So I used to fucking slap him in the face and say, "Manny! Look at me when I'm talking to you." I know he's listening, but he's watching himself. He's admiring his work. He loves to do that.

ROBERT GREENE

I hope he doesn't do that during the fight. That wouldn't be good.

FREDDIE ROACH

No. The good thing about that, it's inside the box. You can't really see it from there. But he does like to watch himself. Amir is like the best listener in the world, because he's still green and he doesn't know everything that Manny . . . Manny has learned almost everything. Amir doesn't know any of it. So Amir pays more attention because he realizes what I have to say. So he pays attention a lot more than Manny will. I'll tell Manny something and he'll go out and do it, so I know he's listening to me.

ROBERT GREENE

One of the ideas in the book is this idea of empathy. I don't mean in kind of a soft, sensitive way. I mean the ability to get inside the skin or the mind of the person that you're dealing with or the problem that you're dealing with. So, for you, it would be getting inside the mind of your fighters and knowing almost how they feel, being able to so totally identify with them. Is that a power that you've developed?

FREDDIE ROACH

Yes. But a couple times in my life, I haven't got there.

ROBERT GREENE

A couple fighters, you mean? With a couple fighters?

FREDDIE ROACH

Yeah. A couple fighters. Tyson was the hardest. He had been fucked so many times he didn't trust nobody. So it's like, with Mike, the first fight, I'm showing up every day. I'm doing the mitts with him. I'm close with him.

I'm the only one he talks to in training camp, because everyone else he just bosses them around. He treats them like shit, the rest of his entourage. I guess that's the way he is. But he had respect for me, because he grew up watching me fight. I had a good relationship with Mike. Every day after we'd do road work, we walk the last half mile or mile together and we'd just talk about strategy. He asked me questions about Eddie Futch. He'd tell me who he watched the night before, because he watched fighters who were similar to the guy he was fighting. What he saw and what he thought might work.

So, it was in the first fight, and we were really close together. We got along really well and stuff like this, but I still wasn't inside his head completely, because he would still ask me questions. Usually when I'm inside the head, he doesn't have to ask me. He knows, and vice versa. There's always that moment that you know you connected with the person. It's

like you see eye to eye and you know you've fucking got him right where you want him.

That didn't happen with Tyson until after I stole his plane, after I wasn't allowed in his room for two days. And then the night before the fight, he calls me at like 2:00 in the morning and said, "Freddie, can you come down to the room and wrap my hands?" I said, "Okay. You want anything else Mike? Should I bring my mitts or something like that?" "No, just come wrap my hands. I want you to wrap my hands exactly like you're doing it tomorrow for the fight." I said, "Okay." So I wrapped his hands that night at 2:00 in the morning. "Mike, anything else I can do for you?" "No, you can go back to your room now." I says, "Okay." So the next time I see him is in the dressing room for the fight, because nobody could find him. We found the hand wraps on the floor in the room, and how he got them off, I have fucking no clue. It looked like he bit through them. If you don't have surgical scissors to get

hand wraps off, they're really fucking hard to get off.

ROBERT GREENE

Oh, really?

FREDDIE ROACH

Yes. They are a pile of gauze and tape. "How the fuck did he get them off?" They were all chewed up it looked like. So, they found him on Beale Street giving money away to poor people. So he's giving to poor people, he's giving money away and stuff like that. Then he shows up in the dressing room an hour before the fight, just enough time to get ready. So, I wrap his hands, and then he wanted the other guy to do mitts with him, because he was still a little mad at me. So, the guy, first punch, he pulls away. Mike hurts his arm. I said, "Fucking sit down." And I grabbed my mitts and started warming Mike up. His sister says, "Who's that? Bruce Lee?" She never saw anyone catch like me. Because he was freaking explosive, and I could catch what he threw. Then, we worked on this last move,

and I said, "Okay. In this situation, Mike, when you do this, he's going to do that." So he made the move. We did it a couple times. I would give him breaks in between, because there's no bell in the dressing room and stuff like this. So I'd walk away from him for a little bit. And then I looked at him, and he looked at me, and I fucking had that connection. I said, "I fucking got him." I fucking finally was there. And it took a long time. So I knew I had him. I says, "You're ready."

ROBERT GREENE

So it's a moment where you kind of connected with looking at each other.

FREDDIE ROACH

Uh-huh. I had him.

ROBERT GREENE

What does it mean?

FREDDIE ROACH

I got him right where I wanted him. He's ready. I didn't need to warm him up anymore. He was ready to go out and fight.

And then he went out, and the same move that we worked on, he used and he knocked the guy out in the first round and he was really happy. He said, "Freddie, that was the move." And he was really happy and stuff like this. So, the next time I trained Tyson, I said, "Okay. I'm going to get in his fucking head real early this time. I'm going to have a good fighter." I never got in his head the whole fucking way.

ROBERT GREENE

Really?

FREDDIE ROACH

Nope.

ROBERT GREENE

Because he's closed. He's paranoid.

FREDDIE ROACH

I never got to him. I never had that moment. With Pacquiao, we have such good rapport with each other, the connection is almost every day. Some days he's off a little bit. Some days I might be off a little bit, but by the end

of the workout, we're both on, because we work so well together.

ROBERT GREENE

Do you sort of have a feel for what he's thinking and his moods?

FREDDIE ROACH

Yeah. Definitely. And the thing is, sometimes I'm having a bad day, because I have good and bad days.

ROBERT GREENE

And he knows it.

FREDDIE ROACH

I don't know if he knows it and stuff like this, but the thing is . . .

JAMES

He reacts to it.

FREDDIE ROACH

He'll react to it. The thing is, by the end of that workout, that bad day will turn into a good day, because I have to rise to his level, even though I don't feel like . . . it's just like, the medication is fucking with me, or I just don't feel good that day, or I didn't sleep

well the night before. But by the end of the workout, everything will come together. And that's something that happens every day with Pacquiao.

ROBERT GREENE

Wow. And sometimes with the other fighters as well? Not as much.

FREDDIE ROACH

Not as much, yeah. Like with Amir, I can get close to that with Amir, because he has a lot of trust in me. But Pacquiao, he's different. The relationship with him is much closer. When he thought he was being ripped off and so forth, a lot of people think that I went beyond my job and beyond what I was supposed to do to get the lawyers and make this lawsuit happen. A lot of people said that. Like I remember that one guy that makes the suits. He said, "Eddie Futch would be rolling over in his grave if he knew what the fuck . . ."

James: I'd say also, like with Manny, you two get . . . there's like a competitive element with it, too. You're pushing each other.

FREDDIE ROACH

Definitely. I'm highly competitive with everybody. I'm just that way. So, if I'm having a bad day, I know I've got to pick it up. And then when he's having a bad day, I'll force him to pick it up. That works really well between the two of us.

ROBERT GREENE

But you almost have to try and imagine what they're thinking, do you actually try and put yourself in their mind at all?

FREDDIE ROACH

No. I get this feeling of readiness and confidence. We don't have to speak to each other. That connection is never spoken. It's just a glance, a look, and you know you've got him. Sometimes one of my games is like . . . the last day of sparring, I'll schedule four to six rounds. And then if they look really, really sharp within three rounds, I'll stop it.

I'll say, "Okay. That's enough." And they'll ask to have one more round. I'll tell him, "You're ready," and I'll have that moment.

When they ask for that one more round and they're hungry to fight, I've got them. I've got them right where . . . I don't tell anyone, the fighters that at all. I can't let them know, because then it would just be bullshit.

ROBERT GREENE

I imagine not all trainers have that. It's something unique to you where you have that kind of close relationship, mainly from the mitt work perhaps.

FREDDIE ROACH

Yeah. There's a couple trainers, like Emanuel Stewart, out there. How he gets close with his fighters is he takes them in and becomes a father figure, and they live with him.

ROBERT GREENE

I don't think that's probably as effective.

FREDDIE ROACH

It's just way too much. They're grown men. They're not kids and stuff like that. You're

dealing with men. To become the father figure and maybe take his relationship with his own father. He used to do that, but now he just trains guys four days a week and takes three days off, and he enjoys life a lot more than I do. I enjoy what I do and stuff like this, but my biggest thrill in life is going to the gym for 12 hours a day and having dinner at a good restaurant afterwards. Or I might go to a movie.

JAMES

Freddie, in my experience from talking with a lot of these guys, he's not really crossing the messy line into these guys' personal lives. Doesn't care. With a lot of trainers I've talked to, it's like they want to know all about what's going on with their girlfriends and all the rest of it. Freddie, you would it's not necessary. Right?

FREDDIE ROACH

Yeah. . And I was a father figure to Manny for a long time. I was closer to Manny than most guys, but I was very careful to separate

. . . he'd come to me for advice and stuff like this on girls or whatever it may be. But I never became . . . I've been to dinner with Manny three or four times in my life over 10 years. So I don't want to be social with them. I don't go to the Palazzo and hang out with them and play darts with them and stuff like that, because that would affect our work relationship. Manny plays fucking jokes on everybody. I'm the only person in the world that doesn't have to worry about him fucking like taking my legs out from under me from behind and shit like that.

ROBERT GREENE

He knows not to do that with you.

FREDDIE ROACH

Right. He has way too much respect. He would never do that to me.

ROBERT GREENE

One of the ideas in the book is that sort of the goal for becoming an ultimate master is that you're able to bring out your own style, to be completely individual, do something

no one's ever done. Now I think you've done that in your career as a trainer. There's no other trainer like you. You created completely your own style, a lot of it having to do with your mitt work. There are other things as well. Do you think this is something that you try to bring out in your fighters as well? Because I know Ali, his genius was that there was no other fighter ever like him. He was so unconventional. He broke all the rules. He created his own style. Do you think that's something that great fighters do that you maybe try and bring out or no?

FREDDIE ROACH

I think it has to be more inside them, more natural. I think Ali, he did everything wrong, but he was so athletic he'd get away with it. You can never teach someone to be him, that's for sure.

ROBERT GREENE

But each person has their own personality and character.

FREDDIE ROACH

Yeah, and they all bring their own personality into the fight. They have their own personality. And obviously, I have to know their personality, because I know that's going to happen. Manny's will exchange with every opponent somewhat. I've taught him to be a better boxer, but somewhere along the line, he's going to go back to being the old Manny Pacqui o and just throwing the . . .

ROBERT GREENE

That's his own thing he created himself.

FREDDIE ROACH

I would never ask him not to do that. I would never ask him not to do that. ♦

ROBERT GREENE

What do you mean?

FREDDIE ROACH

The thing is, I haven't completely taken that away from him, because I kind of like that when he exchanges. But it's just for him, he knows to do it at the right moment at this point. At one time, he didn't. When he taps his gloves together, it's like he's telling the opponent, "That's all you got? Let's see if you can take what I got." Most coaches would tell a guy not to do that, but I like it. It's like, "Fuck you. Come on." It really is. I love that.

SANTIAGO CALATRAVA

ROBERT GREENE

Also, are you familiar with Paul Valery, the French writer, Paul Valery?

SANTIAGO CALATRAVA

Paul Valery, yes. Of course, of course.

ROBERT GREENE

I was going to get you another book by Paul Valery.

ROBERT GREENE

Oh, about the architect.

SANTIAGO CALATRAVA

Yes, about the architect. Yes, yes. But I know also Valery from the time. He was a big admirer of the architecture.

ROBERT GREENE

Yes, he was. But also of the relationship of architecture and nature, like seashells and rocks and minerals, things like that. Very interesting man.

SANTIAGO CALATRAVA

Yes. Also, by the way, you know, because you speak about the French, Victor Hugo, you know for sure, Victor Hugo.

ROBERT GREENE

About the churches.

SANTIAGO CALATRAVA

Yes, and he had written a wonderful essay on architecture. It's part of one of his books, most popular book, *Notre Dame*. And it is a chapter. He says, "Ceci tuera cela." "This will kill that." It's in the middle of the book, in the handling. You see there is this person, I think it's called Frollo or something like that, who works in the cathedral. And he's facing the cathedral, he points at the book, and says, "This will kill that." And then he goes into the next chapter and makes a parenthesis. Very beautiful. And described... and described the reason why Frollo has said that. And then he speaks about the gothic and speaks so highly. And then you see gothic soleil couchant. The setting sun over whole epoch. And then he says, nice scene, like Michelangelo, only who has understood that in all the trouble with these took the Parthenon, the Coliseum and the

Pantheon. It's very moving. He compiles the cathedral as a book, and hence the book.

And you see, there is also . . . the same book, very beautiful. More about describing a city is called "Paris a vol d'oiseau. So in the book, he takes two opportunities in which he described Paris, you see flying how it was in the Middle Ages. So vol d'oiseau, flying like a bird. Two beautiful passages in this book, very beautiful.

And there is also another book which may interest you also. It is a book of . . . it's not a writer, but it's a great artist in the town. It's Rodin, and Rodin was very influenced by Victor Hugo. He has done also the monument of Victor Hugo, shaped like that with the muses around. But very much in his romantic, late romantic, still romantic, but late romantic period. And you see what is interesting about Rodin is that he was not a cultivated man. He learned as a praticien. He was working in Belgium as a praticien. And he worked from Brussels to Paris, work. And

he was visiting cathedrals. And he wrote a booklet called “Les Cathedrales de France.” “Les Cathedrales de France.” And in this booklet, just in the beginning of his stay, in general, he speaks about the spirit, you see the cathedral. He also makes beautiful comparisons, like a poule, you see a chicken. He sees a head like that and the people entering into the cathedral.

Everything, in a way, has to do with comparisons of Victor Hugo. He was very influenced, because ... sphinx...like a kind of monster -- two heads, sphinx with two heads, something beautiful. Then, in a certain point, he goes just about architecture. He loses the whole, let's say, pictoric aspect, the colorist aspect of the cathedral. He goes into the architecture, and then he says . . . he used words like [speaking French]. But it's not written in a sentence. There's a sentence like that, which you cannot rely on. [speaking French]. They are enormous games of the volumes and the delight. In the 20th century,

there is a single definition of the architecture given by Le Corbusier, who says [speaking French].

ROBERT GREENE

He took it exactly.

SANTIAGO CALATRAVA

You see what I mean. He took it direct from [inaudible 0:05:54]. It's very beautiful, because you need the sensibility of a pure artist, as Rodin was. [inaudible 0:06:02] enormous plastic to deliver this very abstract sense of architecture. Who has not to do with the structure, who has not to do with the [inaudible 0:06:13], who has not to do with the materials. Is pure plasticity. And also in another essay, but this is less known. We are speaking about famous people. Now we'll speak about somebody who is not so famous. He's called Matteo Marangoni. He's an Italian fellow. He's a man of the beginning of the 20th century. He was a conservator of Il Bargello in Florence. And then he wrote a lot of books in Italian.

So it's almost the parallel of these movement of Germans who came, Borchert, and many others who came to Italy to rediscover the Renaissance. He was pushing ahead through criticism. He has a book, for me a very important book, called “Saper Vedere”. “How to See Art.” It's also translated in English. So the fellow is Matteo Marangoni. There is another fellow who took, he's called [inaudible 0:07:16]. But it's just like a parallel way of the working of . . . and then he has an essay inside on the architecture. And Marangoni says, “You see, you can see light. An architect, like a sculptor or a painter, can send his message through the force, [speaking Italian].” So he again is [inaudible 0:07:52]. It's interesting to see that very often, people who are a little bit outside of the current of architecture could be [inaudible 0:08:04] and also a very analytic way to understand the moment.

ROBERT GREENE

Did you read anything about what I'm doing on this project or not?

SANTIAGO CALATRAVA

Yes, I know what you're doing. You wrote me, and also the press person wrote me a note. I don't know very much, but we are speaking with each other.

ROBERT GREENE

Do you want me to explain a little?

SANTIAGO CALATRAVA

Yes, yes. Please, please.

ROBERT GREENE

And also, I speak Spanish, if occasionally you want to.

[Spanish exchange 0:08:50 to 0:09:45]

SANTIAGO CALATRAVA

Okay. Let's go for it.

ROBERT GREENE

So just very simply, the book is about what I'm calling mastery. And what I'm saying is there are levels of intelligence, and there's the basic intelligence that we use in our day-to-

day life. But when we try and learn something like art or architecture or science, as we go deeper and deeper into the field, we develop a different kind of intelligence. And the deeper that we go into this, we begin to have a feel for how things are supposed to be. The rules that we are learning about architecture or science, they become internalized, and they become alive from within. We don't have to think very deeply. Things come to us very quickly. This is a higher form of intelligence, leading to what I say is almost intuition or mastery. Knowing something so deeply from the inside, you know what makes things come alive, and there are people in history that exemplify this. So Leonardo da Vinci obviously. Charles Darwin in science or Einstein. Or I don't know if you know who Glenn Gould is, the pianist.

SANTIAGO CALATRAVA

Yes, I know very well the work of Gould.

ROBERT GREENE

Glenn Gould. These are the kinds of people that I consider masters. Now, I'm interviewing people like yourself and five or six other people who I consider similar to these people in history. And the reason I'm doing this is I believe people are losing a sense of discipline and process of what it takes to learn something so well that you develop this higher form of intelligence. And it's very dangerous I think. They don't know how to make things well, and if you can't make things well, they're not beautiful anymore. They've lost . . . so this book has a slightly didactic quality. I don't know what that word would be. Pedagogical. It's to instruct people a little bit about this higher form of intelligence.

SANTIAGO CALATRAVA

There are two things I want to add to your point. Maybe for people a little bit anachronic, out of our time. One is Plato. The beautiful is difficult. [laughs] He had

probably good reasons to say that. And the second is Socrates, who was his teacher. If you read *Phaedon* in a certain point, surrounded by his disciples, somebody asks somebody, let's say in a symposium about music, "Tell me about music." And then somebody says, "But Socrates, you will die in a couple of hours. Maybe one hour. Why are you interested for music?" And then he says, "Dying without knowing about music?" To die [inaudible 0:13:23]. You understand what I mean? It gives you two keys to understand the problem. Considering the relationship of Socrates and Plato and this work of the [inaudible 0:13:42] one of the milestones.

This is what we call the occidental culture. You need the understanding with all the contradictions [inaudible 0:13:50] all of that, you see. Then you see, these two points are the one side. Somebody who tells you it's difficult. Beautiful is difficult. And then the other side will say you need an enormous curiosity. You see what I mean? You have

to honor until very late in your life. It's like also the engraving of Goya. You see, when he was in Pontejos, completely deaf, he was unable to hear anything. It was not half deaf. It was total deaf. Goya takes a car and goes alone to Paris. [inaudible 0:14:35]. And comes back. People ask why he went to Paris and [inaudible 0:14:40] write a book, which it is Goya in France. It's called Goya, but it's Goya in France. [inaudible 0:14:46] who was the minister. And then he discovered that he went to learn lithography. He went because he understood a new metal to do lithography, so he went to learn lithography.

ROBERT GREENE

And he's already so old.

SANTIAGO CALATRAVA

And then he translated the *Bulls of Bordeaux* in a lithography. So this is the reason why we have one of his last engravings, called *Los Toros de Burdeos*. And he makes a lithography. But you see even very moving is to see this drawing he has done. Like Leonardo, you

see, nobody has looked like that. [inaudible 0:15:20] This is an old man getting two sticks, and he writes below, "Todavia aprendo."

ROBERT GREENE

Still learning.

SANTIAGO CALATRAVA

I keep learning. [laughs] It's a deep sense of curiosity. You understand, the sense of learning. But it's true what you say. It's not only learning, like hearing a little bit about science. Also, indeed, let's say, there is also a sense of perfection who goes through the work. You see that learning the craftsmanship, just getting lost.

ROBERT GREENE

In what?

SANTIAGO CALATRAVA

The craftsmanship, in the craftsman. It's getting lost. You understand what I mean. Maybe metaphysical reasons, because it's through realization and so on, but there are more complex things. You know that things get done somewhere else. They know

more here. You understand what I mean? The community is lost. It's not a matter of the community saying we have machines that can do buttons much better than doing it by hand. It's not that. But they think it's done somewhere else. So people lose the sense even of the elements that are essential, transforming material into, let's say, into another product. Because that's sometimes is moving to go to Mexico, because there it's disparate. Everybody is doing something. They do more toys. They do it all by hand. So there is [inaudible 0:17:04] comes home. he was here a couple of weeks ago. We are so happy when he comes, because he always brings something extraordinary from there. Maybe a napkin.

ROBERT GREENE

From where?

SANTIAGO CALATRAVA

Mexico. A napkin or something like that, or a [inaudible 0:17:18]. Things like that. [inaudible 0:17:21].

ROBERT GREENE

Only in Mexico or places like that do you still find it.

SANTIAGO CALATRAVA

In their situation, they are still living a sense of the craftsmanship, which it is a basic. It's very important. It's a basic. There are people who look back to a source of inspiration and know what's important.

ROBERT GREENE

Well, so, the way I'm structuring the book, I'm very influenced by the idea of the Medieval crafts where you went through an apprenticeship, and then you became the journeyman, and then you were a master. So the book is structured like that. So actually how I'm going to talk to you, I'm going to be kind of going through your life a little bit like that as well. So I wanted to begin with your earliest years very briefly. I've been reading everything about you, but I don't know much about your parents. Your mother, it seemed

like, was interested in sending you, in you going into art.

SANTIAGO CALATRAVA

Let me, a little bit, speak about, just so you maybe can see to it, my parents. You see, indeed, no one of them has had any professional relation to the . . . I want to add something. If my father would live today, he would be far over 100 years. I came very late.

ROBERT GREENE

How old?

SANTIAGO CALATRAVA

Over 100 years. I came very late.

ROBERT GREENE

He's still alive?

SANTIAGO CALATRAVA

No, no, no. He passed away young.

ROBERT GREENE

Oh, he would be.

SANTIAGO CALATRAVA

Si mi padre vivia hoy, because I was born the last of four and unexpected. And so it was my mother. My mother was a bit more [inaudible

0:19:31], 42, 43, which was at the time, was old. My father was in the 50s. And also, he passed away when I was very young. I was 12 years old, and he became very sick. And then when I was 13, he passed away after two operations. And now, you see, my father was dedicated to the commerce. He was exporting out of Spain fruits and agricultural products, which at the time was one of the few sources of export from Spain. Because you have to think, Spain after the Civil War, and very isolated. Artists and even the tourism have not started. [inaudible 0:20:17] phenomena in Spain is in the middle of the '60s. Then my grandfather, who was doing the same, the father of my mother, the same business as my father. He was the correspondent of my great grandfather in Paris.

So it's a tradition of export, people working in the trade and export. He was more than 20 years in Paris, and my mother was always saying, "You have to go to Paris." So indeed, she sent my very young. I was, I think, 13

years old when I was sent to France. And this was an important step, just because it has almost assigned my life. From this moment on, I was going abroad. Then I went to Switzerland. Finally I studied in Switzerland. And still today, I am living out of my country. Although, I am very deeply rooted in my country, because my family still today is all there. Now, this is a point. The second point is that where it comes in this context, the activity, call it like that. You see, I think there is . . . imagine my father goes to Madrid for business. Comes back, and he speaks only about the Museo del Prado. You understand? I remember as a kid getting with him to visit the Museo del Prado. A very moving experience as I remember.

ROBERT GREENE

You went to the Museo del Prado with him?

SANTIAGO CALATRAVA

Yeah, with him. I was, I don't know, maybe 10 years old, 9 years old, something like that. He was already, not sick, but I didn't

know at the time I would maybe live with him three more years. So very interesting to see, discussing . . . even at home with my brothers at the table. Also another interesting aspect is, some days after lunch, we would also hear music. Today, if I were trying to do that, I'd hear a lot of music and my kids also. You can't imagine at the time to hear a record or something like that. It was almost [inaudible 0:22:35] a piece of classic music. So it's a very simple way, you learn to think. For example, an artist is more important than a businessman, is more important than [inaudible 0:22:55]. This is what you learn as a kid, you understand.

ROBERT GREENE

Where did you learn that?

SANTIAGO CALATRAVA

From my father, because otherwise he would only speak about business. But coming back from business, he spoke only about the Museo del Prado and the beauties [inaudible 0:23:08]. I hear about him getting

to Toledo. I didn't go with him to Toledo, but you see [speaking Spanish] the wonderful composition and all of that. Discussions, you see, if [speaking Spanish] there is a horse, you can see it in the back, only standing on two legs. The other two legs are up. So, [inaudible 0:23:33] for example, telling that in the middle of the painting, there is a ambrosio. I remember those things. It's just to give you that although it was [inaudible 0:23:43], but still for a kid, you open your mind. You see, there is [speaking Spanish] in the middle. And then they give each other [inaudible 0:23:51]. They're [inaudible 0:23:54] and who lost. There it makes, by the two fellows, you don't know. As you know, he kept attention, you see, he has to be gracious in the defeat and magnanimous in the victory. Do you understand what I mean? So the two men, you don't know who of them has, you see. So this [inaudible 0:24:19]. Painting of Velázquez. He was crazy about Velázquez, my father.

ROBERT GREENE

He was crazy about what?

SANTIAGO CALATRAVA

Velázquez. He loved Velázquez. But also El Greco. Just to give you a little bit. These things, I am telling you, I learned them at home, and I learned them when I was maybe 8, 9, 10, 11, 12 years old. And also another aspect that might also be interesting for you is that I was drawing the whole time. So I'd usually take a piece of paper to draw. It was easier for me to draw than to speak. Even as a kid, in the kindergarten, we had the big black board. I used to draw things there that . . . even I remember myself drawing.

ROBERT GREENE

When you were 4 or 5 years old.

SANTIAGO CALATRAVA

4 or 5 years old and even later when they sent me. But in between, in the meantime, apparently I was so persuasive in this decide to draw. And I say always I wanted to become a painter. Then my brother Joseph who was

much older than I, 15 years old, elder than I or something like that. But I remember with him going to the arts and crafts school. It was in the neighborhood. Not very close to our house, but in the neighborhood.

ROBERT GREENE

In Valencia?

SANTIAGO CALATRAVA

Yes. And then entering into the arts and crafts school, probably when I was eight years old. And going every afternoon, after finishing school, with other people who were learning crafts. So they were apprentices. And then they went at 5:00 there to learn from 5:00 to 8:00, courses. Modeling, clay, or drawing. So they were older than I was of course. I was a kid. They just admitted me because my brother and the family and all of that. They said they'd let me in. I was sitting there drawing a little bit, watching. But it was almost interesting, because they also would receive lectures on architecture. The first lectures in my life, I received it there. And I'll

tell you how it was. Because even for those who want it, they could receive 30 minutes in a specialty after that. And because I was always accompanied by one of them, so I stayed there. And you know, at the time, no slides, nothing. Just like the old . . . no slides.

ROBERT GREENE

What did they have?

SANTIAGO CALATRAVA

They had rows [inaudible 0:27:15] and then you see an image. The image was a column. [speaking Spanish] Things like that. They showed the image of a Greek temple [speaking Spanish]. But all done in the old fashion, because Spain at the time was still in the '50s probably.

ROBERT GREENE

Late '50s, uh-huh.

SANTIAGO CALATRAVA

Late '50s. And the school was also very . . . it was a poor school. Good teachers, however, because you see, the first art school in Spain, artisan school, was established in Valencia.

Valencia had a tradition of academy. The first one, before Madrid, before it was called La Academia de San Carlos, which still today exists.

ROBERT GREENE

How old is it?

SANTIAGO CALATRAVA

There is La Academia de San Fernando in Madrid, who comes from the King Fernando VI or something like that. La Academia de San Carlos is at least 100 years or something like that, and they used to have also a school of architecture. So I say these are a little bit points that made also for me, when I look back into the 10 years of my life, there was fundamental aspects. After that, as I say, I was moved into school. It was not a boarding school, but I had to enter there at 8:00 and leave the school at 7:00 in the evening. It was a very intense learning program. No time except inside the school to draw, which I was doing. For example, imagine what day was the anniversario for teacher, we had the day

off. And so I went to the blackboard. I will, again, draw for everybody. So to draw for me has been a constant in my life, which it is even today.

ROBERT GREENE

And so, your first interest was in drawing, not necessarily in architecture.

SANTIAGO CALATRAVA

It was in drawing and in painting. In painting also, water color, yes.

ROBERT GREENE

When I see your work, the shapes and the forms that you create, they're very much like sculpture. Was there anything in Valencia . . . I know like the Mediterranean and the light has a very large impact on your work. What about the shapes and the forms and the things that you were seeing as a child? Has that had any influence on yourself?

SANTIAGO CALATRAVA

You see, let me tell you. What I have done from this moment . . . so, along the time in the school, I was having . . . not changing my

mind, but this thing, the school, sometimes getting towards the university, sometimes it gives you other point of views. It's not a disoriented view, but stereotypes of certain professions. So I was maybe interested in a certain moment to enter into medicine, because my brother Joseph who has studied medicine, and I thought maybe I could study medicine. But I give up at 16, and I say, "No, I belong to the world of the art, and the thing I like to do is art, and the thing I can do the whole day without getting tired is that." So I decided to switch into the art. But from this moment on, there was a combination between the interest in the exact science, geometry and general mathematics even, and also my interest into the painting and drawing. Now, probably you see, if I was really good at this point, I switch for an art school and dedicate my life to painting. But from this moment on, you get the baggage of six, seven years of studies, oriented you in one direction. So I decided to go to the art school, but it didn't

work. I even went to Paris for a while, then came back.

ROBERT GREENE

You were there in '68.

SANTIAGO CALATRAVA

And then I understood that the academic school was [inaudible 0:31:50], was refounded in Valencia. That was during, maybe, a lot of years it was not an architecture school, but suddenly it was an architecture school very young. And I decided from the art school to switch into the architecture school. So I went into the architecture school.

ROBERT GREENE

Was that because of the Corbusier that you .
..

SANTIAGO CALATRAVA

Yeah. Let me tell how it happened. Because it's interesting. I will come to your question, but I come a little bit around it. I went into a library, no, you could buy articles for drawing and painting, and then there was a small booklet, like that small. And then there was

a photo in which you saw in a dark blue background three ellipses in different, very bright. And I bought the booklet, and by studying the booklet, I discovered the plastic of the work of Corbusier. Indeed, I also later on, I [inaudible 0:32:54] drawings to the school in the lessons of geometry. And so I was enormously interested, and indeed, also during my studies, I visited many of his works in France. But also, another book was now being in the architecture school, I bought it also, was a book called *Before the Architecture*. And it's a book that somebody has done photographing the Mediterranean light.

Particularly this book moved me even more than anyone else, because I decided myself to travel in the Mediterranean, which I have been doing, and also systematic. For example, we have done work on the native architecture in the region of Valencia and the area that was very familiar for me. Studying those white houses, you see studies on the [inaudible 0:33:55] of them, types, typologies

and all of that, together with two colleagues. We also went to Ibiza, which at the time, you know you have to imagine, I was maybe 19 years old, so we are speaking about 1973, something like that, '72, something. So at least it was a time [inaudible 0:34:20] has not aggressive. There was a lot to see. Even typical fellows, personalities from the island.

So I started getting more and more familiar with the purity and the volumes and the relation between landscape and architecture, which in the Mediterranean area sometimes is very integrated, but sometimes it's also very specific. You can see that if you want in Tuscany for example, which is also part of the Mediterranean. You see those houses. You have a hill, and then they put the house up on the top of it and signify the place. So, then from there, I traveled along the whole Mediterranean. So I became more familiar with the Italian coast. For example, places like Costiera Amalfitana. I have been there three times by walk.

Positano.

ROBERT GREENE

Positano and all those, yes. And always in October, for example, when tourists they have all left. And walking alone three times. Amazing. Ravello, all those places. There, it's pure Mediterranean, but also it has sometimes a very academic character [inaudible 0:35:34], the cathedral. You see the incline, el pulpito, you know where the priest goes up to preach. It's a master work. So, you started discovering this amalgam of classicism with popular architecture, or also to fortify. Then I went to Sicily also and Monreale, up in Palermo. Amazing. La Cuba in Palermo. San Giovanni degli Eremiti, very pure cubic form with the cupola. Then I went once to Greece.

ROBERT GREENE

Where?

SANTIAGO CALATRAVA

Greece. The Greek islands. There was the [inaudible 0:36:22]. In Greek, how do you say, "I want to die"? Not too much. In the most bold landscape, the church white. We've got blue. You speak about a language. The architecture express itself. It is not shy. It delivers, express itself and illustrate, humanize the landscape. So this is the great [inaudible 0:36:50]. This is the great . . . so this period was enormously interesting. Of course, you see, I went to see the Parthenon. But you see, you need so much time. You need so much time to understand what is behind that. There is so much rationality, you understand. Also, you can let people explain to you that [inaudible 0:37:12]. Although I have to say, the last time, being already a mature architect when I was working, for example, for the Olympics. I took my son Gabriel up into the Parthenon, and being in the Propylaea [inaudible 0:37:25]. But you need the maturity.

It is like Hagia Sophia. Hagia Sophia [inaudible 0:37:31], but in order to understand the beauty and the intelligence that is behind it, you need a lot of maturity. You see what I mean? Many of the things I am telling you, this combination of landscape, color, and cupola are very evident. Everybody can almost like it or dislike it. But things like Hagia Sophia, entering in the architecture, imagining all these churches full of mosaics, seeing the light, up in the top, you see for hours because I got a permit to stay there. I stayed half a day, just getting a little bit. Seeing also the enormous technical achievement to do this very shallow cupola is like the Pantheon, the church of the Pantheon. Any time I go to Rome, I enter there just to meditate about it.

ROBERT GREENE

It's the most beautiful building.

SANTIAGO CALATRAVA

Because it has to enter in yourself. So it's another level, because the rational decide and

the intention of doing something, let's say, that has a presence, that over the centuries remains readable. It's explicitly done. Which it is different in the popular architecture. Architecture without architects. Let's go like that. It's more like an instinct who bring people to deliver these kinds of things in which they solve everyday problems. So it's another type of approach, although I understand. But this is just to give you a little bit of [inaudible 0:39:06]. Let me make a break. Can I do a break for a few minutes?

ROBERT GREENE

Of course.

ROBERT GREENE

So, you went to architecture school, but something about it, it seems like you were lacking some kind of discipline or some kind of rigor. And so then . . .

SANTIAGO CALATRAVA

You know what happened, it was a very difficult moment. The school has had . . . very young school, you understand. Very

young school. But when you are 20, 22, you don't need much more. It's just a problem at the time, which may also be an advantage after that, was the fact that we were in the last phase of the Francos. The Francos who had been in the first phase and the middle phase all the way back. But at the end, it was terrible. At the end, was the [inaudible 0:40:22]. At the end was the police in the school. You see the police entering into the school. People between us who were also policemen.

ROBERT GREENE

Spying.

SANTIAGO CALATRAVA

Spying and things like that, because it was a terror. It was a political terror. Terror in Espanola. It's not like in France with only the guillotine. Bad terror, you understand. Probably the most courageous of us get so engaged that they even, some of them finish in prison. And you see, this is an experience you don't want to have. Indeed, you see

probably the very best of art [inaudible 0:41:02]. It is the same. They kill him.

ROBERT GREENE

Who?

SANTIAGO CALATRAVA

Ernesto [inaudible 0:41:08], they killed him. But [inaudible 0:41:11] was an enormously talented fellow, a good friend, and he was put in prison. He gets out, but never could be from the [inaudible 0:41:21]. So, it was a very sad period. A sad period. It was not good. You understand, when you study, you imagine Salamanca. You see working in a studio in Salamanca and things like that. Nothing to do with that. School was sometimes closed, because somebody or the authorities decide, we don't want to have the students there making assemblies and things like that. So they close the school, and then the school, let's say from February to almost May was closed. So we got three, four months. So, we had to help us, to go to the library and to stay away and in contact.

So it was in these matters, it was also a good lecture, because it engaged you for the rest of your life. So you had to have also to take a position in this time and see what is good and what is not good.

Indeed, as soon as I could, I left the country. Franco was not yet dead. This was my obsession. I wanted to go somewhere else, because it was not . . . although then, when things get reestablished in the country, and the democracy was back there, I came back there, and I had been working. Very specifically, not in every project, but I had done the City of the Arts and Science in my hometown. I dedicated 20 years there only to this project. I have not done some bridges in the city. All public works, because I think it was necessary. It's the nature of my forces [inaudible 42:59] testimony of this good [inaudible 43:02]. And it's just to speak in a more general matter. Interesting of the school was that we had a library. As I say, in all those months of no school, I went always

to the library with a bag. A case filled with books. And I was making a kind of diagonal culture.

So I discovered books on Rodin, wonderful books. So I discovered books. Sometimes, just a good collection of books on Corbusier and [inaudible 0:43:40]. *Dictionary of Architecture*. So that gives you a sense. And we had also some very good teachers. In mathematics, great. Valdivia, great mathematician who was teaching at the University of Valencia and was also our teacher. And his assistant, Santos. And also physics, [inaudible 0:44:03]. And also in drawing, Ernesta. The school could a little bit capitalize almost a good part of the fellows who could deliver on something. So, in this matter, it was not bad. The school was not bad. But what was maybe not so good is the sense of the community and the persistence. So it does not grow in you the sense of the team or the sense of belonging to a group, because the school was really [inaudible 0:44:36]. As I say, the library for

me drove home an important point, and you see the librarian was following me around all over. We became good friends. And then when I went on an exhibition, he or someone else [inaudible 0:44:58] the librarian.

ROBERT GREENE

He's still your friend?

SANTIAGO CALATRAVA

Yes, still. Yes, yes. But it's funny, this kind of . . . also, interesting fellow. For example, in terms of art, there was a good teacher. There was a very good teacher of history. [inaudible 0:45:22] Simone. Very good. Also sometimes radical. So, art history under the social point of view. She was only teaching about the relations between socially and artistically. But radical. There was also another teacher called . . . I have to recall his name. He is by himself a good sculptor. The name will come to me. But you see, I remember his lectures, very scientific, very analytic.

ROBERT GREENE

About what?

SANTIAGO CALATRAVA

About composition. Elemental composition.

ROBERT GREENE

Your first instinct was towards art and drawing, and as your father said, art is more important than business. But then there's a side of you that's very interested in geometry and math. And then you decided to go into engineering. Where did that come from? Where does that come from?

SANTIAGO CALATRAVA

Yes. I tell you what happened. So far, you take the regular program in any school. [inaudible 0:46:36], because I had been thinking about that sometimes. The first year, a lot of innovation in your life. You are introduced to drawing, to technical drawing, to artistic drawing. The program is very elemental. Geometry. Very push way, very demanding, because we had to pass this first year in order to belong to the school. Otherwise, there's an examen de ingreso. It means, if you don't pass this exam, you

are not part of it. You have to pass all the matter. Then algebra, calculus, and physics. Then second year, you're entered already, and then you start examining the elements of composition, but it's still mathematics and physics and mechanics, a lot of it. You enter in the third year, still you get also, the school is giving you. But you are started in the point in which you are started also delivery from yourself. You have to deliver projects.

And the discussion about the matter, you are delivering, the quality of the discussion is very much based in the quality of the person. You are come from that. And then you're started, at this point, recognizing that indeed the experience of learning about architecture in a [0:48:08] way, in which you are receiving something, stops. And you enter more in a dialectic process, in which the ideas of the other person or the model that this other person is following, plays an enormous role in what you are receiving. And I say the model is not the experience, particular and personal

experience of the person, making a [inaudible 0:48:37], but it is the model he is following. For example, you could enter the studio, and they maybe follow a more classicistic understanding according to that style, or more modern according to this and that. And so I thought, I started . . . let's say, I decide at this point to . . . I tell me, it's a matter of creating my own vocabulary.

In seven years, I could do that. So I tried to draw, draw, draw, because I always have been more the kind of . . . prone to go through the wall. So straight through. Even today, I think by drawing, by exercising, by getting in yourself and working in yourself, something will appear. Then I brought enormous amounts of work back, and finally prayed. So could be very high qualified, or it just comes through. So this contrast of criteria, according to the person I was confronted by. I understood that this is what the university finally can give me is more precise knowledge. And I tell me, for example, could

I build Hagia Sophia or understand how it works? I tell me honestly, no. [laughs] Could I build the Notre Dame de Paris and those buttresses and understand how they work? I tell me, no. Although, I admire them very much, so let's learn that.

ROBERT GREENE

But you wanted to learn.

SANTIAGO CALATRAVA

I understood there were a lot of things I love in architecture and in the nature of the architecture that I don't know. I have to go through that. Do you understand?

ROBERT GREENE

Yeah.

SANTIAGO CALATRAVA

So I started from this point on, on the one side, concluding my . . . so, you see, it's like that. If you want, I call it the impression. Because what I have told you about the school of architecture, you could say that every student or everyone who has been in a school of architecture, all very well could

say the same thing. The school of Valencia may be a little bit smaller, a little bit more . . . it's not Harvard. It's not Yale. It's not one of those great schools. But I cannot say it was a bad one, because finally, it's your personal relation with the school who makes the job. Did I receive enough input to get good use in architecture? No doubt. No doubt, because otherwise I have abandoned the profession. I would have done something else. As I say, drawing, painting, all of that, composing, elements of composition, geometry, all of that, even the particular knowledge in mathematics and the exact science was given me there [inaudible 0:51:49]. Now, finally, if this moves me to understand that there was a leak in my formation.

ROBERT GREENE

A what?

SANTIAGO CALATRAVA

A leak, a void. Un vacío en la formación. Vacío. You could resume it like that. Imagine I take a book of Roberto Meyer, and you . . .

written by Maxfield. And I look at the bridges of Meyer, but I think, "That's a piece of art." How they work. I'd like to know, I would like not only . . . I don't know. But I would like to know how they work. Or let's say I take a book on [inaudible 0:52:29], and you see the Italian master builder. And I see Palazzo dello Sport in Rome with this filigree, cupola, and so on. And I say, I would like to know how this works. Do you understand?

ROBERT GREENE

Yes.

SANTIAGO CALATRAVA

These things push me towards the study of engineering. Now, I think what I learned in synthesis from the engineering was a bit different approach which may justify why I was seeking for another type of approach. And it is the engineer is empiric.

ROBERT GREENE

Is what?

SANTIAGO CALATRAVA

Empiric.

ROBERT GREENE

Empirical.

SANTIAGO CALATRAVA

Empirical. It's empírico en Español. So, it's all about experiences. So, you see, he takes a piece of wood, takes, bends it, and says, flexion model or [inaudible 0:53:28] model, or elasticity model, and compress it, and say the formation for compression. One, all this, all tension. But he's doing it with a piece of wood. So he goes in the natural. Imagine, he goes to the tree it came from, cut it, makes a cube, because he has to synthesize, he has to have a high . . . and then test different lengths of different cubes and different [inaudible 0:53:50]. But he took it from a tree. You see what I mean?

ROBERT GREENE

Yeah.

SANTIAGO CALATRAVA

And then he sees the slope, and says, is this slope stable or not? And then he sees how the slope comes down when a catastrophe has

happened. Then you study and say, the slopes comes like that. It's a matter of equilibrium, weight, and so on. So applied physics too, but it's also [inaudible 0:54:17]. He makes a [inaudible 0:54:19] and then put water. And then the water [inaudible 0:54:22] make a cascade and all that. And also watching the nature.

ROBERT GREENE

Watching the . . .

SANTIAGO CALATRAVA

Watching the nature.

ROBERT GREENE

Nature.

SANTIAGO CALATRAVA

Nature. La naturaleza. The engineer is just looking at the nature, making an abstraction, and delivering you a result. But it's very important, watching to the nature. So, the nature is the key. And this is philosophically a school, that when you go into a particular study, is very [inaudible 0:54:56]. You don't see that so clear. In the second year, you lose

the vision. In the third year, as I describe it, the first year was clear. So you take [inaudible 0:55:09], abstract figures, and so on. So, drawing, you know drawing whatever you see. Drawing even into your [inaudible 0:55:14], your drawings, whatever you can do. But there is always yourself toward this is what you are doing, or it is you see you are watching these or seeing why you see problems of mechanic or all that, or even problems of things that you can realize in your mind.

But suddenly, you enter into an amalgam in which is your criteria as a teacher towards my criteria. So I have to enter in your criteria in order to make a project where you will give me a ten, whatever. And if my criteria is different than yours, so we have to negotiate it. [laughs] And this is another story. This is business in a way. You understand what I mean? We discuss about business or art. It has also a little bit to do with, not education which is coming out of yourself, but also a

little bit of indication, which you are putting into the fellow something of yourself. I learned, you see, and still today, you see that finally you learn from another person much more through the example than through the advice. You understand what I mean. You learn much more. Sometimes, if I look to my teachers, I don't know what they have told me. But I know, for example, Santos came to give us a talk the day his mother had passed away. But he came and gave us the lecture.

ROBERT GREENE

The example with the lesson.

SANTIAGO CALATRAVA

That's an example. You see what I mean. I don't know [inaudible 0:56:50], but he was [inaudible 0:56:51]. You understand what I mean? So finally, this is a way to teach. But I'm also not criticizing any teaching of sort. It's just telling you a life experience. So finally, what I discovered in engineering who encouraged me very much is this approach to the things you see in a way. Even the most

abstract things, because another beautiful part of the studies of engineering is that, for example, we could paint a tree with all the leaves. [inaudible 0:57:27] very beautiful plant. Then, the tree, same thing for the engineering is I can deliver. Block the ground, it's apart like that with a certain distribution of roads into the surface of the [inaudible 0:57:45] aerodynamic.

And then he can also deliver you [inaudible 0:57:49] laugh about. He can tell you the deflection and how much wind it needs in a spring day to make it fall apart. And even, he will tell you, it's not the tree. It's the hole with the root, will turn around and make you . . . finally, when you look [inaudible 0:58:10], both are discussing about the same thing. Only for the engineer, the tree is one line with another line down below. Now, it meets [inaudible 0:58:19] to show you that the tree can be alive. Do you understand me? So, there is also a deep sense in this mental exercise that the engineer does, there is also

far . . . is an artistical regard of nature. Why? Because what he's doing is an abstract view, abstract model that you will analyze, getting from another abstract sign which is the mathematics. And this is, in my opinion, the most interesting. You see what I mean?

ROBERT GREENE

Yes, I do.

SANTIAGO CALATRAVA

It's this link. Indeed you see, when you look at the work of . . . it should not surprise us looking, for example, at fellows like Alexander Calder, cutting the steel plates or [inaudible 0:59:08]. He was an engineer. Taking thick plates like that. Because the language of engineering goes very much . . . so there is also a record. He is engineering, and he is that. But there is [inaudible 0:59:22]. So these are aspects that I like. Intuitively, I was seeking a little bit before that. I want to say also, when I conclude my studies in architecture, I was 23, and I didn't want to

start working or open an office or something like that. I was too lazy to do that.

ROBERT GREENE

Too lazy?

SANTIAGO CALATRAVA

Yes, I wanted to keep as a student.

ROBERT GREENE

You wanted to be a student still?

SANTIAGO CALATRAVA

Indeed, I went almost eight more years, until I was seven, seven good years. I was not seeking to start the professional life. I was seeking for more knowledge. Even I regret a little bit looking back that at the time I was studying engineering, I decided, I took my codes as an architect, and I hung them and said . . . you understand what I mean? I was a pure engineering student. Also, because I came to Switzerland, and I didn't speak German. So I had to learn the language and study at the same time. And at the other side, I wanted just to make this experience 100%. So I was sometimes writing to get a little bit

of money or preparing what became later my Ph.D. and things like that. But I was just doing that. But today, I think it was a pity, because the school there [inaudible 1:00:46] go back.

ROBERT GREENE

What do you mean?

SANTIAGO CALATRAVA

The school of architecture was here, and the engineering was there. It was close. So, it's a pity that I have not been more involved in the architecture school.

ROBERT GREENE

At [inaudible 1:00:58].

SANTIAGO CALATRAVA

[inaudible 1:01:01]

ROBERT GREENE

Well, I think that basically in the 19th century that engineering and architecture kind of split off. And architects and engineers have nothing to do with each other. And you're kind of bringing them back together again. Do you think that's some kind of

important . . . could that possibly be a trend for more architects to study engineering, or are you an exception? Don't you think it's better that architects know about engineering?

SANTIAGO CALATRAVA

I think, answering the last question, we should know about everything. I think it is a very open . . . if I look at the work of architects I like, for example, let's say Louis Kahn. Louis Kahn, the American architect. You will see, if you look at the Kimbell Art Museum, it's also a masterpiece of engineering, the vaults, the cylindric vaults working as beams. So indeed he works [inaudible 1:02:04] very good teacher. They say he's [inaudible 1:02:07]. It's just to tell you that there is no doubt that if you analyze the work of very good architects in the 20th century, there has been always in Corbusier even a nostalgic approach, because he was [inaudible 1:02:30], and he probably knew little about mathematics and all of that. So

he was always admiring the work of the engineers, and he put these example. You know, with the two [inaudible 1:02:40].

But I think you see there is a fact today in our time that makes more physical. That both professions [inaudible 1:03:02]. Not taking an individual and making it [inaudible 1:03:11] I am the architect and engineer, which may be my case in all modesty. But what did happen is . . . what happened is two things. One thing, it is the computer. The computer has put all the engineers in a very difficult situation to justify their [inaudible 1:03:29] calculators. Because indeed, what the engineer does is establish criteria, create models, and the computer calculates. So, in my generation, when I finished at school, to calculate the [inaudible 1:03:45] frequency, the [inaudible 1:03:47] frequency of a beam, you could do that, because there were formulas. As soon as you get to a more complex body of whatever, you know a frame or something like that, almost impossible. So

you could say that in suspension bridges, they chose Washington.

Somebody said they were very lucky that this wouldn't happen in [inaudible 1:04:11] the bridge would collapse. But it was just sometimes even a matter of luck, because there were phenomena that they could have never seen before with necessary accuracies. Today the computer gives you not only [inaudible 1:04:32], complex thing. It gives you the first models, the second models, and all the tertiary models, and so it is impossible to do that. If you compare the engineer 30 years ago and today, they are two different personalities. Today, you press a button, and in a fraction of a second, you get all the calculations. So you have only to give the model. You get the calculations.

If you look at it in a positive way, it means the engineer can work with variants. So, before, until make the analysis of one solution, it took you so much time that you couldn't repeat it

for a second or a third or a fourth solution. Today, in a couple of days, you can do 10 solutions. And then, you can compare them. You can compare them. Mostly you compare them in terms of efficiency and cost, which this is all done [inaudible 1:05:24] statistical aspects of how it is all related to dollars and measured by figures. It's a tragedy. But beyond that, also I hope that people became more demanding. Also, I don't want only to have an efficient solution. I want also to have a beautiful one.

ROBERT GREENE

Creative.

SANTIAGO CALATRAVA

A creative solution. A beautiful one to integrate well into the landscape who don't spoil my landscape. Because, and this is the second part of the story that relates architects and engineers, it is that we are getting gumption that the landscape is a cultural good. So, when I hear, let's say I hear Aaron

Copland, the composer. He wrote about the Appalachian Suite, the Spring Suite...

ROBERT GREENE

The Appalachian Spring.

SANTIAGO CALATRAVA

I was hearing that. So when you hear that, you know you can think those mountains are a monument. Indeed, the Americans introduced the concept of a natural monument. And so it is an American invention. Natural parks, American invention. So, the first one to open the mind to the people in the world that nature is something to preserve and captured as a sanctuary and things like that, was here in this country. So, is a movement going ahead of saying, [inaudible 1:06:53] the mountain is not only a mountain. It's also a part of the French culture after Cézanne. All the paintings of Cézanne. So we can understand that. [speaking Italian] the hills of Rome are also part of the culture of Rome. [speaking Italian]. So we are opening our mind. It

seems ridiculous. It is not. Think they turn Penn Station down. So somebody decided 30, 40 years ago, Penn Station is not valuable. We want to do a commercial thing, and Madison Square Garden is over there, and that's all. So they put an ugly tower, and then they turned down the most beautiful station where nobody had ever been.

You see, you can understand today, we will never ever let [inaudible 1:07:41]. So will happen with the landscape, which it makes that suddenly engineer work. And not only to be efficient, but also economic. But they have to fit in the landscape, embellish the landscape. Some of them do. The Golden Gate does that. George Washington bridge does that. The Brooklyn does that. The Verrazano does that. Just to name a couple of bridges in this country. What happens is that if these things come together on the one side, the facility of providing variables and no more the [inaudible 1:08:18] of saying, this took one year to calculate.

The facility, and also an interest in getting better works, more illustrative work, more creative work, more interesting work, and thinking the building environment belongs to a heritage and is not a matter of saying you see the building environment is just . . . like when you say, I want to have this glass. I pay five. After 20 years, this glass has to be amortized, so I throw it away. And it has to deliver the same money as I have put my five in the back. Nothing to do. Because with a glass, I maybe throw it away. And in 3,000 or 4,000 years, somebody find it in archaeology and [inaudible 1:09:19]. But with buildings, they are part of our everyday life. They remain there, and the people measure our popularity by our buildings. So this is the point where I am telling you, there are hopes that the two professions, the architect seeking for beauty and the engineer seeking for efficiency, they maybe come together.

ROBERT GREENE

Okay. If we were to think of your apprenticeship, yourself as an architect, would you consider it more . . . I guess you studied for 14 years, essentially, architecture and engineering. Or was it actually designing buildings that you learned most of who you are today? Or is it a mix of the two?

SANTIAGO CALATRAVA

In all ways, you see I am a product of the university.

ROBERT GREENE

You are.

SANTIAGO CALATRAVA

Yes, because I spent 14 years. The negation, I am not [inaudible 1:10:19]

ROBERT GREENE

You're not [inaudible 1:10:21].

Unlike Corbusier.

SANTIAGO CALATRAVA

Not like Corbusier. Not like . . . I am not [inaudible 1:10:26]. I am the product of an education process coming out of

the university. Indeed, you still mention [inaudible 1:10:34], because what the university makes you is offers, is open new possibilities, is open new direction. Also, it's a source of conflicts, and maybe personal conflicts. At the university itself if necessary. But it's just you are in a context of the university, which it is a very old institution. It is not so . . . it's very old. I think in Spain it was great, because the university was still [inaudible 1:11:09] democratic institution. So we met also great fellows at the school who were teaching us and was also clearly dissidents. This was an example for me. But I tell you that because I am the product of the university. So finally, I consider this time as a very important time. And I consider also the fact that I was just purely immersed in the libraries, in the interest in taking time to follow a little bit the muse [inaudible 1:11:51].

First of all, it has delivered me the courage to never go anymore. That for those projects, I think I can deliver something to them. So

I was, for example, imagining how many possibilities have made me diversify in my work into, let's say, call it like that more commercial aspects of your profession. Until today, yesterday, I have never done that. I think it's given by the fact that I decide at a certain time I want to be a student for 14 years, and I make it. So I say, I want to do architecture directed to a certain type of buildings for the rest of my life. And so far so good. [laughs] But it has to do with teaching you. Because it helps you to legitimate an attitude of saying . . . then also, in the profession, you need a lot of perseverance, because a project may take you 12 years, 13 years, 14 years. Also, I was 14 years at the university. Sometimes I was telling me, why am I doing that? I could be only four years and jumped and done other things. It's a model that . . . it's still, as I say, it's still today is having a . . . but I don't think it's a universal model. I would never preach

that this is the way my kids want [inaudible 1:13:28].

ROBERT GREENE

Why not?

SANTIAGO CALATRAVA

Because for example, the third one who started engineering at Columbia, who was doing a good career. He decided to go into finance, what he is doing. And then he lost that. And then he said to me, "You know, at the university, for this type of job I am doing, you should be only the necessary time where you learn is working in other fields and getting into the work." Very different. Do you understand what I mean? It's very different. Indeed, he is working more in the business. And myself, I'm not a businessman. I was telling you that from the beginning. So, there are two schools. As the Romans say, [speaking Latin]

ROBERT GREENE

You've done pretty well.

SANTIAGO CALATRAVA

[inaudible 1:14:28]. Ask my wife.

ROBERT GREENE

Maybe I should interview your wife.

SANTIAGO CALATRAVA

Also something, to eat and to enjoy it you need a full concentration. And to do it and enjoy it, you need your full concentration. You have to have the humbleness to go and understand that the drawing, that there's more changing, a drawing makes sense. Many people say, it does not matter. It's good. The door is here or there, it doesn't matter, which I understand. But it matters. And when you do that, after a day, you see a fork heat up or whatever. With my people, they come and come again and come again. Every three hours they come again, and you remove a little bit. And you receive a satisfaction. You receive a feedback which justified your day. Other people, maybe me, myself, I would like to gain \$3 million. And I will be happy [inaudible 1:15:32] something

like that. [laughs] You see what I mean? It's important. I think that's a key point. It's all about renounces.

ROBERT GREENE

About what?

SANTIAGO CALATRAVA

[speaking Spanish] It means saying, I don't do that.

ROBERT GREENE

I see what you're saying.

SANTIAGO CALATRAVA

I don't do that. I just do that.

ROBERT GREENE

Concentrate.

SANTIAGO CALATRAVA

Concentrate. It's not only concentrate. It's also saying that for this I am not good. For this I am also not good. People maybe have a perception of the other side, and they have a perception that he does whatever he wants. It's not true. It's just a matter of recognizing the whole time, and it's also a matter of an instinct for perfection. Perfection makes sense.

Perfection delivers you a satisfaction. When I go to bed, I am tired. I have been sick the whole day, and I just say, like Cézanne says, [speaking French].

ROBERT GREENE

I believe I'm making little progress.

SANTIAGO CALATRAVA

Little progress. You have to dedicate with all your forces to it. And then also you are admiring and almost [inaudible 1:16:57] the intelligence of those who have achieved that. When I see, for example, another person . . . persons who I go across in the [inaudible 1:17:10]. Incredible. This fellow has been . . . sometimes I am sure two different [inaudible 1:17:20] he has maybe had a certain [inaudible 1:17:26] aspect of his life. But on the other side, just to achieve at least what he had achieved. Guarino Guarini from Torino, the architect who was a mathematician. Almost, you see, there was thinking [inaudible 1:17:51]. They were thinking that perfection they were streaming is something

that is very old that comes from far away. It comes from the fellow who has been carving the sculptures. And then carve the sculptures up, up, up into the places you cannot see them, but still they carved them there. It's also, it's a taste that needs to be developed.

ROBERT GREENE

A taste?

SANTIAGO CALATRAVA

You understand. There are so many things you can understand and appreciate, but the appreciation that beyond . . . Goya wrote [speaking Spanish]. He was obsessed until the end of his life for the novelty towards the perfection and the beauty and the fruits of our time and delivering his message and keeping delivering his message. And justifying until the very last of his life. It's a kind of secret. Not everybody understands. Barely also, even in the schools is given to you. It's more like an initiation. Because I thought . . . imagine the old schools, somebody wrote a

great [inaudible 1:19:18] in a book about the Mogul architecture. You know, the Mogul?

ROBERT GREENE

Yeah.

SANTIAGO CALATRAVA

So the Moguls came into India and made wonderful buildings. And apparently, they form the fellows, learning them mastership in one profession, then another, and then another. And after learning three professions, maybe he likes [inaudible 1:19:46], stone cutter, and gold carver. Then this man went to one year into school and came out as an architect.

ROBERT GREENE

Where did you read that? Is there a book on that?

SANTIAGO CALATRAVA

A book on that, yes, but I cannot tell you where. But it is on the Mogul architecture.

ROBERT GREENE

Okay. I'll look for it.

SANTIAGO CALATRAVA

Architecture. The way how an architect was formed. It was learning professions, and then somebody learned you the religious part of the [inaudible 1:20:24]. Religious, why? Because the word religion means nothing else than bounding together. So you understood why I took it there. It belongs to the same body, although one is working with stone, the other is working with wood, and the other is working with steel, there is something common that links them. And this, how to bring that in the school, you need the experience of life. So I am telling you that, because to finally answer your question.

ROBERT GREENE

Well, I'm surprised, because when I look at your first buildings like the [inaudible 1:21:01], your first work is very mature. Your work has definitely grown, but you seem to have come out of the university already prepared to make very beautiful buildings.

SANTIAGO CALATRAVA

I never thought that. Let me tell you what I was, at the time. Sometimes people ask me, we are in a difficult moment for architecture. What will you say to a young architect? I receive this question [inaudible 1:21:37] a while ago. I was in '92 here in New York, and then he put me this question. I say, "Look. When I started, I took every building very serious. It does not matter what building I was doing. So if I had done a balcony, for me this balcony was as important as a bridge. If I was doing a bus shelter, for me this bus shelter was as important as it was a whole station with all the complexity. Every corner." And then, also, the case of instinct, for example, was just a facade. It was a facade. Because even the regularities of the building are given by the work of the people who were doing just the logistical understanding how this house has to work, and they needed to put an elevator, they needed that.

So, it was also in a way a good exercise. By saying it's like painting. They let [inaudible 1:22:41] like a big painting. [inaudible 1:22:45]. Also trying to . . . let me tell you, this comes back to my childhood. Somebody told me, [speaking foreign language]. But also, Vivaldi [speaking foreign language]. He put all his work or part of his work [inaudible 1:23:20]. [speaking foreign language] Very important. So something at home was always highly prized when I was a kid is they are doing new things. It's new. It's different. It's better than before. So this sense of the invention, very important. When I went into my work, from day one, I was convinced that I have the possibility to say something new. In the modesty of the bus shelter, even I tried to do small things. And I say [inaudible 1:24:09] for my heart.

ROBERT GREENE

Your what?

SANTIAGO CALATRAVA

[inaudible 1:24:15]. So even there in this thing, even a glass, I was thinking about that glass. [inaudible 1:24:25] for the bar mitzvah of a family I met that has done three [inaudible 1:24:32], one for each of the kids. But then I [inaudible 1:24:36]. So it was the first time I have done that. When you do those thing, it doesn't matter how big something is. Even a knife or a glass is even more difficult, because you touch it with your hands, you bring it into your lips. It is sensible that that is very difficult. So, I went out, let's say convinced that even those things was important. I was not dreaming to the station or thinking like that. Indeed, I even look to my position today, and sometimes I think because at the time, I had not had anything to do except that, I was also in a very peaceable situation.

ROBERT GREENE

Very what?

SANTIAGO CALATRAVA

Peaceable. Peaceable. My only preoccupation was maybe from time to time where will come the money to pay the people who are working with me. But my wife was also taking that into account and had been very meticulous and looking that the thing worked well and the business goes ahead. But indeed, otherwise, I'd pass all my time with that. So my education from 7:00 in the morning to maybe 9:00 or 10:00 in the night was only that. We were also living in the same place we were working. Casa-bottega you say in Italian. So, of course, after a while, through the intensity with work, it appears also a maturity. However, as I say, it's a maturity that comes through the exercise of the work, and also setting decisions, for example. Little money, so use aluminum, the cheapest aluminum, crude aluminum. Fabricate elements of concrete or the station. Concrete and speed. Also, working on reduction. So, what I was able also is to manage the

language of . . . so for example, let's say I take plates of steel like that. And you can only do that when you are an engineer, because you know with plates of steel like that, you make it. As simple as it is, you [inaudible 1:26:47] plate of steel like that is more resistant than a plate of steel like that. [inaudible 1:26:53] for plates of steel like that. It's also something, you know they are fabricated, they are industrial, you can weld them and things like that.

ROBERT GREENE

So, I wanted to go into your creative process when you're working on a project. I'm interested in where you begin in your mind. So for instance, you have something like . . . I've only been to one of your buildings I'm afraid. But there's not many in the United States. I've only been to Milwaukee Art Museum.

SANTIAGO CALATRAVA

Milwaukee, yes, yes, yes.

ROBERT GREENE

It was unbelievable. I'm interested in where you begin. So, when you have a project like that, do you begin with an image in your mind? Do you begin with an emotion, a feeling that you want? Where do you start? I know you must draw something out. But do you know where it originates in your mind? Do you have an . . .

SANTIAGO CALATRAVA

I can speak a little bit about the process of approaching that. Yes, I was just thinking if I have here something I could show you. Maybe I have. You see, the language I use in order to fix whatever, an idea in [inaudible 01:45]. That is the physical process. So what happens in my mind before, we should maybe a little bit analyze. And very often, you see I draw a lot and go through the whole process a lot. And you can also see, looking at the serial drawings and seeing the end product, how a project might change. Then, another thing I do is a lot of models. I keep doing models,

but for this you need another maturity. So I will show you also down below some of the big models we are doing for Ground Zero, in which you see the door, you see the benches, the handrails, and all that. So you can go very far. It's another way of analyzing. It's another way. But let's say at the very origin of the things that you see, and I have all the cities for example, I think here, all the drawings I have for Ground Zero. You can see the very early ones.

ROBERT GREENE

The very early ones.

SANTIAGO CALATRAVA

The very early drawings. And also, this weekend, I was two days in Connecticut where we have a house with my daughter and two friends of hers. And also, I was working there. You can see also what I've done just this weekend for a project that already started. But you can see also how evolution can be put in the matter. The fact is that certainly, something very important is the

place. For an architect, you have to put the things in a place. It's very important. The proximity of the water, of the mountains. These things seems to be a little bit, but it is not true. There is something in the place, and what it does, the place. For example, imagine I went to Laguardia where I have done a winery.

ROBERT GREENE

Laguardia in Spain.

SANTIAGO CALATRAVA

Yeah.

ROBERT GREENE

Oh, the Bodegas.

SANTIAGO CALATRAVA

Yeah, when I saw this place, I almost became weak in the knees. I said, how to put here something? What a tremendous challenge.

ROBERT GREENE

With the mountains.

SANTIAGO CALATRAVA

The mountains and all the landscape. And then also seeing the ugly things [inaudible 04:03] because around . . .

ROBERT GREENE

In the what?

SANTIAGO CALATRAVA

Seeing how poor the thema has been treated around. Because Laguardia is a jewel. It's a Middle Age village, even with the walls. There is also, in Laguardia, very interesting [inaudible 04:17] short after was a very engaged man [inaudible 04:21]. But the beauty of this place. He brought us into the cathedral, and the cathedral in Laguardia, cathedral or basilica, whatever they have there, it's a very beautiful gothic church. It's a very special one, because they built in front of the portal, the tower, later. So they have the portal of the church, and then they built the tower. Now, by doing the tower, they make another door. So, the portal remained recessed. Now, the portal is original like they

had done it in the gothic. All painted. So I have seen for the first time in my life a gothic portal as the gothics had painted it. Where you have pastel colors, all the apostles there, they are in red and blue and yellow. They had [inaudible 05:11] fishes, and the fishes are green. [laughs] So suddenly, you see almost a naive way.

The fact is, I thought that's a very difficult job, because also the budget was very little. When you work for people who do wine, they calculate. You can see how long the cork is, so good is the wine. Because nobody will put a cork, because \$1, bad wine. So if you take a [inaudible 05:47] a fit until there are corks like that or three inches long. Not as long as that, but almost. Because they can expend a good cork for a wine that has to stay good for 50 years. So it's very interesting to see the combination and the opportunity. But the place and these impressions, visiting the cathedral, seeing the fishes there and all the colors, and seeing also the man and the

[inaudible 06:19] of the city. The man of the city. It was enormous also the beauty of Laguardia. Also a little bit, there is the 20th century, one building here, another there, a house here. It's following this wonderful landscape, but still, the landscape was commanding. You could say some stains, but it is amazing. So, this moment's place is very important. Nothing to do with the architecture itself will emerge from you, but you gain a lot of respect. You go into your job and still you know here, the key point is how to do something here that fits well and is efficient and it is economic. Do you understand what I mean? It's establishing the [inaudible 07:13].

ROBERT GREENE

The Bodegas is one of my favorites with the rolling. Where does that come from?

SANTIAGO CALATRAVA

You see, sometimes, let me tell you. You see, for me, I tell you, there is also another work I do. This work is related to pure plastic

research or sculpture or things like this. Nothing to do with the architecture although people maybe think. For example, [inaudible 07:52]. This is the movement. Imagine, for example, I take one line. This line here. You see this line? Okay. And then this line will move, getting back along the circle until finish here. Delivers you this effect. This is mathematical talk. You see, the first line, it started here and goes there. The second, it started a little bit and goes there and there and there. And then comes through and delivers you this shape. Superposition of those shapes. This is another one [inaudible 08:35] is the same problem right there, but here I'm going to have a circle. Here is a complete circle. Here is how to circle. So I [inaudible 08:44] making a [inaudible 08:47] with the cup in the center, creates attention. Now, two of them [inaudible 08:53]. There is a pure mathematical trick, but the origin has nothing to do . . .

ROBERT GREENE

What is the origin?

SANTIAGO CALATRAVA

Excuse me?

ROBERT GREENE

What is the origin?

SANTIAGO CALATRAVA

The origin in these cases is research I have done for my work in Ph.D., in which I was taking principles of topology, for example, a poliedra who can collapse. And then the poliedra can collapse back and became a line. So this was the original, my Ph.D., and I have investigated that and several poliedras and combinations of it. So it looks very plastic, but it's a work in topology. So, in the start of this collapsing poliedra, coming to one line, are surfaces. And as a residual form of those two faces are bodies. The first time I employed explicitly for any sculpture, I have run for the New York Times. It's a time capsule.

ROBERT GREENE

I was going to say, this reminds me of the time capsule.

SANTIAGO CALATRAVA

Exactly. It has been done for collapsing [inaudible 9:58] time capsule to the [inaudible 10:01]. And in these cases, there are all the variants, you see the thema. Now, you see, imagine I'm now working, doing something. This is like a back back. You understand what I mean? Like if you could save a [inaudible 10:24] or Cézanne [speaking foreign language]. You could also learn to understand the architecture. [speaking foreign language] But also by having a baggage of shapes, your makes may be employed.

ROBERT GREENE

Like a vocabulary.

SANTIAGO CALATRAVA

Like a vocabulary. Who is [inaudible 10:50]? You see, when we started the conversation, I said to you, and I keep saying that to

young people, [inaudible 10:58] satisfaction, this you'll find in your own words. This is something nobody can take away, because this is what you are saying to the world, and it remains there. The people read it like that. They have your own work.

ROBERT GREENE

So do you begin with a shape in your mind of something?

SANTIAGO CALATRAVA

No. You know what happens, in the case of the Bodegas . . . because it touch a little bit of essence. Let's go here. [inaudible 11:35] You see, now. Because I don't want to fall in the limitation, saying you do shapes, you take one and make a building. Now, you see, we have to start back in this point in which we say, a fellow learns to deal with the steel, learns to deal with a stone, learns to deal with wood, maybe textiles. And then he became an architect. So architecture has very much to do if it is stone, if it is steel, if it is textile, or if it is wood or whatever. Architecture is

very abstract. Now, Matteo Marangoni says that the most abstract of all the arts, who nourish itself from the rest of them. Nourish, you understand what I mean? [speaking foreign language]. Why? Because, you see, for example, do you know La Cappella degli Scrovegni de Giotto in Padua. There is a chapel he painted. He painted . . .

ROBERT GREENE

It's Giotto.

SANTIAGO CALATRAVA

It is Giotto.

ROBERT GREENE

I was going to mention that.

SANTIAGO CALATRAVA

In Padua. The architecture is just a support for painting. What is architecture? What is painting? It does not matter, because Giotto was also a good architect, because he has done the campanelle [inaudible 13:05]. You really get the . . . you understand. Then you know, the facade of Notre Dame de Paris. Is this a sculpture, or is that architecture? Full

of sculptures. [speaking foreign language] And the towers and everything, the capital. It's a sculpture. So architecture also takes over in sculpture. So there is a sense of literature. It tells you the story, the story of Maria, the story of the creation, the story of whatever, the facade of the head of Christ, the [inaudible 13:47]. It's a story that's written there. It's also, in a way, literature. [laughs] [inaudible 13:55] very much. [inaudible 14:01] and write very good about it. But these kinds of things, and what is finally the architecture.

If you think, even in extreme cases, the Japanese. They are coming from the Zen Buddhists. All is transitional. Nothing is permanent. Buddha temples, after 70 years, they tear them down. They redo them again. [laughs] So even the sense of the permanent that we have in [inaudible 14:33] is also not there, and still is the architecture. So even though material consistency is part of it, once this point is well put and you understand that

it is like that, there is probably a moment in which you started feeling how the building has to be, but you don't see yet the shape. The only thing it is when you get the feeling, I need a long building, and it is on the hills, and it is the process of the grapes entering here and the bottles getting there. And it's a linear process with the [inaudible 15:12] in the middle, and the hills rolling there. It was the moment in which you just go, oh. It's for you like an [inaudible 15:24]. It's like the sun comes out.

ROBERT GREENE

Epiphany.

SANTIAGO CALATRAVA

Yeah, it's an epiphany. But it has to happen. It's not that I say, "I want to do a building like that." Believe me, I could also do that. It's the fact that you are trying to go through the process. And then in a certain moment, you understand, I can use these as a part, and I can allocate it. And then you see, because you have been analyzing the problem. And

then you see you need something very simple, because you need two walls. And then there is not only the roof that is undulated, but it's also the facade. And finally, the building has nothing to do with the sculpture, although . . . the building has nothing . . . I will give you also a movie to use, I've never seen. It's called movimiento. I'll give you two movies. It will be interesting for you. You can see them maybe this evening.

ROBERT GREENE

I'll watch them tonight.

SANTIAGO CALATRAVA

And tomorrow, we can speak about it. Because you will see very much this link between the pure plastic work and . . . so, in a way you see it's an approach that you have to recall, and in a certain moment, you see the wall coming from this plastic research, and the other one can mesh together. But it is not an a priori, and mostly, what you are saying in a certain period of time is recalling elements in your mind. Recalling elements

coming from the landscape, recalling elements coming from the function, recalling elements coming from the function of . . . and sometimes, you know what happens. The process of recalling elements is so intricate.

Let's say Ground Zero. Ground Zero, very difficult project, because there are so many things coming together. And finally, the key in Ground Zero was an enormous exercise of simplification. Almost like when you are dealing with topography, so I have the train passing through, the subway. So I will have to go down and then go up into another space. And there's no way to remove this subway. I cannot put it down. I cannot put it up. It has to stay there where it is. And these kinds of approaches bring you into the fact that the project . . . it's like, imagine you are doing a sculpture. You are cutting, and then suddenly you discover, here is a mistake. What can you do? You can't [inaudible 18:08]. You see what I mean? Or suddenly, like it happens apparently with the motions of Michelangelo.

He broke the neck by cutting. And if you look, the head is very short. A head like that, he was very short with a [inaudible 18:25]. A piece went out. [laughs] So he had to make, you see what I mean? He had to work with that. He had to work it out.

So, in a way, there are processes that has to do with that. The more you [inaudible 18:41] go and do that also. Suddenly, the context has completely changed, and you have to still build. So, they are very much . . . sometimes it is a long process that guides you into a solution in which you are just ordinating and putting the things as clear as possible. Sometimes it is the place that imposes you a lot of respect for the place. Sometimes it is the need. For example, [inaudible 19:13] because you spoke about [inaudible 19:14]. You are in such a building, and what to do. You could make a choice. You could say, let's unify the building. Let's use a single material to do that. But there it was different. I have a south facade, a west facade, east facade, north

facade. Let's treat them separately, but unify them by the use of the material, because it's all aluminum and concrete. So let's use the opportunity by making for mature sculptures or paintings. It's the opportunity also to experience, for example, in the elevator, came back, I have a vertical facade. But the elevator is all covered of scales. There is, in the east facade, little appreciated, but I gave a lot of importance to this facade, because it has no opening. It had just the elevator popping out. They put the elevator . . .

ROBERT GREENE

The elevator?

SANTIAGO CALATRAVA

Yes. You see, it looks like that. Let me show you. You see, this is one facade. Then it does like this. Here is the delivery with the chimney. Here is the office. Here is the north facade. Here is a big element like that, a bridge to connect. And here on the . . . the opening. Yes, and this elevator here, the facade is all with vertical elements. Very

simple. But very long, 17 meters long, so they have to roll them extra. And then here, you'll see the facade is all done like that, like scales. You call that shingles. You call that shingles?

ROBERT GREENE

Shingles, yeah.

SANTIAGO CALATRAVA

Shingles. All of that like that in aluminum.

ROBERT GREENE

I've never seen that.

SANTIAGO CALATRAVA

So, it was also . . . this was experimental. Interesting is, as I say, in the . . . for example, about imperfection, I tell to the client, you will get . . . it was also a critical moment, because it was not too much work. And I tell to the client, "Look, we will find a good [inaudible 21:50] to do very economic work. But a good [inaudible 21:54]. So we found a Swiss [inaudible 21:58], who has been doing in Germany bank facades and things like that, very expensive facades. But they were willing to enter on that, because they needed

the work. You see, this is also very important. Even those types of things that have to be very low cost, the perfection of the work and the knowledge of those who put their hands on the work is essential. It's essential. That is also another thing. You will never keep good architecture without great craftsmanship. If you look, whatever you see. And it is also very important to . . . but I am not answering well your question.

ROBERT GREENE

It's typical. It's typical.

SANTIAGO CALATRAVA

The question you put about how these things started, it depends from case to case as I say. Maybe they brought already my bag. I will bring it up. [inaudible 23:03]

ROBERT GREENE

You were saying something.

SANTIAGO CALATRAVA

Yes, as I said, it depends very much from what happens. I always attach a lot of importance, and when I was younger, maybe

I was easier to get . . . it is also the emotion you can put into the project. Emotion is very important. When you are in a very emotive mood, probably in my opinion, you have a stronger capacity to deliver something interesting. The emotional part is . . . and why I use the word emotion, again, to quote Cézanne, [speaking French]. And to administrate emotion all along your life and be even capable after 30 years work, to work with the same spontaneity as you used to work when you were younger is also very important. I think, in a way, finally it's the afraidness of doing something ugly in a beautiful place who delivers you the [inaudible 24:30] of the attention you will take to do something that is not ugly. You see what I mean? Or simply the feeling that you've got the opportunity to do something unique. You see, sometimes, I can also look back into my works, and when a lot of factors are disturbing you around, things are maybe not as good as they used to be or they could

be. So it's also important to find . . . and it's also very difficult to explain that, because who do you want to sell, what a critic of architecture will buy. How important is the emotion? But you are not doing architecture for the critics. You are doing that for the . . . these are some of the drawings we have done for Ground Zero. I will show you that, because it's . . . maybe they are chronologically ordinated, or maybe not. This is very much our presentation for the client. 2nd of June, 2000.

ROBERT GREENE

So it began with the bird?

SANTIAGO CALATRAVA

Yes, and you see. Even I started putting things for which, if they are chronologically ordinated, has nothing to do maybe with this, what people call the basic idea. Even things I never know were there. But I started drawing . . . let's go like this. Also, it's very important to persevere. Maybe another shape, another, another. Maybe here, you

see also for the first time, you see there is a gap. Maybe the light should enter in. This is [speaking foreign language]. Also, these are sections.

ROBERT GREENE

Beautiful.

SANTIAGO CALATRAVA

Here. There is the June, the 1st through the 3rd. Already, you see a bit more different, because until now probably I was looking at the part that is underground. Now the part which should maybe open, so some drawings . . . this remembers all the things I have done. Thank you. Thank you. Thank you very much. This is from yesterday. This also, the day before yesterday. I will show you that. This is here, and then you see . . . so I am trying to do roofs. And then, here appears something. A shape, a shape. And the shape, also, I separated. Okay. So, shape. Then, we see . . .

ROBERT GREENE

The [inaudible 27:56].

SANTIAGO CALATRAVA

[inaudible 27:56]. Largo, largo. [inaudible 28:01]. Then here, you see already [inaudible 28:12] something in the green.

ROBERT GREENE

It's beautiful.

SANTIAGO CALATRAVA

Then here, the shape. Here, more precise. Here, even more precise. See, I started with the [inaudible 28:26], but then I am coming back to the [inaudible 28:28] and the diagonal. It's a way to make [inaudible 28:34] by drawing.

ROBERT GREENE

So you figure things out as you draw. It comes out, as you draw, ideas come to you.

SANTIAGO CALATRAVA

Exactly. This is it. And here, I probably is as interesting. In the same block, I stop here. Look at that. This is also something to read. Because as soon as a new cover page appears, I'm jumping. So I let it there. Probably I thought, I have something already. Then

I step back, and this is what I used to have before. But I start to make it so narrow, I started making it longer. Come back to that here. And then we change five, the 5th. 3rd to the 5th. Here, I come back into the arcs. Into the arc, because it is a part of the station. Has to go up. The part of the underground. Maybe I was tired. And then I draw people. [laughs]

ROBERT GREENE

The people in the . . .

SANTIAGO CALATRAVA

Yes, I draw a lot of people usually in between, but we have to clean it. Because the [inaudible 29:44] was not for presentation, they thought it's better we left it here or for some [inaudible 29:49] matters. So, very much, this is the galleria in a symmetric arc. This remains almost like that. Ultimately the vocabulary here was related to the concrete, because we see that the shape . . . it's good to see that, because I will show you . . . then here, I wanted to let enter the light, because

I was thinking the memorial will be here, and we can capture a little bit of light for the memorial. And people here. Then, this is when? Nueve, nueve, nueve. Nueve de junio. Junio. [inaudible 30:40]. If it is boring you, tell me.

ROBERT GREENE

No, I'm getting to see how . . .

SANTIAGO CALATRAVA

Again, concrete, concrete, concrete. You know, this is a train that has to pass through. A train.

ROBERT GREENE

Amazing. How many sketches?

SANTIAGO CALATRAVA

Oh, my wife has put an archive, 125,000 drawings.

ROBERT GREENE

Wow.

SANTIAGO CALATRAVA

You see here, a little bit starting to see the building itself. 7th of June. This was maybe before the 7th. Maybe the 6th. Because they

are all correlated. They are ordinated in the time. [inaudible 31:41]. Then suddenly, you will see, we will jump into the section. Quite similar to this would be [inaudible 31:50]. Section with the light in the center. Section, section, section.

ROBERT GREENE

This is the one that's sort of the bird.

SANTIAGO CALATRAVA

Yes, yes. This in the part. There's a head down below. Very decomposed with that diagonal. Not yet, because we are drawing here again a compact to the original shape. You remember the shape? I went with a diagonal point, and the corners, and here trying to set that. Here also, drawings, drawings. Very different from this what I write, but you see, it is a whole . . . here. This is probably [inaudible 43:44], just because I already know the size. It's getting ahead. Things became more precise. More you see the precision in the drawing and the style of the drawings changed. Concentrate

and focused in the problems of the rails, for example. It goes ahead. See again, coming back. Back and then coming back to the shape. Then, you see, I have enough, and I go back into the lower parts of the station. Dealing with the light and drain. But you see, it's already more precise. I have little to do with [inaudible 33:38] finally has been . . . because this is a process . . .

ROBERT GREENE

When is that?

SANTIAGO CALATRAVA

24, 22, yes. 22 of June.

ROBERT GREENE

There's the . . .

SANTIAGO CALATRAVA

Sketch. Then you see, getting out of the square, getting more into helix. And here. Cross sections, cross sections of arcs. Again, similar to the previous drawing. But here, the other one, you remember the opening wasn't until here. Here is the opening a little bit higher. They say, for the special perception. It

started getting here more evident. But it's not an a priori. In order to arrive here, you have to solve the problems as you saw before. So, it's not that you get something like that. Of course you're going to do something like that, but you can only describe it with your art. It's not yet a clear image. Of course, the ambition is to do a big skyline, an enormous skyline.

ROBERT GREENE

You don't start there.

SANTIAGO CALATRAVA

The ambition is also to bring the light in. But you have to articulate that through a whole process in which sometimes, the cross section, the nature, the element you are using, or the geometrical conditions you are giving the subway line. You have to get familiar with all of that, and you are putting that slowly, slowly, slowly [inaudible 35:16] process until it became something that can barely be changed.

ROBERT GREENE

Very interesting.

SANTIAGO CALATRAVA

It's for sure not the result of [snaps]. Even sometimes I say, if I control immediately my project, all I am copying myself or copying somebody else. I don't know that which happened. You don't know.

ROBERT GREENE

Copying yourself.

SANTIAGO CALATRAVA

You see, so this is all about. Now that things are getting more . . . this is what people call architectural sketches.

ROBERT GREENE

Beautiful.

SANTIAGO CALATRAVA

These are the sketches of an architect. But indeed, the process was . . . you see, in order to arrive here, it started with getting the feeling, here light, there light, light in the back entering. So, a lot of light entering so that you almost don't see this materialize, because the light can materialize things. So here, very material.

ROBERT GREENE

When is this going to start being built? When do they begin the construction?

SANTIAGO CALATRAVA

It's almost finished.

ROBERT GREENE

It's almost finished?

SANTIAGO CALATRAVA

Yeah. We are, at least 60% of the work is already done.

ROBERT GREENE

Really?

SANTIAGO CALATRAVA

Yes, yes, yes. A lot of work is done. The only thing that is, as you see, many of those things, when I draw the arcs and all that, this is all in the underground, and nobody can see that, because these are right, just at the level of the street. And [inaudible 36:47] the bird. This is what the people call the bird. This thing, people call the bird, this will be . . . we have done all the projects, and they are on the time to give the steel for fabrication. But all the

studies and all of that, and they will do that in the next day. You see, here is another. You see the two shapes back. Bird. Also, this is a copy of another sculpture I have. Here, I work much more. This is more . . . it has less to do . . . you see, the better the drawings look, the less you are in the confusion of the creative process [inaudible 37:25]. Because then you are managing what you want to do, so the drawing is much precise.

ROBERT GREENE

You're not having much fun right now.
Very interesting.

SANTIAGO CALATRAVA

Here is just the . . . even you can draw the studios and, see the arcs. The fact that we are getting more towards precise drawings, and even sometimes, something like that appears, this is a [inaudible 37:53] a crisis, which it is also very important. And you see, about the drawings I have done yesterday, those are very, very same. They are related to . . . let's say, these are very specific problems. You see,

I am doing a school in Florida, and this is the study of a beam.

ROBERT GREENE

Of a what?

SANTIAGO CALATRAVA

A beam.

ROBERT GREENE

A beam.

SANTIAGO CALATRAVA

A beam who will hold a part of the roof. It's just done. You see, one. Another here, the dissolution of the beams. Another, you see. It may bore you, because it is all about the same. But there are small nuances from one into the other. If you look here.

ROBERT GREENE

These are like watercolors.

SANTIAGO CALATRAVA

Also the paper is very good. [inaudible 38:40], the best paper you can get. So this is the [inaudible 38:49] there, and here the pergola you see where people can go out. And here, the pergola again. So, it may be a bit

boring, because it is repetitive, but it is not. There is a whole evolution. Particularly for me, it's a process of maturation. Then, here, these for example, another book was started before this book here. This book here. And this is about the mechanisms too, because I would like that the roof opens like that. It's a bit more difficult.

ROBERT GREENE

This is the one in Florida?

SANTIAGO CALATRAVA

In Florida, yes.

ROBERT GREENE

What kind of building?

SANTIAGO CALATRAVA

It's an education building for a university.

ROBERT GREENE

Which university?

SANTIAGO CALATRAVA

It's called South Florida University Polytechnical. It's a new Polytechnical. We are master planning and doing a couple of new buildings there. These are just about

mechanism. These are not initial sketches. I started in dia cuatro de Diciembre, but you see, half of the block has been working this weekend. So it is about the mechanism to open the roof. So, there are the studies on the mechanism, studies on the mechanism. Here, here, here. Whether [inaudible 40:14] can be allocated. This is an advanced study in a project ongoing. It's not already . . . you see, even to do those things, you have to go through those processes. You see how this can be before. You see, it goes like this, like that, or like that, and it is the same frame, because the diagonal is changing, and the diagonal is [inaudible 40:34]. Here also, here. Here, I started feeling comfortable already about the mechanism, and I am allocating it in the roof. Here, too. Here also, already allocated in the roof. This means, I have almost already conclude, and make a break. And then I started getting back into the roof. The roof itself. Then here, the end, the tip of the building. It's another problem. So the tip of

the building, how to conclude here at the end. And then, this is the whole building itself, the cross section. You see, the studies you saw here are only about this part.

ROBERT GREENE

And the roof is opening for what?

SANTIAGO CALATRAVA

For the sun to [inaudible 41:26], and also because they wanted . . . also, they tell me, we would like to have . . . so the roof is like this. And the roof can open this part. So this part here becomes full of sunlight . . . not sunlight. It became full of light. And here, you see I can have [inaudible 41:49] solar cells. Or it can also do the same thing. You see, morning, when it is like this, or [inaudible 42:00]. A bit like Milwaukee. It's a bit following this story of making buildings [inaudible 42:08].

ROBERT GREENE

But you're . . .

SANTIAGO CALATRAVA

Which is also something that has been . . . you see, because look at the case of [inaudible

42:15]. You want to see in this building something [inaudible 42:20].

ROBERT GREENE

It's already there.

SANTIAGO CALATRAVA

It's not only an invention. The only thing it is, I think there is a transgression in the rules, when also, let's say, a building can change shape. I believe very much in that. I think if you do, will bring us to buildings who have maybe air. They are soft already. All those dramatic buildings. Those buildings that are full of air. You press them, and they will move around. So, you see what I mean?

ROBERT GREENE

Were you influenced by the Space Age and NASA and all the science fiction?

SANTIAGO CALATRAVA

That's a good point. Somebody says, the cathedrals was like the Mars mission today. It was the top of the science and the knowledge at the moment.

ROBERT GREENE

That's right.

SANTIAGO CALATRAVA

Do you understand?

ROBERT GREENE

Yes, I do.

SANTIAGO CALATRAVA

So in a way, it's nice to get a little bit of this flavor in the actual buildings. Do you understand what I mean? So, at the time, people had done those cathedrals, that was the highest achievement we can do, technical and material and also economical. [inaudible 43:53] of these where people can [inaudible 53:57]. In terms of spans, in terms of economy of materials, in terms of placing. These are almost [inaudible 44:05]. You think it was crazy, with the enormous technical expertise, enormous landed columns in the tall windows. Technically, it was like a Mars mission today. So, the comparison you do with NASA is for sure not out of our time. So bringing this kind

of expression to architecture, you are also indicating the architectural aspects of support for the most modern achievement we can have today. And the other side, we live in a very economicistical basis. If they will try to amortize a trip to Mars, there's no way. You would say, why are you getting to the sun? Why are you getting to the moon? There's nothing that grows there. But still, we are going to the moon or to Mars or things like that. So it is necessary also to understand that certain missions of our time that are done with an enormous rigor is like the CERN. The CERN in Geneva. You know the research, they make the [inaudible 45:18]. They are just to understand a little bit from a mason or a peon or something like that. We exist or not. [laughs] Also, in a way, they are also [inaudible 45:35] idealistic in approaching.

ROBERT GREENE

When you were young, were you excited by trips to the moon and the whole Apollo? Was it a source of inspiration?

SANTIAGO CALATRAVA

Everybody, I think so. I think believing that technique is a source of inspiration, and also is a source [speaking foreign language]. To make that here.

ROBERT GREENE

Oh, lever.

SANTIAGO CALATRAVA

Lever. Lever of progress and many of those things. I belong to [inaudible 46:18]. I believe that techniques are also in my profession, clearly, in support of the [inaudible 46:28]. So, you can [inaudible 46:31] in many senses. As an architect, you have to do it through the techniques.

ROBERT GREENE

Well, returning, for example, to the Milwaukee Art Museum. What struck me was the incredible use of the water and the

lake, and how it's everywhere. I'm wondering where the shape with the Brise Soleil and the bird, which is so strange and so remarkable, where does that come from? Does it come from a process of drawings, beginning with the lake and the water and the idea of a shiv? Or you can't really say?

SANTIAGO CALATRAVA

Certainly, for example, if you look at the museum, physically, it leans toward the lake. It's clear that for me, the presence of the lake was everything. So it leans towards the lake. It leans. Also, you see I have the bridge, and then I wanted to do a piece of [inaudible 47:44] there. And there was also park in there. [inaudible 47:49] gardens. But they are intentions to, in a way, to humanize. [speaking foreign language]. When I was a kid, my mother let me read a book. Only [inaudible 48:16] because of the drawings. But [speaking foreign language]. If you see three persons and a old lady, who you should say good morning, madame. Things like that.

I never read this book, but the drawing was very funny.

ROBERT GREENE

What were the drawings?

SANTIAGO CALATRAVA

They put an old lady, and then a young boy saying good morning, madame. Things like that. The rest, I forgot it. But the fact is that the word [speaking foreign language] means education. So making a place more human is for educating this place. What I am telling you is almost pure rhetoric. Indeed, behind the intention in Milwaukee is the lake, so enormous like an ocean. The lake is everything there. Even sometimes you see a boat passing by. A big boat. [inaudible 49:18]. And then there's all the cisterns and all that. So finally, you are confronted to a piece of nature, and the whole building has to breathe nature. Now, how far is a priori that the building looks like a boat? Not by me. I don't believe in these kind of images as a priori. You understand?

ROBERT GREENE

Yes.

SANTIAGO CALATRAVA

But it's beautiful when other people think the building looks like a bird or looks like a boat. Indeed, in the movie I will give you, you have a person who has done the movie, who is an artist. Indeed, the movie was awarded in Montreal by the [inaudible 50:02] award of the critic, who was a lady who was [inaudible 50:08] very well done. But for example, somebody sends me a photo. The whole interior was blue. Because, you know this expression, if you don't like the weather in Milwaukee, wait 10 minutes, it will change. But it's true. It's very atmospheric. So the white color captures every light and every color, so [inaudible 50:30] orange you see in a sunset, or it may speak in blue. And somebody sent me a photo. All the interior was blue. This is the power of the architecture. It had nothing to do with your intention. If you are honest, it is like the

shadows. The shadows are on the ground, and sometimes you get amazed. Or seeing the station in [inaudible 50:48]. I saw rosa color, rosa reflects. Rose, like an impressionist painting. Rose in the white rose. [inaudible 50:56] if I say I was thinking of that. There is also a kind of [speaking Spanish].

ROBERT GREENE

Synergy.

SANTIAGO CALATRAVA

Synergy between the building and the environment that [inaudible 51:08] to make great architecture. So you are a little bit, in a way, you are part of an orchestra. You are conducting, and then the music, maybe there are vibrations and tonalities that you have never expected. Do you understand what I mean? When you see those things, you see the symphony of . . . of course, you have to understand that it has to be like that. You cannot negate the lake. If I say, I'm not interested in the lake, then we are like very often in the industrial architecture when the

rivers were clocks. You see, it was the clock of the city. So everybody was putting the back of the building towards the river, and the building was facing the street and not the river. The river was just . . .

ROBERT GREENE

A sewer.

SANTIAGO CALATRAVA

A sewer. Today, we are turning around, and then we have [inaudible 52:03]. You understand. [speaking foreign language] all the beautiful part is along the river. So this kind of understanding is very important. But you see, we have to understand also that you only exercise the architecture. You understand. [inaudible 52:19] And if she wants, she comes. If she does not want it . . .

ROBERT GREENE

So is she an inspiration, you mean?

SANTIAGO CALATRAVA

No, you just try to work with a lot of love and respect for the thing. But it's something that .

... I however, believe in the force of the work.
You can see that in those exercises.

ROBERT GREENE

[inaudible 53:02]

ROBERT GREENE

The force of the . . .

SANTIAGO CALATRAVA

The force of the work.

ROBERT GREENE

It's the process.

SANTIAGO CALATRAVA

And all the constant dissatisfaction. You should never be satisfied. There is always possible to do things better.

ROBERT GREENE

Interesting.

SANTIAGO CALATRAVA

In training programs, dissatisfaction is a [inaudible 52:53].

ROBERT GREENE

How do you know when . . .

SANTIAGO CALATRAVA

It's very interesting. It's a source in my opinion of progress.

ROBERT GREENE

[inaudible 53:02]

SANTIAGO CALATRAVA

Curiosity and dissatisfaction.

ROBERT GREENE

One more thing before, I guess, we have lunch.

SANTIAGO CALATRAVA

Yes, we can go. Let's go. [inaudible 53:14]. We are going to eat at a small place just around the corner.

ROBERT GREENE

Okay.

SANTIAGO CALATRAVA

Because it's difficult for me to give you . . . what I try is to answer you in all honesty. To answer you really as I feel.

[French exchange]

ROBERT GREENE

I will make something beautiful out of it.

SANTIAGO CALATRAVA

Yes. Because it's difficult. The questions are really difficult.

ROBERT GREENE

They are difficult.

SANTIAGO CALATRAVA

How do you start in a project? It's very difficult. Your question is, because I try a little bit to bring you more elements. It's for sure, very often, the result of an intuition.

The result of an intuition is just to decide . . . and even, you know what? Although I sketch very much, it's tremendous when you look back into the sketches, and you see you have had hesitation and maybe you should have stopped there and kept in this direction and not go ahead. Because although you don't understand the sketch, it does not mean the sketch is bad. You see what I mean? Often, it's also an enormous effort, sketching, to recall the things into a rational basis. Rational from the point of view of the construction, from the point of view of the material, from the point of . . . you see. And the risk is sometimes that you lose spontaneity by this effort.

ROBERT GREENE

How do you get that spontaneity back?

SANTIAGO CALATRAVA

How?

ROBERT GREENE

How do you get that spontaneity back?

SANTIAGO CALATRAVA

At least a way to preserve it along the whole process is to keep sketching, to keep sketching. So, you keep sketching until [inaudible 02:32]. You keep sketching, sketching this particular [inaudible 02:36], sketching of this particular part. Also, having the courage, sometimes, to say, this is not the way. That is not good. And starting over. It's not being [inaudible 02:51]. Because you have done a process of maturation in the meantime. So starting again, very often, if you recall your process, it delivers you sometimes something [inaudible 02:59]. So the fact of starting again and throwing the whole work apart, this I have done sometimes.

With the risk of . . . also understanding that when a project goes into a crisis, which it happened several times in the process of . . . because there are many people involved. The project gets in a crisis. The crises are also creative opportunities to reform a project and make it even better. You see, you have a lot of partners in a project, and each one of them has to carry a responsibility. For sure, your responsibility is understanding all of them, but also keeping the quality of your project. That is my . . .

ROBERT GREENE

What?

SANTIAGO CALATRAVA

Keeping the quality of the project. Trying always to push ahead. Let's take, for example, Ground Zero. Ground Zero was a project that in a certain point arrived into an enormous crisis, and the crisis was the fact that everybody was believing that the target, possible targets in a place that has already been targeted twice, will be

the towers. Because twice, they have been again the tower. The first time [inaudible 04:12], and the second one, everybody knows what happened. But they came back from Madrid, and then from London, and then they understand that the public expectation is [inaudible 04:27]. So a requirement in terms of security for [inaudible 04:31].

Now, here's a bigger deal. The deal with security means you're not doing the things according to very strict concepts, so you have to develop new concepts. For example, a concept would be there. I'm doing a building, and I have here one support and here another support, very thick ones, very powerful. And here, another one. And here, another one. And here, and here, and here. Many supports. You have also many targets. And each one of them vulnerable, because if you arrive with a backpack or a bag, you can put them away. So you need also a lot of cameras, and you need also a lot of surveillance personnel. You say, no. That's not the way.

Let's put one support here, and the other there. And no support. It goes [inaudible 05:35]. What had happened [inaudible 05:36], they became normal. So no bag can blow them away. You need to arrive almost with a [inaudible 05:44] because they are enormous.

We are getting very big [inaudible 05:49], 200 feet [inaudible 05:54], in the underground, new. In the underground, several foot. 200 feet. Few, but very powerful, that you almost don't see. And also, you need few so that we can commence. So you can [inaudible 06:10] obstacle. And then later, the people [inaudible 06:17] in panic, the most important thing is to find the way. So the clarity deliver you to maybe find a way, so it's comfort and security. So you see how a problem can become a [inaudible 06:29] if you administrate the rules. [inaudible 06:33] when you start to do more columns and thicker, you almost don't do any [inaudible 06:38]. You see what I mean?

So this is something I have been having to manage. Of course, being an engineer helps me enormously, because you can not only argue about the fact, which it is rather reasonable, but you can also have the certainty you can do that. You can devise a reasonable course, and technically you can manage that. So finally, the instance of all the effort has . . . we are putting the steel there at the level of Mars mission. Doing the most sophisticated construction in steel. I have never done it. In the name of the handicap.

ROBERT GREENE

In the name of the handicap?

SANTIAGO CALATRAVA

The handicap that we have to deliver more security. This could be a hindrance. [inaudible 07:28]. In the process, it's continuously alive. You have to understand, the whole process is continuously alive. The conversation with the client, always very [inaudible 07:40]. You could almost think the project is not in myself. The project

is brought by the client, because he feels the need for whatever you have to do. So, in a way, he cannot speak it, but you can imagine, the project is in discussion. You can imagine [inaudible 08:03]. So, the conversation [inaudible 08:05], particularly if he is positively inspired. [inaudible 08:13] enormous resources to articulate this with him in order to do the project. This kind of . . .

ROBERT GREENE

This is a very important theme in the book already about turning any kind of problem or resistance into a way of moving ahead.

SANTIAGO CALATRAVA

Systematically, you have to realize that. Even have the courage [inaudible 08:42].

[French exchange]

SANTIAGO CALATRAVA

Enjoy, enjoy.

ROBERT GREENE

[inaudible 09:22] building that I'm particularly interested in, among others, was

the library at the Zürich University, because there you were given a building that was already there, and you transformed it into something completely different with a very simple solution. Is it possible to go into the process of where you decided to come up with this enclosed atrium with the circular . . .

SANTIAGO CALATRAVA

You see, the fact is that there was sometimes . . . again, let's say, it's a very similar case. The case with [inaudible 10:11]. You enter into a building where it's almost [inaudible 10:21]. So the geometric conditions are given. But still, dealing with the context, it is very contextual in this case. You can have many types of context. You are working in a neighborhood, and your building has to be in a historical neighborhood, and your building has in a way or another. So there is always contextual building, and in some cases, contextual building is the result of the physical environment you are working

with. And then, it also delivers you a series of opportunities.

So for example, somebody described it like that. You enter to the building, and then there is a lobby, like each one of the rest of the part of the university, nothing is special. There's security for the bags, boxes. There is a fellow there [inaudible 11:23] you don't pick up a book. Things like that. The entry is like that. But you see, 10 meters later, you are in a completely different world, which it is the interior of this space. [inaudible 11:35] It's part of the game. It's part of the game, because if you underestimate the entry in order to exalt the interior. But exalting the interior, you are giving to the people the [inaudible 11:59] in a special way. This is done in a special way. The entry is like the cafeteria in the university, like many other things [inaudible 12:07]. But you enter into the building, and then you say [inaudible 12:15] the library. So it's a matter of relations. You see what I mean?

For example, you take a man who is 180, and you put him close to somebody who is 175, he is not big. But one man, who is 180, which is very [inaudible 12:34], and then you put him close to somebody who is 155 or 160, and he is a giant. Because it's all a matter of relation. So again, there is a way to approach a problem. You are working in a modest context. You are not working in a context where you can do extraordinary thinking. You have to administrate your elements in order to deliver a [inaudible 13:01]. The most grandiose place in another context is Hagia Sophia. Hagia Sophia, you enter in the narthex. The narthex is long and cylindrical. And you enter like this [inaudible 13:14]. Mostly you enter like that. [inaudible 13:18] You turn 90 degrees, and then after 15, 20 meters, you are in the most grandiose space, and you are amazed. The same principle applies to [inaudible 13:30].

ROBERT GREENE

Do you think you were thinking of that when you did . . .

SANTIAGO CALATRAVA

Well, it's part of the profession. It's part of the professional rules that you can also know. There are rules in the profession. Same thing as the Pantheon. The church of the Pantheon, you have the [inaudible 13:50], the atrium, and then you enter, and then you are in [inaudible 13:52]. All of that shows you the fact that there are rules. In the profession, there are rules that you can use. Now, what is dignifying this space? Again, it's also the use of geometrical resources and technique. Technique, why? Because there are no supports. The whole library is held in four supports. You enter there, and you even go underneath. This is the old [inaudible 14:35]. This is the new. They are nowhere touching together. Only in the [inaudible 14:40].

ROBERT GREENE

Oh, I didn't know that.

SANTIAGO CALATRAVA

Otherwise, they are floating. They are floating inside. It has two columns in the back that you see very well, because they are put in the corner without touching the historical system. And then there are two elevators that are also embedded in the wall. And that's all. [inaudible 15:01]. There is also a technical [inaudible 15:06]. The places where the students are sitting, they are like bridges. And the back of the shelf are beams, are crosses who are carrying the shared forces to carry all of that. There is also the idea of introducing an element inside the space to modulate the lines. Finally, [inaudible 15:53] something like that. Backward, I can explain those things very logically. Up front, it is just discovering the opportunity and changing the [inaudible 16:02]. I have had two projects. I went to two projects. You have to have this patience and courage.

ROBERT GREENE

You have to have what?

SANTIAGO CALATRAVA

You have to have the patience and the courage to say, I don't like the project. Everybody likes it except me, so [inaudible 16:16]. The previous project [inaudible 16:20], but this was more all the people [inaudible 16:24]. Anatomical chair with everybody sitting there, but just the one side, facing a wall. [inaudible 16:35].

ROBERT GREENE

Nowadays, architects don't do much drawing. It's all on the computer, right? Mostly. So, in starting and working through so much of the process with actual drawing, don't you think you create a different kind of building than if everything is done on a computer?

SANTIAGO CALATRAVA

Yeah. There is no doubt. Except myself, everybody works on a computer in my work. Except myself.

ROBERT GREENE

[inaudible 18:07]. Does he draw, or no? I don't know.

SANTIAGO CALATRAVA

He may.

ROBERT GREENE

I think he probably does.

SANTIAGO CALATRAVA

But the point is that I keep drawing.

[inaudible 18:18] will tell you, when I was at the [inaudible 18:21] in Zürich, I worked during one and a half year in the architecture department. This time, I started there with computer graphics. I was working with a computer, but I understood, although it's a magnificent tool, it takes a lot of your own personal energy. It takes a lot of your personal energy, because you are modifying and working with systems. It takes such a contemplation. I used to say it's like driving a lorry. Imagine Luciano Pavarotti. You know Luciano Pavarotti was a baker. You know that? His father was a baker. Before he started in singing, he was learning to be a baker. But they discovered his grandiose voice, and then he became Luciano Pavarotti. So imagine

Luciano Pavarotti baking bread while singing Aïda. It's not possible. He has to concentrate. [inaudible 19:24] and a good voice.

In a way, in order to deliver from yourself, you need an instrument that is very close to you, very short between your mind and your hand. You know something that you can [inaudible 19:47]. Computer is for sure not like that. It causes you a lot of rules. It delivers you also many. You can only deal with these things. Your dream capacity is limited by the machine itself. Although, it can even go beyond your mind, because you can do psychedelic colors. You can do it like that. You can do it in this tile. My son tells me, you can draw like this. You can draw like that. You even can take now a pencil and do . . . but [inaudible 20:22]. But for the moment, I prefer such a primitive rule like a watercolor and a brush and the colors and things like that. But nothing against [inaudible 20:32], because I started telling you that the engineers are conveying toward the

architects [inaudible 20:37] our times. Also, the ability we have to work in variants and make changes. Sometimes I reject a project, and I say, we have to do [inaudible 20:51]. Everybody can [inaudible 20:54] computer, you can go fast.

ROBERT GREENE

[inaudible 20:58] why people can't use both. Why you can't sketch and draw and then use the power of the computer. But it seems people become addicted to the computer and then they lose the ability to . . .

SANTIAGO CALATRAVA

That is true. You see that in the younger people. They come from the school, and they don't understand the paper. The culture of the paper is a wonderful thing. It's a wonderful thing. The Arabs brought it to Europe, and because the first paper mills established in the Mediterranean. In Amalfi, they have a very old paper mill. The do a wonderful [inaudible 21:43] in Sicily, in [inaudible 21:49] in Spain. So in the south of

Spain, there are paper mills that are already 600 years working. Now, finally, you can also lose the sense of the paper. And I call them and say, "I want to see this section." They tell me, "I have to print it." I say, "But why don't you have it already printed? You should have a booklet of the drawings you are doing there. And you are showing me that. It does not matter if it is not the most accurate one." So they also pretend that things exist only the inside computer.

We understand [inaudible 22:27] myself. One, they have to scan those drawings. I send them to Zürich, and they will be photographed and put in the archive. Something of my work remains. Finally, I see my work through the consistence of the paper, which is not very much. But I see it as something autonomous that has a quality by itself [inaudible 23:00] look back in 100 years or whatever [inaudible 23:04] fellow has drawn a lot, or things like that. [inaudible 23:10]. For them, this does not exist. We

understand the present [inaudible 23:16]. I have a single draft man with me, a single one. He's a fellow, he is deaf and also can speak very badly. He's in Zürich. He still draws by hand. And then of course, you see the quality of the work he delivers.

ROBERT GREENE

What does he do?

SANTIAGO CALATRAVA

Quality. He draws by hand still.

ROBERT GREENE

He's an architect?

SANTIAGO CALATRAVA

No. He's a draft man. He came to me drawing in [inaudible 25:52] with an engineer. Nobody took attention on him, but I did. He draws very good. And deaf people, they have a big handicap, because they . . . I think it's worse to be deaf than to be blind. Because if you're blind, you can have a blind lawyer. They are hearing the whole time about [inaudible 24:17]. But deaf, you see, [inaudible 24:19]. I took him with

me, and I started giving him my sketches and working closer with him. He learns a lot, but [inaudible 24:31]. Before, people have had a little bit more personal relation with the thing they were doing. Because something [inaudible 24:54]. I mean, you see, for example, I have other people in my office who do rendering. They can do images of the building. They're also very good. I like also the capacity of the computer to deliver you almost a photographic image of the building.

ROBERT GREENE

But you can put the two together.

SANTIAGO CALATRAVA

Yes. This is what we are trying to do. Although, in my office, I am the only one who is doing that.

ROBERT GREENE

You're the what?

SANTIAGO CALATRAVA

I am the only one who is doing that.

ROBERT GREENE

Drawing?

SANTIAGO CALATRAVA

Yeah, here in New York in any case. And I have even [inaudible 25:33], you have to look at the sketch. If I do 30 different sketches, there is a difference between one of them. It takes me maybe one hour to do one sheet of paper. So why you want to see [inaudible 25:50]? You have to dedicate at least 5, maybe 10 seconds, or several before you turn the page. So dedicate at least 10, because [inaudible 26:00]. You understand? So you have also to educate them the art of seeing [inaudible 26:11].

ROBERT GREENE

Also, in drawing, aren't you also discovering things and learning? Just the process of drawing something out, you're thinking about it very deeply, which you're not doing if you're putting things in on the computer. You have to think very deeply about each drawing.

SANTIAGO CALATRAVA

Or even, this comes to my mind now. It is interesting maybe for you, about thinking or

not thinking. Let me tell you, for example, I read a sentence [speaking Spanish].

ROBERT GREENE

Yeah, what does miembra mean?

SANTIAGO CALATRAVA

Miembra, the members, the limbs. Limbs of the body.

ROBERT GREENE

This is Michelangelo.

SANTIAGO CALATRAVA

[inaudible 27:08] You see, you start deluding yourself. This what I'm telling you is crazy. It's like, for example, one day, a piece falls on the ground. I go down and pick it up. And then, you discover your arm. [inaudible 27:33] another time. I have had an operation here. They opened it. So, you receive anesthesia. So this arm was like that. So it was hanging like that. It was not me. It was just something hanging there. So you discover your arm. It's very interesting. It may be crazy, but these are situations in your life, you discover your hand. Then, I want to use my

hand as a tool, not [inaudible 28:07], just as a tool, because they are my hands. So I started doing like that. I started doing like this. [inaudible 28:52] could keep going. [inaudible 28:47] method, you know. I could keep going. Now, you see.

ROBERT GREENE

Like arms.

SANTIAGO CALATRAVA

Good [inaudible 30:25]. This is the station in Zürich, the cross section.

ROBERT GREENE

The Stadelhofen?

SANTIAGO CALATRAVA

Stadelhofen. It is a station in Zürich. The station in Zürich emerged from my hand.

ROBERT GREENE

It really did?

SANTIAGO CALATRAVA

Yeah. There's all these exercises you can do. You understand? Or for example, I read also somebody says . . . you have by chance one dollar? I have one dollar. Wait, wait. You see

that here? It's a Masonic sign. And the eye signifies God. God, the creator, the architect of the universe, the supreme architect. Now somebody says years ago, Raphael, the painter, has had no arm.

ROBERT GREENE

He had no arm?

SANTIAGO CALATRAVA

No, no. But if he has [speaking foreign language]. So in order to be an architect, you don't need to have arms nor hands. So for me, it was all about my hand. Drawing [inaudible 32:16]. But then I understood, so I started working with the eye. I got interested in the idea of the eye. How the eye opened, how the eye closed, and the sense of the eye and the perception of the eye. But I was also obsessed a long period of time in the eye. I suppose you can do also with the mouth or with the ears.

ROBERT GREENE

Or the head.

SANTIAGO CALATRAVA

The head. And the gesture, very general. You see, the gesture. You say, a house is like this. It's already, you are doing that. Or it's like that. [inaudible 32:57], but the gesture is very important. A lot of architecture [inaudible 33:04]. And it is understandable, because we are person. We are building for person. And also, even if we believe red is red, red is only a color for you, me and [inaudible 33:18]. But red for my dog might also be another thing. So it's interesting to see also that we finally are humans, and all that comes from our humanity is common understanding [inaudible 33:38]. You understand me?

ROBERT GREENE

Yes.

SANTIAGO CALATRAVA

This is the essence of [inaudible 33:43].

ROBERT GREENE

And what does the Michelangelo sentence mean? What does it mean, Michelangelo, about the miembra?

SANTIAGO CALATRAVA

Yes. When I read it for the first time, the sentence, the person translating make a comment. If you are not good in anatomy, you cannot be an architect. I think it goes beyond. It goes beyond. For example, I'm sitting, and my feet are on the ground. So, the height of the seat is like the height of my legs. I am putting my arms here, and the height of the table is correct. You understand what I mean? I think this is what it means. It means many things. But it means also that, as my coat, you see the length, like my arms. And also the width is like my shoulders. So the architecture is, after our coats, it is the architecture that is surrounding us. But it means also a lot of things. It means that you can get inspired from our body. So, many of the buildings of Michelangelo remembers the body. The building is that. If you look at the cupola of Saint Peter's [inaudible 35:25] and things like that. Also [inaudible 35:29] anatomical.

Now, it is important that this is my hand or not. If I say that in the school of architecture, it would be a scandal. Do you understand me? The people, they would not accept it. They'd think that's strange.

ROBERT GREENE

Yeah. What is the importance of sculpture in your architecture? I know you have that exhibition in New York of sculpture and architecture. Is that another way of working out your problems, or is it simply a form in and of itself that you're interested in?

SANTIAGO CALATRAVA

Yeah. [speaking French] It may be a bit noisy here. Maybe more break. I will think on your question.

SANTIAGO CALATRAVA

... sonography. [inaudible 0:00:02]

ROBERT GREENE

To do the theater for a play?

SANTIAGO CALATRAVA

Yeah. The play. And then we finished doing [inaudible 0:00:10], and they also called it the

architectural dance. But when Peter Martins, who was a former dancer and is now the artistic director, came to me, I said he should know what he . . . [laughs] He should know. But it was a very good cooperation with a great team.

ROBERT GREENE

That would be very exciting.

SANTIAGO CALATRAVA

And I was pleased seeing that, because I tell you, to make even one, it took three of them, or five, and you put them together. Then you see the relation, and it was very nice, because for many of them, the music was done on commission. So, the director called Esa-Pekka Salonen.

ROBERT GREENE

I know him very well.

SANTIAGO CALATRAVA

A great . . .

ROBERT GREENE

Los Angeles Philharmonic.

SANTIAGO CALATRAVA

Los Angeles. And he composed a piece.

ROBERT GREENE

He's a very good composer. Beautiful. He's fantastic.

SANTIAGO CALATRAVA

It was all about strings. So very much in the [speaking foreign language]. Structure.

ROBERT GREENE

Very mathematical.

SANTIAGO CALATRAVA

Mathematical, yes, yes.

ROBERT GREENE

Yeah, he's a great composer.

SANTIAGO CALATRAVA

A young woman played there, and the other fellow was dancing. Everything new. The sonography new, the dress new, the music new. It was really . . .

ROBERT GREENE

Excellent. And you did the . . . what did you make? The sculptures?

SANTIAGO CALATRAVA

Yes. I will show you. They are in photos I have. [inaudible 0:01:41], and then there was a great lighting engineer there, and artist, and he put all the [inaudible 0:01:52] colors. It was beautiful. It was really an enormous thing. Then, there was also another one. You see, how the time today is a little bit conservative because there comes somebody and says, no, no, no. I want to have something in La Pampa in Argentina. He takes a piece of [inaudible 0:02:10] and he put [inaudible 0:02:15] running and dancing. So, a bit more descriptive, like a story, telling a story. And I had to paint landscapes.

ROBERT GREENE

You painted landscapes of Argentina?

SANTIAGO CALATRAVA

[inaudible 0:02:30] And then they [inaudible 0:02:35], when it started, they put [inaudible 0:02:39] books. It was very strong, because it was also a challenge for me not to go into the [inaudible 0:02:46]. It was very interesting.

ROBERT GREENE

Are you going to do it again?

SANTIAGO CALATRAVA

They say this is like the Olympic Games. You may once in your life [inaudible 0:02:56]. Not the way I . . . but it was very nice. Also, very coherent. Very coherent. Of course, if you look . . . often the people, I look a little bit at the work of others, like [inaudible 0:03:20] and all that. And it's a bit, at certain times intended to represent a happy world. You understand what I mean? In the ballet, or a little bit like a mechanical . . . you see, like you will have clockwork and then the ballerinas come there and dance, and then it changes. But in this case, it was more about ambience, creating an ambience during 30 minutes. Creating an atmosphere. And of course, people may not be very accustom, although they found that it was very worth seeing. Critics and people, visitors. It was very worth it to see.

ROBERT GREENE

Do you have . . .

SANTIAGO CALATRAVA

They did in floor. Like when Stravinsky [inaudible 0:04:13]. "Money back" and things like that. [laughs]

ROBERT GREENE

Are they familiar with Martha Graham?

SANTIAGO CALATRAVA

Martha Graham, yes, yes, yes.

ROBERT GREENE

And what about the great Japanese sculpture, Noguchi?

SANTIAGO CALATRAVA

Isamu Noguchi, great.

ROBERT GREENE

He did all of her sets and sculptures for those sets, so it's sort of similar to what you did.

SANTIAGO CALATRAVA

Noguchi had also a wonderful set here for a piece called *Orpheus*, a ballet called *Orpheus*. And he designed just some applies in the body of the fellow and a harp. That's all. Absolutely

minimal. And today, the sign of the ballet is the harp of Noguchi, is the harp of Noguchi.

ROBERT GREENE

Beautiful. It's very beautiful. He did all of Martha Graham's sets.

SANTIAGO CALATRAVA

I think he was born also in California.

ROBERT GREENE

Yes, he was. He was part Japanese.

SANTIAGO CALATRAVA

Some American woman and Japanese man.

ROBERT GREENE

Yeah, in California. Martha Graham is from California, too.

SANTIAGO CALATRAVA

Interesting, interesting.

ROBERT GREENE

We talked a little bit about this yesterday, but . . . oh, wow.

SANTIAGO CALATRAVA

I won't just reform a little bit the head, because I was not very satisfied with the head. But you can speak [inaudible 05:38].

ROBERT GREENE

The idea of constraints, actually being a tool for creativity. Do you understand the word constraints?

SANTIAGO CALATRAVA

Yes, yes, yes.

ROBERT GREENE

So it would be, for instance, the materials that you have to work with and the client that has certain demands, and the site that you're working with. And as you said yesterday, with the World Trade Center, with the threat of bombs and how you had to make the supports. Do you find that having to work with these kinds of constraints forces you to be more imaginative, that it's actually a tool that you use in your work?

SANTIAGO CALATRAVA

Yes. There is certainly . . . in a way, the constraints are delivering you a field of work. So they are defining the boundaries of your field of work, you could say. You could imagine it like that. It is a little bit like

topography, a kind of internal topography of the . . . you understand the word topography?

The hills, the mountains, all of that makes topography and make a landscape. Maybe you are working with a very difficult side, and you have big slopes, and you have to integrate something there. It is a physical constraint.

There are all kinds of constraints.

You see, you can have constraints like coming out of the fact that you have to build a station in the place where the trains are already going through. And you have to build a station of the trains by using the same alignment as the previous one. So these are, in a way, almost topographical constraints that have to be combined with the fact of having to develop a whole process of construction in order to implement this, what you want to do. So these are very hard constraints.

Now, there are other constraints that are, let's say, almost [inaudible 0:08:04]. For example,

they may tell you that for this particular project, the blasting, the explosions and all of that has to be implemented in terms of the security that the building has to offer. Or the earthquakes, working in California. So there are a lot of constraints, physical matters.

There are other constraints, which is the economy of the project. Somebody arrives and says, "I have so much money to spend." And this is it, and you have to arrange yourself in the frame of this project. These things also get in the process even organized under the word value engineering. But they are effectively constraining. Now, can the constraint be understood as positive? I think this is a very subjective estimation. Myself, I look at them as a positive part.

ROBERT GREENE

Yes, that's what I mean.

SANTIAGO CALATRAVA

I look at them as a positive part, because I have to live with them. So I want to do . . . and even ongoing, when you are working on

a project, this is my personal approach, you always have to think, whatever happens . . . [inaudible 0:09:27] through the force of the things transformed in a positive event to the project. So this finally, what then remains is your positive attitude, isn't it? Which I think is capital. So constraints are constraints.

Problems are meant to be solved. It's like a complicated mathematical equation in which you see . . . sometimes, I say, you have to draw an arrow, and the holes are one here and the other there, and the arrow has to go through all the holes. So you may have to bend the arrow, you understand, in order to get through. It's very important. And also, among the constraints, materials you have to work with, you have to understand that when you embark in a process of an architectural project, you will have to deal with people. Not one day, not one month, even not one year, but maybe 10, 12, 13, 15 years.

So the producer has to be prepared when you enter in this process to understand that the person at the end of the process for yourself is another. Because you belong to your next generation, let's say. You're aging 15 years, according to [inaudible 10:47], this is the cycles of a life of a man, a person. So finally, you need also to understand and to develop a certain sensibility, even for the relation with other people, which means also that if you remain positive, it's probably better in the long term for the project.

So this kind of a strategy needs to be established from the beginning, or you have to be [inaudible 0:11:16] you are confronted. What you develop at the end of this process, it is the [inaudible 0:11:21] constraint, and all these long processes. Finally, the product depends very much on you, but also depends on a lot of other circumstances. You understand? You paint all the way. So, it's very important from the beginning to do, in terms of interrelations of people. Not

now so big problem, but the interrelation of people to present an image that is clear and strong enough and captivating enough that everybody follows that.

So that I say, the project has to defend itself. Do you understand? Like a beautiful building, once built, defends itself, and it is eloquent. And it says, "Don't demolish me. Don't speculate with me. Don't transform me." For example, think at the Guggenheim, here from Frank Lloyd Wright. There was a moment that everybody was afraid they may do something else. Finally, they respected an addition that they make it in a prudent manner.

So, I say with that that even . . . the building has to develop an outer defense, so the project also has to be strong enough that it convince the people, I am the reason why you will have to work 10 years. It's important also for you. So you have also to open a certain participation of other people. You cannot

monopolize let's say all the credits. I'm thinking, personally, on Ground Zero, which is a project that will take . . . it's already eight years and going, and I'm sure until we finish that, we will have to work there at least four more years.

ROBERT GREENE

I'm very struck by the relationship of your work to things in nature. Trees, flowers, birds. I know you don't consciously try and imitate these shapes, but you seem to create shapes that are very organic, that could be something that you would find in nature. And that makes it something that we can relate to in some way, and it has an emotional effect on people, because you seem organic. Is that something that you're conscious of? Creating things that aren't just wild speculations in your mind, but that are very grounded in organic forms?

SANTIAGO CALATRAVA

Imagine I was a painter. Imagine I was an expressionist painter, German expressionist painter, Kirchner or [inaudible 0:14:14].

ROBERT GREENE

My favorite.

SANTIAGO CALATRAVA

Nolde. You see, first of all, they have a vocabulary. They also make references to landscapes, to mountains, to villages, to snow, and all of that. And these things appear to be, in the vocabulary of painting, very natural. Painter can do, can transmit a message by making clear references to not just all the . . . a light pole by Kirchner in the wintertime. Or a painting, Frauen und Kinder, or whatever it was. He painted [inaudible 0:14:55] are not the mountains [inaudible 0:14:58]. It's an abstraction.

ROBERT GREENE

Everything's abstracted.

SANTIAGO CALATRAVA

Yes. So, I think in a way, as simple as that, you could also as an architect use the science of nature, indeed. One of the things in which we suffer, even today in architecture, is the absence of ornament. The ornament was banned out of the scene in the [inaudible 0:15:27] and put out of service. And even Adolf Loos wrote this famous book, "Ornament und Verbrechen". And finally, you see, if you look to the higher cultures, the ornament is almost the calligraphic part of it.

Somebody said the Alhambra, which is one of the most beautiful buildings in the world, is the most expensive addition ever done, because it's full of poems. They wrote in calligraphy, in wonderful calligraphy. The Nasrid, you know, Nasrid calligraphy, the old enormous point. Singing about the building, singing about the owners, singing about God, and all of that.

So calligraphy was . . . imagine doing a book like a building. We describe Notre Dame, the cathedral, as a book. But also, indeed . . . a sense of ornament is a superior understanding and transmission of a message applied to architecture. It is something that we have lost. How to recreate that, I don't know.

But the ornament clearly related the acanthus capitals of the Corinthian order of the Greeks. It has made reference into the [inaudible 0:16:56] world, and also the [inaudible 0:17:00] hanging in the [inaudible 0:17:02] from the skull to a skull of an animal [inaudible 0:17:04], and then with the [inaudible 0:17:07]. And so there are differences to roses. Even by Labrouste, who is a great architect in France of the 19th century, he imagined the National Library that you can see in [inaudible 0:17:24] in Paris. You have this wonderful . . .

ROBERT GREENE

Amazing.

SANTIAGO CALATRAVA

Amazing work, and it's like a tent in the desert.

ROBERT GREENE

It's like a what?

SANTIAGO CALATRAVA

It's like a shelter in the desert. So it's a shelter of culture in the desert of the city. And he made this [inaudible 0:17:44], and when you enter, they are carved in stone. There are draperies hanging. [laughs] It's crazy. It's crazy. [inaudible 0:17:53] that you cannot be [inaudible 0:17:55]. We have lost enormous the capacity to express ourselves like that in architecture.

So indeed, even my language, try to force the language of the construction and the language of the engineering to an expression. But not a literal one. Just because a column can be a little bit like a trick and an umbrella. You see, the trees and the branches and also tectonic logic. [speaking foreign language], and also a logic of response to the wind by

the nature of the trees. So this [inaudible 0:18:33] you can instill. But very far, very far of Labrouste. Very far of the expression and the unique way to . . .

ROBERT GREENE

It's not literal, you mean.

SANTIAGO CALATRAVA

It's not literal. We are working with very reduced elements. Maybe make those shapes, like the Auditorio de Tenerife or something like that. Just like this and like that. Makes them maybe stronger and more pregnant, because all the cards are played towards the form. But architecture can carry enormous language. And among others, it can also take natural analogies without any doubt.

ROBERT GREENE

Well you have, for instance, there's the tower, the Sondica, the airport control tower, which looks like a mushroom that grew out of the earth. Then you have the trees in Gare de Oriente, as if there were trees on the hillside or the whole water with the . . . your work

seems to blend into the landscape in some ways, like it kind of grew out of the landscape.

SANTIAGO CALATRAVA

Yes. You see, the first sketches for Lisbon . . . Lisbon is a hilly city. It has something to do with Rome. One of the attractions of Lisbon, it is, I think, topographically in any case, the most beautiful city, the most beautiful capital of the Iberian peninsula. It's really a beautiful city.

ROBERT GREENE

I've never been to Lisbon.

SANTIAGO CALATRAVA

It's a very beautiful city. You will enjoy it very much. It's also an Atlantic city. You feel the light. And you see, what it has, this hilly landscape, sometimes you have bushes of trees in the top of the hills. So I thought, it's a nice thema. Some of my early sketches on the station were related to the trees on the top of the hill. So it's clear, it is not hidden. It's a clear reference to the world of the trees. It's not . . . I think it's [inaudible 0:21:07] in

architecture, as I said before. We are trying to find our way to recopy the sense of the ornament has a superior touch that makes readable architecture. Also, in my opinion, the metaphor of using analogies of nature helps also to reinforce a certain image, or to deliver an image that may also be close to the expression of the natural land and make it more familiar to it.

ROBERT GREENE

You also have the human body that you use as well, right?

SANTIAGO CALATRAVA

Yes.

ROBERT GREENE

The kneeling, the tower with the person holding up a torch where you used the eye. It's also part of this creating new shapes.

SANTIAGO CALATRAVA

Yeah. But you see, you have to understand. I started speaking to you about Kirchner for example. So indeed, there is so much focus and so much expression. Why I chose an

expression? Because it doesn't matter. It could be absolutely abstract. What he is trying when he does those blues and those whites in the mountains is to go beyond and to catch the sensation or the expression this landscape is producing on him. And the [inaudible 0:22:38] wave, coming down, and then the poles of the electricity, and then making the [inaudible 0:22:43] with the cable. So he is representing a drama.

Indeed, it's a personal perception, and that is also very important, that although the architecture has a universal value, and although the values of architecture are controlled by the service, the sense of service which is also very much the secret of the philanthropy in this profession. It's just making buildings that you can use them. They stay there, and they are delivering a service. But beyond all of that, they are also beacons of expression of the person who has done it.

Then, as a painter can use a canvas, as a sculptor can use a piece of steel or bronze to deliver a very pristine message, so is the factor of an architect working on his building. I don't see the difference. Do you understand? So, when I say a building of [inaudible 0:23:42], I see its character. You see a message, 500, 600 years ago done, but today, it is still fresh and still very touching.

ROBERT GREENE

And how do you relate that to the idea of nature or forms of the human body?

SANTIAGO CALATRAVA

You see, so finally, you are developing a vocabulary. You are developing a vocabulary. So I have been, all those years, trying to find a vocabulary. So one of the aspects is that the tectonic of the body, the sense of the art, or even for example, as I said to you yesterday, just in the gesture. If I tell you the house is putting my hand like that. So I say, it's like this or it's like that or it's like this.

Related to a movement like this with the wall.

So it's already in my body. I am signifying already in architecture. So in this gesture is already architecture. Do you understand? It's already architecture. So it means that there is something . . . in a brush stroke.

ROBERT GREENE

In what? Brush stroke?

SANTIAGO CALATRAVA

There is already the gesture of the hand of the painter. You cannot come around. In your calligraphy, there is your gesture, and even people say your personality. So we are humans, and as human beings, we produce things that are related to us and also have been . . . for example, one of the very moving things. Somebody said, even the piano. They started with a cimbalo and then they went to piano for today. And then they're going to the grand Steinway, which is as big as this table. You play an energy coming out and fill you see the whole Carnegie Hall, 2,000 persons.

But the human voice is the same in the time of the Greeks. So, a singer sings exactly with

the same intensity as singing 3,000 years ago in the [inaudible 0:26:17] Theater or something like that giving the [inaudible 0:26:20] there. So, it's very important that we understand that there are elements in the human nature that are not only common, but they are also invariable. So the sense of love, the sense of hate, the sense of frustration, the sense of desire, whatever. There are so many things.

You see, these things are finally what it's about in whatever activity or in architecture. Even the human body. And finally, you see the chairs are maybe a little bit higher. Maybe there are cultures where people don't use chairs. They sit on the ground. But to go through, a door is a door, and a room is a room. And our perception of those things remains attached to our body and to our human nature. So this is very important to understand.

Finally, we are not building buildings for whatever. We are building for people. And these things mean that you can also establish a dialogue in many senses. One is making it correct for the bodies, and even using a language that is understandable to them. Conscious or unconscious. In conscious part of everybody, it's also my conscious part. So when I do something conscious, can be maybe written by others in an unconscious way.

ROBERT GREENE

You mean in the union sense, like the collective unconscious.

SANTIAGO CALATRAVA

Yes. If I do something just pure, coming out of my unconscious part, it can also be . . . a shout [inaudible 0:28:03]. It's also [inaudible 0:28:08]. You see what I mean? Everybody of a certain age has been in situations in which . . . you see what I mean? So there is a universal message that is not only readable in terms of . . . and this makes architecture

even more difficult, because architecture is also something you have to measure in millimeters, in inches, in one-eighth of an inch, and things like that. And then you have to decide the color, and somebody comes and paints it.

So finally, you have to ordinate all those things in a message that has to be done even by somebody else. So, what remains, also finally, your hidden message. Often it is intentional, making a reference to the trees or the sense of gravity. For example, another thing also [inaudible 0:29:03] also interesting. Since I studied engineering, I got this thought. We live in a universe of light. I see better with my glasses the light [inaudible 0:29:21], red and so forth. This universe is coming from the light. We live also in a universe of gravitation. So if I take the pencil, and to put the pencil like that, it's rather difficult. So we live also, there is something . . . you could also say to the light, which it is the gravitation. And this gravitation, brings

always to movement, because forces . . . in physics, you say forces . . . the confusion comes already in the study. They call it static, and static means something that does not move.

ROBERT GREENE

But everything is moving.

SANTIAGO CALATRAVA

But everything is moving. And even the forces that come from the static is mass multiplied by the acceleration, but the acceleration is a cinematic variable, that is the space, the elevated space to all the time to us. So there is time also in the forces. So indeed, you see. Also, the amount of time can be very static. It's a matter of time, and it's a little bit [inaudible 0:30:29]. Finally, the [inaudible 0:30:30]. So there is a continuing process in movement.

This is also, in my opinion, a basic of meditation and also of thinking that I try to translate in those things. Maybe as I said to you, it's as simple as that. Those movements.

We know that we are accustom. The only thing it is we are not so accustom, that our beliefs can also transform or change or even move. [inaudible 0:31:03] moving cones and things like that already.

So finally, it's also the kind of amusement in the research of new horizons. It's also to say the design is very original, so very special. But it is not, because, for example, Milwaukee without this moving roof would be another place. The [inaudible 0:31:37] it would be another. So this sense of metamorphosis of the building and the surprise for you to view, to see how a shape can change and transform into something else. And then also the sense of symmetry in the asymmetry of the composition. Facing the lake, you see the building there and the horizon in back.

These things have an emotional component, and for this, it's justified. [inaudible 0:32:11] not so much. Even not so expensive. A little bit to put things more in a conciliate way,

which also you have to learn. There are two worlds. One world is the world of what really happens, and another world is how to bring those things to. Because finally, you have to convince other people. Of course, you see, there are people who are very [inaudible 0:32:44]. And it's this, what I tell you, the project defends itself and finds its way.

So you do something, and then people say . . . they see that even if it is not built. That is also a positive aspect. This is what I say. In our mind, you see the fact that I can drink . . . because ideas, it's very platonic, this thing. Ideas exist. So I may have an idea that I have sketched. But it's also a common world. And the fact, once you speak it, it's property of everybody. So because you cannot patent an idea. You cannot patent [inaudible 0:33:26]. [laughs] Not in the idea of writing or something like that. So very interesting. Still, this platonic understanding that an idea can have the force to combine certain people and even to change . . . you have to

come [inaudible 0:33:44] with these factors by going ahead.

ROBERT GREENE

I noticed in the drawing on the Ernsting Warehouse you had written in Spanish, [speaking Spanish]. So, is it you were literally seeing the buildings that you create as a living organism that has a life?

SANTIAGO CALATRAVA

Ernsting, I have to tell you, it was a funny thing. Because the idea of . . . you see, there is a kind of script, like a television, something like that, where you . . . I explained you that. I make you a small sketch here. You will see. If you're looking from the side, the building has something like this. And here is the facade, and here was the gate. The gate, this is the facade. Then here there was an elevator down. All those things needed to be done because there was the transformator that was here. And then here, the [inaudible 0:35:09] keeps going like this. Now, I decided to put here a kind of special element to catch the

eye. And here, I project for the first time . . . I have done also [inaudible 0:35:24] a kind of eye that will open and close.

ROBERT GREENE

This is the opening?

SANTIAGO CALATRAVA

Yeah, yeah. And here were the doors, and here was the side. You see, I explained to the client that . . . I brought also a model of that, and I said, "Look, this is like this, and your lorries are entering here you see every day and getting out." You have the lorries and [inaudible 0:35:54].

ROBERT GREENE

This is the thing about the whale.

SANTIAGO CALATRAVA

Exactly. And I told him that. He got almost an attack. [laughs]

ROBERT GREENE

Good or bad?

SANTIAGO CALATRAVA

Bad.

ROBERT GREENE

Oh really?

SANTIAGO CALATRAVA

Bad one. And he didn't make it.

ROBERT GREENE

Why?

SANTIAGO CALATRAVA

Because I think he goes too far. And also, I think he is a very, very Catholic person. He associates to a Masonic symbol something like that. The eye is associated with the Masonic . . . this I tell you out of record. But I think in his mind happened something like that.

ROBERT GREENE

Well, the Masonics were very religious.

SANTIAGO CALATRAVA

Very much. You see, I have very good friends who are Masonic. Myself, I am not. But my father-in-law goes into the highest hierarchy of Masonic. Now he's old and retired, but they have been anti-fascists. They fight. They have been democratic forever.

ROBERT GREENE
Mozart, in the 18th century, Mozart and all of the great were Masons.

SANTIAGO CALATRAVA
Mozart has composed enormous magic. Even *Die Zauberflöte, the Magic Flute*, is an apology of the Masonic [inaudible 0:37:11]. And even the rules in this highly [inaudible 0:37:14] in those holy spaces, we don't know the . . . Rache is the vengeance, vengeance.

ROBERT GREENE
What's the word in German?
SANTIAGO CALATRAVA
Rache is sich frechen. Vindicativo. Vengeance is when somebody does something bad, I give him bad. This is the vengeance. It's an enormous [inaudible 0:37:45].

ROBERT GREENE
So, he didn't like the whale analogy.
SANTIAGO CALATRAVA
No. He didn't like it. He almost . . . [laughs].

ROBERT GREENE
So you learned maybe not to tell that to a client.

SANTIAGO CALATRAVA
Yes. [inaudible 0:37:59]

ROBERT GREENE
The lesson.

SANTIAGO CALATRAVA
That you cannot trust . . . when you want to go very far. It's funny, because once you speak about Frank Stella. He has done for a church in Rome a [inaudible 0:38:19]. Now, it's all about pieces of metal and soft pieces. Absolutely completely abstract. They didn't accept it. But I was invited once to Rome, and I spoke with a man who was in charge of all those things, although he [inaudible 0:38:38] when I said, "Look, you have [inaudible 0:38:39]. It's a great work." I tell you, you have to understand that, [speaking Italian]. The anatomy of the paint is different.

It's all about paint. It's not about the scene. You can speak about the scene, but watching

this thing, you have to think and paint. Not on the picturesque aspect of somebody carrying a cross and falling apart. You have to feel the pain. [speaking Spanish] You see, often, also sometimes, a sentence helps. So the idea of a building as a living organism, as I come to your question, is very beautiful. Very beautiful, because we are life, and architecture celebrates life. It celebrates life.

Even the pyramids celebrate life. When you think on the history, you think that they use to call . . . I can't imagine [inaudible 0:39:45] the light, because it was all polished. The surfaces of the pyramid, first the blocks up, and then they put [inaudible 0:39:54] stone, and then they polish it down. And then on the top, there was the pyramid all in gold. So the first beams of the sun, arriving at the top of the pyramid and make that lighting. And then in the afternoon and so on, changing, and the sunset. [inaudible 0:40:10].

ROBERT GREENE

Can you imagine what it would look like back then?

SANTIAGO CALATRAVA

Great. It's all about that. Also, something we have to [inaudible 40:19] speaking about here, but if you go to Berlin to the museum, you can see the door of a star. You see a Babylonian door, blue with the blue ceramics, and you get amazed when you see those things. The door is blue with yellow. They wanted to really say, "Here we are. You are entering." Babylonia is the most important city in the world [inaudible 0:30:43] you enter there [inaudible 0:40:46]. It's really to give you an idea that this kind of dream has existed. It's like the human voice. The capacity of making enormous dreams and bringing the things to a point, as you say, sending the man to Mars or making cathedrals or making the pyramids. This feeling is universal, and it has existed in human beings.

ROBERT GREENE

When I look at the DVD, the movimiento, you see the doors moving. It's almost to me like the buildings are breathing in a way. There's like lungs, and the whole building is alive.

SANTIAGO CALATRAVA

It's beautiful. Often, even in the rationalist epoch of Corbusier, he defined, because he was very much in a way, he was a genius of the publicity. So it was also Frank Lloyd Wright in a way. They are not only prominent because they were good architects, but they were also putting very beautiful work in a time in which also the [inaudible 0:41:53] and the idea of revolution has been a little bit of the tenor of the 20th century. It's all about revolution and changes and utopia, social utopia and all these things.

So it was [speaking Spanish]. What this means. But the fact that the building can breathe is . . . indeed, I don't know if you are familiar. There is a book, the Book of Psalms.

Psalm 150 is the last one. 150 something.

It's wonderful. I tell you, if you go and see [inaudible 0:42:38] was four balconies that were in Santa Maria [inaudible 0:42:47] in the cathedral of Florence. And these balconies [inaudible 0:42:53]. So, these balconies were dismantled later on and are now part of the museum. So you see, all those [inaudible 0:43:03] done by Donatello [inaudible 0:43:05]. The full verse of the Book of Psalms that says, praise the Lord with the sound of the cymbals, with the sound of the tambourine, and there are four instruments. And then you see those [inaudible 0:43:20] and so on and so forth. Concludes the last sentence, it's very beautiful, that everything that breathes, praise the Lord. Everything that breathes.

So the sense of breathing is very important. So you say, why I put you in this context? Because I want to tell you, not on behalf of me, but Donatello was inspired [inaudible 0:43:45] masterpiece. So finally, even the

idea of breathing is also a wonderful idea. And because the building establishes with you a dialogue at this level that you call feel, the building breathes. And this is important. Important is also that . . . it's that the building established a dialogue.

ROBERT GREENE

This is related to the idea of nature, but the sense of creating movement in all of your works, either literally, with doors opening, but also you feel like they're moving. It's frozen, but it's about to do something. It's also very much to me part of something in nature or organic, as everything is in a state of moving. Is this something that is part of your philosophy? Because things in the 20th century seem to be all about creating movement in cinema . . .

SANTIAGO CALATRAVA

[speaking Spanish] fellows like that. [inaudible 0:45:10] so forth who [inaudible 0:45:12] and showing also how . . . also the use of photography to cut the movement, an

instant of movement by [inaudible 0:45:22] and many others. The preoccupation of the movement and how to fix it was very important.

ROBERT GREENE

Are you consciously trying to bring that to architecture?

SANTIAGO CALATRAVA

You see what somebody says. Art precedes architecture. Art precedes architecture. Okay. Let's say Alexander [inaudible 0:45:44] and these wonderful moving objects. Or if you know, [inaudible 0:45:57]. He also invented a machine to produce [inaudible 0:46:02]. So he put the machine here, put a ramp, and he was [inaudible 0:46:06] crazy objects, turning around just to [inaudible 0:46:14]. So, the idea, let's say, of the movement, the physical movement. You have also a man, Marcel Duchamp who passed away in New York and was also very important for the avant garde here in New York. He has made this painting, a fellow descending a stair.

ROBERT GREENE

The nude, the bride.

SANTIAGO CALATRAVA

So the preoccupation of the movement is all in the art. The question of cinematic is old. What is also interesting in the art, always I'm getting out that this is art that is movement in architecture. Or the evolution of the architecture. Another point that's interesting is seeing some of those fellows. Let's say, the last works of Calder became so big that you can even walk on them.

ROBERT GREENE

Like architecture almost.

SANTIAGO CALATRAVA

Like architecture. The last works of Moore.

ROBERT GREENE

Of who?

SANTIAGO CALATRAVA

Moore, Henry Moore. You can also almost enter and exit from them. Some works of Eduardo Chillida, which may be familiar to you. He's a Spanish sculptor who was also

[inaudible 0:47:38] large pieces of concrete and steel [inaudible 0:47:42]. So they show us a way, that there is the desire and the intuition that art should transcend into architecture. Maybe today, if you look at the situation today, maybe you will consider there are a lot of things happening in architecture. Maybe less in art. So there was already intuition at this point, that architecture can carry an enormous force, an enormous force of expression. And also, all this preoccupation about our social context. I mean a station is the best way you can use to say to everybody every morning you are someone important. This station is here, for you five minutes, you have to wait for your train. Or let's say with a Russian [inaudible 0:48:40] the metro in Moscow.

But beyond that is discovering that architecture and the motions and the sensations you can have in a building are enormously close to the sensation you can have by watching a sculpture or watching a

piece of art. So, I think, in my opinion, that is a crucial point. How far to take architecture cannot begin to support [inaudible 0:49:09]. If you think at the Guggenheim, for example, in the [inaudible 0:49:12] in the middle of the city or many other things. Really almost in delirium. It's almost like a delirium.

ROBERT GREENE

Delirium.

SANTIAGO CALATRAVA

Yes. There is no doubt that there is enormous potential. Now, coming up to the question of the movement, as I said, my relation to the movement is, I think, and maybe the museum in Milwaukee and all the pieces I have done show that. Of course, there is always a background functional. But it's also delivering to the building a sense of inspiration that is not only . . . so the building is the building expressed in this position, expressed in this position, expressed in this position. In all the positions. And even expressed through the transition from one to another. So finally,

the movement is to the service more than anything to the expression of the building.

ROBERT GREENE

Now, say that again. What do you mean?

SANTIAGO CALATRAVA

The movement is to the service of the expression of the building. Movement is . . . I don't know if you understand what I mean. It is like . . . let's say, I'm trying to explain. You see, this is the door, and this is [inaudible 0:50:41], and this is the door opening. So, you have to understand [inaudible 0:50:50], but it has also expressive value. [inaudible 0:50:56] The movement itself is an expressive piece, a beacon of expression. And art to the building, in all the different extensions, value, an aesthetic value. And then, when it's closed or when it's open and through the fact that it can stay, all those extensions, in an enormous way . . . it's like a new dimension.

ROBERT GREENE

Yes, no one's ever really done that before in architecture that I can think of. Making the movement part of the expression.

SANTIAGO CALATRAVA

You know, it has been done. Things I can tell you, imagine this is a house, and this is the living room. And the sun, this is the west. So in the afternoon, makes it like that. At noon, makes it like this, and in the morning, makes it like this. Houses all around [inaudible 0:52:13] motorized and everything, the whole house spinning around with a [inaudible 0:52:21]. I saw a house [inaudible 0:52:24] has been done.

And however there, the house does not practically change. It is the same shape, just looks like a sunflower, you see the orientation toward the sun to get the maximal exposure. Like a [inaudible 0:52:41]. You can take [inaudible 0:52:43] following up with everything, the satellite. So things move in big dimension for functional purposes. It has

been done. Less for an expression proposal, except in the pure field of the art. As I say, Alexander Calder or others.

ROBERT GREENE

I think Buckminster Fuller tried to do some things like that.

SANTIAGO CALATRAVA

He has done a building also. He has done a moveable building. It was a kind of car that moved. And also, he has tried to do skyscrapers that could turn, almost like a wheel. Similar to the effect I tell you about. We hold admiration for the philosophy behind the work of Fuller, because if you look at my thesis, it has a little bit of flavor of Fuller. Maybe more concentrated in matters of mathematics and transformation of poliedra, because I was [inaudible 0:53:43] because my interest in a more puristic mathematical research. But I had something of these cupolas and domes and all of that. What is interesting is that the type of . . . let's say, the paradigm I am trying to find in those

moveable things has less to do. Now, whatever our research of a pure crystalline . . . or let's say it's less mineralogic than botanic.

ROBERT GREENE

I see. You mean . . .

SANTIAGO CALATRAVA

So, [inaudible 0:54:25] principles. So the rules of poliedra and all of that, sophisticated. Myself, much more interested in botanical. [laughs]

ROBERT GREENE

I like that. Okay. So this idea of things transforming into one another, like [inaudible 0:54:46] or metamorphosis, like the Greek gods and how everything, the building is transforming into something else. Do you think that's the future of architecture? Do you think you're the first person that's at the forefront of creating structures that will literally be able to change shape?

SANTIAGO CALATRAVA

Let me tell you. Let's take a cathedral. Let's take a big ceremony. Maybe they crowned the

kings in Notre Dame and they buried them in Saint Denis in Paris. And Saint Denis and Notre Dame are connected by almost a straight line. So you have Saint Denis where all the greats are, and here is Notre Dame. So, they used to drape, to flag all Notre Dame.

ROBERT GREENE

They used to do what?

SANTIAGO CALATRAVA

To flag, to take flags and draperies and hang from the different balconies inside the cathedral, put flags coming like that. So the idea for a festivity or for a particular even, transform an interior and bring it into a different state. We are also reading today the Greek architecture in a very different way as the Greeks, because it was all painted. The Greeks painted the [inaudible 0:56:13], and then they [inaudible 0:56:16]. And the frieze of the horses and the Parthenon, it was all painted. [inaudible 0:56:23] nothing to do with the reality. It was also painted. Do you

know the painting of Alma-Tadema. Alma-Tadema is a British painter. He paints . . .

ROBERT GREENE

Alma-Tadema?

SANTIAGO CALATRAVA

Alma-Tadema. He painted the Parthenon getting built. It's a painting.

ROBERT GREENE

Is this the 19th century?

SANTIAGO CALATRAVA

19th century, yes. 19th century in the Victorian period. He painted the Parthenon getting built and then, they painted all the frieze with the natural colors of the Parthenon and all of that. So, we have also an approach to do these kinds of things a little bit different. So probably, they have moments in which architecture was much more alive and much more breathing, and they took those buildings and put them close [inaudible 0:57:28]. So, also the porticos of the gothic cathedral was painted as it show Laguardia,

in which you have this portico with wonderful colors.

Finally, I think there are dimensions in the architecture that, for us, are very nebulous, because we got through the realm of the rationalist. The 20th century is very strong, and we are kids of the rationalism school, of the functionalist [inaudible 0:58:03]. Myself, I study in a very hard functionalistic scheme in which you have to do bubbles, the kitchen, the living room, here, the sleeping room, the day function, night function, some things like that. It's like you see . . . it's pure analysis of the architecture.

You can also judge the Parthenon under the point of view of the functionalities, and then you will find that that side has no tolerance. [laughs] [inaudible 0:58:40] It is a kind of thing. They are fruits of the time. Fruits also over time in which there was a tremendous speculation. When I was a student in the late '60s getting into the '70s, there was

enormous speculation going on. There was building apartments after apartments after apartments. And probably these two buildings here, the red brick one and the [inaudible 0:59:12], and also this here in the corner are products of this epoch. It was tearing down the most beautiful houses here to do these monstrous buildings in the name of functionalism in which the balcony is never used and the windows are horrible.

You can see examples of that all over New York. Even if you go down towards the Bronx and in the Harlem, you see the most horrible block work, people do not want to live. So we have to understand that it's interesting of the analysis done backward, is for example, for me, it prevents me to do all kind . . . I dedicate all my life to the public architecture practically. I have done little for private, because I was escaped.

ROBERT GREENE

You want to get away from the functional . . .

SANTIAGO CALATRAVA

No, because I was escaped. I thought at the end of my studies . . . maybe it was also the key why I wanted to study engineering, because I understood, I don't want to do like that. I don't want to do horrible buildings where I don't want to live.

ROBERT GREENE

Maybe someday you'll make beautiful buildings for people to live in.

SANTIAGO CALATRAVA

Yes. This is the other part. For example, I try in Sweden, they are rented apartments, and not expensive rent apartments.

ROBERT GREENE

It's such a beautiful building.

SANTIAGO CALATRAVA

Yes, and you see, it is also a very mixed society from people you see, because Sweden has a very equilibrate social configuration. And also a tradition of social housing. So my client was a builder of social housing, and he decided to do an extraordinary building for

social proposals. And indeed, the rents are modest, they can be met by people. I know there are many people willing to live there.

ROBERT GREENE

Do people like to live there?

SANTIAGO CALATRAVA

Yes. Because they also understood something. Often, it's not only the architecture [inaudible 1:01:21]. It's also that there is not a structure that provokes social relations in this building. So, it's very important . . . I saw by this organization that they were working sometimes in very slummy areas of cities, in buildings of very poor quality. But they have restructured the whole connection in a way that there were a lot of social activities, there was a lot of social contact, there were parties, there were activities that people could develop so that they tried to maintain the place not only secure but also active and attractive for those who live there.

So finally, the price of the quality of the place very poor from the architecture by itself, they

rise up the quality of the place by injecting one or two persons who has nothing else than trying to coordinate things, to solve problems for other people who are living there, to organize parties and make sure there are more clubs and things like that. So it is interesting to see that often the architecture cannot solve all the problems. You need also a social infrastructure to create a more convenient . . .

ROBERT GREENE

You gave them a kind of model for doing this, because you had . . . is this the one with the four floors where you have a common area?

SANTIAGO CALATRAVA

Yes, there is a common area floor in between.

ROBERT GREENE

So you gave them the possibility for creating that.

SANTIAGO CALATRAVA

Yes. I'm also [inaudible 1:02:59] there are two floors that they can rent for parties, and then down below, there is also a wine cellar. There

are also places for activities. All that, the program came not from me. The program was articulated through my client, who I say is very experienced. They are already over 100 . . . today maybe 30 years doing housing in Sweden. They say that every three houses, one has been built by them. So it's a kind of saving back with the people who put the money, and then at the end they get an apartment. And so it's very interesting to see these kinds of efforts that are fruitful. I mean, I have also a lot of respect for the fact that, let's say, imagine for example, Paris in the late '50s. There were thousands and thousands of people arriving to Paris and establishing in the so-called bidonville.

ROBERT GREENE

Bidonville.

SANTIAGO CALATRAVA

People were living [inaudible 1:04:00] so they make these kinds of villas. And then, the state came and said, no, we will give to these people small apartments with maybe

two rooms, and then a living room, a shower, and toilet and a small kitchen. So it was the beginning of the HLM. They built all these HLMs.

Of course today, nobody wants to know about the HLM, but at the moment, between living in a bidonville or living in an apartment and having an entry and having a place to put your car or whatever, it's completely different. We have to also understand that these were tools also at the service of an urgency, to take away an urgency, a situation, and today, we can do the things much better.

ROBERT GREENE

I had an idea for a book. This is where we're talking, where you mentioned the pyramids. That they were burnished and then there was the gold on top, which has all disappeared. And then the Parthenon, which was painted, magnificent. Or the Notre Dame with the big drapes. To have a book that would bring this to life again. Maybe if you imagine these things, it really could . . .

SANTIAGO CALATRAVA

For example, think about Rodin, who has a wonderful plaster collection. He has that in his house. There is a book you should read you would for sure enjoy. I'll write the name. Because you understand French, you can . . . the author is Paul Gsell. [speaking French] Another book that you may have interest . . .

ROBERT GREENE

Is it *Conversations with Rodin*?

SANTIAGO CALATRAVA

Yes, *Conversations with Rodin*. But it's called [speaking French]. But it's a conversation. You will enjoy this book. Another one, you know Rainer Maria Rilke?

ROBERT GREENE

Of course.

SANTIAGO CALATRAVA

Okay. Rainer Maria Rilke. He was the secretary of Rodin.

ROBERT GREENE

I did not know that.

SANTIAGO CALATRAVA

And he wrote the most beautiful first book on Rodin. Small booklet. You have to find it. And it is the collection of the sayings and the conferences. Because at the time he was giving talks without images, and there is one about the erotic in Rodin. Wonderful, wonderful.

ROBERT GREENE

The book is called Rodin?

SANTIAGO CALATRAVA

Rodin, Rodin. It's a booklet like that. There are only six or seven talks on Rodin, and usually it's illustrated with black and white photographs. Some of them of the American photo [inaudible 1:07:01].

ROBERT GREENE

Stieglitz.

SANTIAGO CALATRAVA

No, no, no. [inaudible 1:07:07] Stieglitz was living here around the corner. In the third house getting from this corner in the next block.

ROBERT GREENE

This is a nice area.

SANTIAGO CALATRAVA

[laughs]

ROBERT GREENE

Woody Allen.

SANTIAGO CALATRAVA

You know, Stieglitz, by the way, he was living there with, how it's called, a painter who became his wife. A famous American painter, O'Keeffe.

ROBERT GREENE

Georgia O'Keeffe?

SANTIAGO CALATRAVA

She was living there.

ROBERT GREENE

Georgia O'Keeffe was.

SANTIAGO CALATRAVA

Yeah. And Stieglitz organized, here there is the armory. Stieglitz and O'Keeffe and others organized the first exhibition of art of the 20th century done here in New York in a major scale where pieces of [inaudible

1:07:54] and many others. Here in the armory. There's also a story about bringing those pieces here in America. But it is interesting. But the fact is, these two books, I recommend to you, because they can give you beautiful . . . the first one is a very beautiful book. There is also a testament of Rodin there. And this here is also very nice.

ROBERT GREENE

I will order them as soon as I get home. I don't know really what this is about. Obviously, light . . .

SANTIAGO CALATRAVA

I would say it's a book about Rodin. It's just that. Many of his figures appear without legs and without arms. So he makes only the body. There is a torso called Adele Noir. Beautiful bust. You see breast and then the legs. And also, he took also small pieces and put them together and make an assemblage. Even he studied only art.

You know where it comes from? From the influence of visiting the archaeology

museums. When he went to Rome or Pompeii and other places. In the time he went there, he entered into the Vatican, and you see one leg, one head. [inaudible 1:09:17] broken pieces. So this impressed him so much that he created a whole art getting out of it. But imagine these figures, they were not fragments, they were full figures. There were even groups speaking together, and they were even painted.

ROBERT GREENE

I see where you're getting back to the idea of the book.

SANTIAGO CALATRAVA

The idea. So finally, because we have seen the Parthenon in white, and because we have seen those pieces held down, even important artists took it almost literally, as they were like that. The fascination of it, here in the museum in the Metropolitan, there is a piece, I think it's obsidian, yellow. It's a yellow stone, very hard. And you see only a piece of the face like that. But it's so beautiful.

ROBERT GREENE

Is this Rodin?

SANTIAGO CALATRAVA

No, this is Egyptian art. In the Egyptian gallery. It's only a part like that of the face. Then you can buy even in the souvenir as a kind of replica. In the catalog of the best pieces of the Metropolitan, it's in. And it's just a piece like that. And even my daughter brought me and said, "Look at that. It's so beautiful. The mouth is so beautiful," she says. And you see only a piece like this of the face. So finally, you see the fascination of those figures remains until the debris. And I have two analogies to tell you. One is from a French called Jacques Perret. Jacques Perret was an architect, and he said, [speaking French].

ROBERT GREENE

Architecture is what makes beautiful ruins.

SANTIAGO CALATRAVA

Ruins. Or who makes beautiful the ruins, isn't it? You don't know. You see what I mean.

So architecture is this thing that even in a ruin is beautiful. Or also the Spanish poet, Quevedo who says . . . it's a beautiful sonnet that concludes like that. "Polvo seran, mas polvo enamorado." There will be dust, but in love dust. [laughs] Beautiful. So finally, it is like a magic thing.

You can learn construction. This is not architecture. You can learn painting. This is also not architecture. You can learn geometries and [inaudible 1:11:54]. This is also not . . . what is architecture? It's these who make beautiful . . . it's these elements that makes the links between all the things . . . it's very much an enormous abstract. It's a profession of enormous abstract. So you can also make things that move, and it's architecture. You can drape Notre Dame, and it's architecture.

And when Christo [inaudible 1:12:24] a building [inaudible 1:12:25]. And when he [inaudible 1:12:27], even more. Because he

makes a solid form of something so materials, like a tree, and shows you the presence of the silhouette of these elements. Also very interesting, this [inaudible 1:12:40] in the landscape. I forgot Christo before, speaking about [inaudible 1:12:45] and all these fellows. Fellows who have an approach to the art that is also [inaudible 1:12:50]. So is Stella. I think Stella is very anxious and interested in architecture very much, very much.

ROBERT GREENE

Obviously, light is extremely important to your work, coming from the Mediterranean. But there's also something I noticed, it seems to be about translucence. You're very excited by the filtering of light through something glazed or opaque, at night for instance, creating all kinds of effects with translucence.

I don't know really what it means, but it's very haunting, very beautiful to turn a bridge into a sculpture at night with these effects that you're creating with the light just barely coming through or forcing its way through.

Where does that come from in you? What are you thinking? Is this a theme that comes from here, from inside? It makes your work very beautiful, very interesting, how you change it from the day to the night.

SANTIAGO CALATRAVA

Certainly, it's also probably a thema, and also something that shows the possibilities of the technique. Our perception of the cities in the night today is very different than maybe 100 years ago. In Venice, in order to move in the night, you need to have a torch. And indeed, one of the attractive parts of moving in Venice late in the night is that the houses have a little bit of light here and there and there, but it is very little public lighting.

I want just to put it in a general context. The fact is that through the lighting, you can, of course, highlight effects and show a relation of the building from day to night, very strong. And also, even with the landscape, not only because . . . you see, night is not always night. Always you can see the silhouette, and the

way how these elements merge a little bit like a phantom boat. They float. You can even have a perception very much vocalizing the plasticity of the object, the plastical values of the object. And if you take it and . . . it's a wonderful possibility, the techniques that I bring that you can use light to highlight and show certain qualities.

Imagine, for example, in some of the bridges, with the cables, when the cables get beautiful light, [inaudible 1:15:48] from far away [inaudible 1:15:51]. It's important, as I said, that we understand also that the techniques, and maybe in this case, the lighting is kept clear, revolution of the lighting in the 20th century and even ahead. It's one of the things that permits us possibilities of expression that we didn't have before. Particularly when you want to highlight the object, a character of the building, of course in the landscape, maybe be present, but in a very diffuse way. But the presence of the building and the plasticity of the building can enormously

force through that. And the best value you are putting in the building [inaudible 1:16:38].

ROBERT GREENE

It seems like what you're doing is you're creating a larger vocabulary to work with in architecture. So, you're using possibilities of movement. You're using possibilities of light that didn't exist before. So you're expanding the possibilities of expressing something in architecture with this sort of expanded vocabulary.

SANTIAGO CALATRAVA

What is also interesting is that . . . for me, personally, the experience of trying to deliver a personal message through the architecture is the biggest satisfaction. I suppose it is equal, as I say when a painter paints, you see something and put it in the world and say, this is what I want to say. So finally, using the techniques to achieve that is for sure something that is probably one of the big supports of my work.

Another support of my work is also the research. Corbusier used to call it [speaking French]. The patient research in producing sketches and producing drawings and studying the human body and looking for inspiration in trees, and studying the nature and also even doing sculptures. And even making research in movement. If we were in Zürich, I would show you in my house, because I have a team of five people in Zürich who are the fellows who do these models. But they don't do only models. They do also the sculptures I commission them to do. So I give them sketches and measures and all of that, and they build all those things. So they are working, and they are working in my office in Zürich. So there are six altogether.

But it is research that goes parallel. Nothing to do, nobody commissioned me that, and nobody, but is a research or those bronzes you saw here. Also the ceramic pieces I have. These are [inaudible 1:19:06], the work as an architect. So finally, you could think that

my interest for engineering, and my interest for sculpture, and my interest for painting, and all the activities conveys altogether in a discipline which is architecture.

We decide to create a vocabulary, I don't want to. I think it's also a [inaudible 1:19:31] ambition. And also, we decided also to [speaking French]. Cézanne. To do some progress. Because this is also another question. Did exist the progress in the art or not? That is a very old question. Is there progress? In the science and in the techniques, without any doubt. Otherwise, cancer would be a terrible thing, and we will not arrive to Mars, and things like that. We are arriving. So finally, there is also a sense of progress, at least with the human, and even a positive one, because it delivers you also hope. It delivers hope.

ROBERT GREENE

So you could say ancient Greek art is as beautiful and advanced as where we are?

SANTIAGO CALATRAVA

Yes, yes, yes. In art, this of course is a very important question. Did exist progress in art? If you think [inaudible 1:20:26] or things like that. The bronze they discovered in south Italy, the two warriors.

ROBERT GREENE

There's nothing we can do anymore.

SANTIAGO CALATRAVA

Exactly. And also interesting, probably because our ways are different. They were seeking for perfection. They were only seeking for perfection. For them, all was to be a master and to do a masterpiece was to do the most perfect thing indeed. It's funny that the Greeks didn't make a difference between technique and art. They called technique, *tekhni* [SP], and art *tekhne* [SP]. So it's the same root, and both . . . *tekh* comes from *tekhton* [SP], which means worker. So worker posit a technique and eventually is an artist. And then they say, how can this man, how do I recognize it is art? I recognize it is art,

because it touched me and it moves me.

So there is a spiritual link, rational as they were, in the most positive sense. There is a spiritual link that moves me. It touched my emotions, from the object to me. So it's something mysterious. It's mystic. That is not normal. Then they say, this man, who is a human, is possessed by the gods. And then they call him [speaking foreign language]. So it's enormous to see how logic. In their own logical world, they could also capture the sense of emotion and put it in a higher level of understanding, but it's still understandable. Our time is lacking very much for these kinds of [inaudible 1:22:15] activities for the satisfaction that brings the sense of perfection. The man who is able and learned the skill and can deliver it, that is something that we have lost. It is a lost value.

ROBERT GREENE

That's a point of my book, to bring out what we have lost. So people like you and the others that I'm interviewing still retain that.

SANTIAGO CALATRAVA

Maybe we retain that in the sense of the obsession, because we are obsessed. Not because we now systematically the word to arrive, because there is no doubt . . . [inaudible 1:23:01]. There was not only [inaudible 1:23:02], there were many others. Otherwise, you cannot achieve something like that. So it was a whole society structured and oriented towards a certain rule.

ROBERT GREENE

That's true. That's true. Not that we are structured . . .

SANTIAGO CALATRAVA

Yes. You could always say it was an elite, for sure. The Greeks was an elite probably in that time. Athens was an elite. It was the top of . . . it was an elite, but there was not more than one. And even in disparate cases, like the case of Rembrandt, the late Rembrandts [inaudible 1:23:42]. The late Rembrandts I saw in San Francisco [inaudible 1:23:46] almost killed me. It's so beautiful.

ROBERT GREENE

I'll have to go there.

SANTIAGO CALATRAVA

The Prodigal Son and things like that. And a person told me, he was out of every activity. He didn't have a studio. He painted that on the stairs. Somebody lent him a little bit of canvas, and he has to paint something.

ROBERT GREENE

I think what you're saying here is progress maybe in art is questionable when you think about people like Rembrandt or Phidias.

SANTIAGO CALATRAVA

It's questionable. It's interesting also, you know in the book of Rodin, you will see very beautiful. There is a comparation between Michelangelo and Phidias. And he does [inaudible 1:24:30] the sculptures, once as Michelangelo [speaking foreign language] with a body like that, and another like Phidias, more with an S and more classic theme. The two small clays are in the Metropolitan in [inaudible 1:24:47].

ROBERT GREENE

I might go there today after we talk.

SANTIAGO CALATRAVA

Go, for sure, go.

ROBERT GREENE

To see the Egyptian and all that.

SANTIAGO CALATRAVA

You will find that. There is a corridor, and then there are bronzes of Rodin in the corridor. Not in the 19th to 20th century sculpture, which is on the ground floor. It's up. On the one side you have Gauguin and all the Impressionists and that fantastic collection. And then in this corridor, there are several. And in one of the [inaudible 1:25:15] on one side, you see the two clay sculptures from the [inaudible 1:25:20] done for this particular occasion. And it's also interesting to compare Phidias with Rembrandt.

Why? Because in Rembrandt, the emotion is so enormous. Emotion is so enormous. Really, you feel the great artist, not because of the technique, not because of these things. But

because the enormous emotional testimony that this painting . . . a man, very old, almost before dying. It's really tremendous. When in Phidias, it is the universal sense of beauty. It's a kind of paradigm of [inaudible 1:26:01]. Even you know, you see about extending a vocabulary.

In other people, for example Bach, how many canons he has written. When you write a canon, as you are scripting the notes in a way that you can reuse it, and it is like a patron, it's a message, like a brick with which you can do a house or something like that. What an ambition. Enormously, he was obsessed with this idea of really delivering a testimony of intelligence. By themselves, those compositions, because you spoke on Glenn Gould, [inaudible 1:26:45] to emotional fellow until his death. When you look at Glenn Gould [inaudible 1:26:48] 52, 53. Glenn Gould [inaudible 1:26:54] at the end of the '60s when he plays much more slowly.

You see a whole lot. You see the young man and the man almost close to dying.

ROBERT GREENE

Glenn Gould is like God. He's the greatest pianist that ever lived. But people compare architecture and music, like Bach and architecture. It was Goethe who said that architecture is frozen music.

SANTIAGO CALATRAVA

Yes, Goethe. People say Chopin now, where it was Goethe.

ROBERT GREENE

No, it was Goethe. Goethe or [inaudible 1:27:32], but it was really Goethe.

SANTIAGO CALATRAVA

Frozen music. It's true, it's true. So, indeed, there are two things, one interesting, that architecture is all about materiality. You touch it. Space. Music is all about immateriality. So, ding. And then it takes a stand as the reverberation holds it, perceptible. So they are extremely separated things. But in Spanish, you say

[speaking Spanish]. And then you speak about [inaudible 1:28:08], about harmony. You see, you speak about canon, canonic values and all of that. So you have almost a vocabulary of the music, and the vocabulary of architecture is very similar. Also, the perception of a composition as a . . . hearing mallet or whatever. The way [inaudible 1:28:30] enormous. Or [inaudible 1:28:33] it will top now and it continues. It is the end of the third symphony. It goes forever.

ROBERT GREENE

Third Symphony.

SANTIAGO CALATRAVA

[sings] Incredible. It's incredible. And then delivers also the sense of breathing. Also, it's an anatomical. It's not only cantabile. It's also resperabile [SP]. [laughs] It's enormous, enormous, enormous. The structures you see, that and the deep and the different dimensions, and more and more dimensions, and more and more spaces. So you can create enormous beautiful analogies. In the

materiality of one or the immateriality of the other.

ROBERT GREENE

Do you listen to music when you're . . .

SANTIAGO CALATRAVA

Yes. And I hear music systematically. Less now when I work. Honestly, less. But for example, when I go to Connecticut, where we have a house, I just close the eyes and hear two hours music and go back. And also when I am home, also very often. Although I am a little bit deaf, because I had a little bit of [inaudible 1:29:42] in there. So I have to hear music very loud. So the family does not like that. But interesting it is that the kids, the older they get, also more they like also good music. And I am also . . . not only I like music. I have friends who are musicians. I know Zubin Mehta or also Gergiev is a good friend, Valery Gergiev. And also Lauren Marcel. Pinchas Zuckerman. I met also violinist, Nathan Milstein. Never met Glenn Gould. Once I was in Toronto and I

saw a small movie, 32 short movies on Glenn Gould. Very beautiful.

ROBERT GREENE

Yes. Yes it is. Although supposedly not accurate.

SANTIAGO CALATRAVA

Not accurate. Yes, maybe not. But you know, if you look on YouTube, you can find a lot of interviews with him.

ROBERT GREENE

He's amazing.

SANTIAGO CALATRAVA

Amazing indeed.

ROBERT GREENE

He's one of the people in this book. I've read a lot about Glenn Gould.

SANTIAGO CALATRAVA

You know what, there is also maybe a movie. If you like music. You know Sviatoslav Richter?

ROBERT GREENE

Yeah.

SANTIAGO CALATRAVA

The pianist. There is a movie done by Bruno Monsaingeon. He's a filmmaker. I think he's Canadian. Bruno . . . I can write it. Richter, and then it's Bruno Mon, not Mont, Monsaingeon. I don't know. You will have to investigate a little bit. Very beautiful, very beautiful movie where Richter is speaking. He speaks about his life and you will like this movie. For the type of interviews you are doing now, you will like this. Very well done. And there is a passage that I think is enormous. He sits behind the table. He looks like that and says, "I don't like myself."

ROBERT GREENE

Who says that?

SANTIAGO CALATRAVA

Richter. He says that about himself. "I don't like myself." [inaudible 1:31:53] of the dissatisfaction. Nice movie. It's not pretentious, all that. If you are interested in this kind of documentaries, it is really very high quality.

ROBERT GREENE

There are some great documentaries with Glenn Gould as well they did in the '60s and '70s.

SANTIAGO CALATRAVA

For example, he speaks in this movie on Richter, and he speaks about the Sonata in D from Schubert, that started [sings] and goes like that for 22 minutes. He said it can be the most boring thing. But when Richter plays, he is capable to give each one of these repetitions a new life. He says that. He is very eloquent also. When he speaks, Gould is speaks enormous, very eloquently, very beautiful how he speaks in this particular movie.

ROBERT GREENE

Do you like Scriabin at all? Scriabin?

SANTIAGO CALATRAVA

Scriabin, yes, yes.

ROBERT GREENE

He's one of my favorites.

SANTIAGO CALATRAVA

[inaudible 1:33:02]

ROBERT GREENE

[inaudible 1:33:02] piano?

SANTIAGO CALATRAVA

Piano. Alexander Scriabin, enormous, enormous. And you know a great interpretation of Scriabin has been by Vladimir Horowitz. Incredible.

ROBERT GREENE

It's the most beautiful Scriabin performance.

SANTIAGO CALATRAVA

Yes, yes. He was also living here.

ROBERT GREENE

Everybody was living here.

SANTIAGO CALATRAVA

92 Street. [inaudible 1:33:30] knew him. I can tell very funny things about him. He invited him . . . they were friends. [inaudible 1:33:39] used to live on 5th Avenue but then moved here. He was probably living closer to him. He said he eat only sole with asparagus. Dover sole with asparagus.

ROBERT GREENE

That's all he ever ate?

SANTIAGO CALATRAVA

[laughs]

ROBERT GREENE

That's not bad.

SANTIAGO CALATRAVA

I tell that because it's very funny. It's this thing with him. He's capable of doing the most incredible [inaudible 1:34:07].

ROBERT GREENE

Vladimir Horowitz or . . .

SANTIAGO CALATRAVA

Horowitz. [inaudible 1:34:11] most wonderful [inaudible 1:34:13]. It's very funny, because [inaudible 1:34:18] he is a filmmaker. He has a great sense of humor. But it's enormous. And if you look well on YouTube, I think YouTube is a source of enormous . . . it's a lot of mess, but there are also great things there. It's Horowitz's younger brother, he said, "You want to hear something difficult, really difficult?" He say to somebody [inaudible 1:34:45]. Then take away his jacket, he has to

take away my jacket. And then he goes there and plays Scriabin.

ROBERT GREENE

Which Scriabin?

SANTIAGO CALATRAVA

I don't know. But it's incredible. I don't know. A short piece.

ROBERT GREENE

It could be *Vers la Flamme*. Have you ever heard *Vers la Flamme*? Four minutes long. It's the most amazing.

SANTIAGO CALATRAVA

Vers la Flamme.

ROBERT GREENE

I think I've seen that on YouTube.

SANTIAGO CALATRAVA

No, it's no *Vers la Flamme*. But it's also another . . . Horowitz was very good, very enormous. And also, another pianist I never met but I love is Claudio Arrou.

ROBERT GREENE

Argentinean.

SANTIAGO CALATRAVA

Argentinean. Very good, very good. Claudio Arrou. Also Claudio Arrou was great.

ROBERT GREENE

When was he alive? He was . . .

SANTIAGO CALATRAVA

He was alive, I think until maybe still 20 years ago.

ROBERT GREENE

Because I think Glenn Gould's teacher studied under Claudio Arrou.

SANTIAGO CALATRAVA

Could be, could be. He was an Argentinean who immigrated to Canada.

ROBERT GREENE

I have about four questions left in total, then it's finished. Did you want to take a break?

SANTIAGO CALATRAVA

Yes, let's do a small break. I have to go down.

ROBERT GREENE

You look a little tired.

ROBERT GREENE

Maybe the most important part of your work is this idea . . . you had a quote about architecture being a catalyst of great things, not just merely functional. I consider it something kind of almost mythic where you are trying to create something that connects people together in a large sense almost as religion does. You reference things like the pyramids, the angle of the bridge, or Masonic symbols with the eye. Or in Seville, if you had had those two bridges, you only did one. If you had two, you would have had that amazing triangle. Do you think this is something that is incredibly important for the world today where things have become so specialized and separated and particular and everything is sort of kept apart from each other? Architecture is here and science is here and art is here. Where this needs something that brings people together. Is this something you're consciously striving towards in your work?

SANTIAGO CALATRAVA

Basically, you see architecture through the necessity of the functional aspects of the architecture and makes it part of our everyday life. That is a principle. I may not hear music, but living in a city you are confronted the whole time to architecture or architectural circumstances or architectonics. You may take a train to go to your place of work or take a subway. You walk in the street. You traverse a bridge. You need bridges. You need stations. You need the streets. You need plazas. You need also buildings to live in them. This is a fact.

Now, you see as we have been trying to define them in this conversation, it appears that the architecture first of all is an art or can be an art. Second, it is also related to all the other arts. Conceiving it like that means that the architecture can be an element to put art in the everyday life of the people because you are using it every day. Through that, not only dignify the life of the person making them

finding a toilet or a place to wash themselves or a place to sleep, but also to do that with a certain dignity. Who can create a frame in which the life of this person is more dignified, he feels better.

As I say in one of the sentences, you are arriving to a station, you usually spend only five minutes. But those five minutes, somebody is telling you that you are an important person because we do Grand Central Station here with this wonderful [inaudible 0:03:30] that you cross. It's this kind of approach that I think is very relevant. It's the opportunity through the architecture to go beyond the pure functional and material aspect of serving a need. A bridge finally is not only a bridge. It also is a [inaudible 0:03:51] to go across but can be much more. The Pont Neuf in Paris, Pont Alexandre III [inaudible 0:04:03] span La Seine on one side with these big columns with the sculptures up on the top.

Finally, we understand that there is enough value in the object itself, in the fulfilling of the function itself because you are traversing not only La Seine to another bridge, but you are traversing into Le Pont Alexandre III with all these lamps. In a way, we have to understand that also that is enormous importance. This adds value. It's enormously important in our everyday life and also makes the places as distinguished as the City of Paris, l'allée des Invalides, or Le Pont Neuf in the alley of the old part of Paris. We can learn that Paris without those bridges, think for a moment they are absent, will be a completely different place. First of all, impossible to use but beyond that. Or if we could just prefabricate bridges as we are accustomed to seeing in our interstate, it will also not be the same city. There is a kind of scale in the values. They add value that our mind naturally does because we are human beings and because we are establishing continuous hierarchies of value in our everyday life. Architecture

has a capacity to bring enough value beyond the pure functional one. This I want to concentrate. It's just a concentration, very rational.

Finally, it's just a matter of even believing that given in the most Spartan circumstance and in the most poor circumstances because in [inaudible 0:05:53] is not Le Pont Alexandre III and it is not Le Pont Neuf.

It's not done in stone. It's also not done with the splendor or decor. The handrails are very modest. Beyond that, you can keep a symbolic value simply in the model, in the bones of the structure, not in the flesh, not in the hairs. It's just in the skeleton and getting out of the skeleton. You can even do a gesture with an angle who elevates the whole complex into a superior level of understanding.

For example, the pyramids. If they were to [inaudible 0:06:35] would be grandiose because with the force of a laser beam simply something almost immaterial. We could trace

an enormous angle in the background linking the two figures into a single one. These kinds of things are important to understand. Not because they are expensive. Even in the most elemental things go beyond, it's still what . . . doing a balcony as it was a bridge. My first work was balconies. I've done two balconies.

ROBERT GREENE

Really? I didn't know that.

SANTIAGO CALATRAVA

Yes. Two small balconies. I was just thinking I will do a balcony as it was a bridge. Then also my first work was inside bus shelters. I will do bus shelters as they were a real station.

ROBERT GREENE

They must be amazing balconies then.

SANTIAGO CALATRAVA

Tiny balconies but in how they work, they work with hanging or maybe with a [inaudible 0:07:40] down below who is half an arc who goes into the concrete slab of the balcony. Even in a glass. It does not matter how big the object is. The sense of

transcending through this object into another category of understanding is necessary and it is [inaudible 0:08:04]. It does not matter how big an object is or in the fabric interesting. You are working that and finally you can make all those things link together and then the architecture is effectively like a whale, like an animal, like a Jonas. You see the cars and things and getting out and things like that. This is not depending on cost. It's also not depending on function. It's value. Finally, it's the whole time to elevate the matter to a superior level.

ROBERT GREENE

It's almost spiritual.

SANTIAGO CALATRAVA

Yes. Elevating the matter, taking the stones and putting them into the air almost, and grab it, floating. You understand? Taking them off the natural bit and putting them and let them float. Schweb in German is a beautiful word. Schweb means they are in equilibrium and floating.

ROBERT GREENE

Clouds.

SANTIAGO CALATRAVA

Yeah, like clouds. It's getting a little bit against the regular laws of the everyday life and rising up the things of the ground to a superior level of understanding. It's a matter of the idea [inaudible 0:09:34] the object. You can do that, as I say, [inaudible 0:09:41] into it. You were speaking about it's a very simple gesture, but the fact that it gleams with a precise angle and has also the high of the pyramid of Cheops.

The first time I have done an incline bridge, I did it in Paris. Never built. I made a project for Le Pont Charles-de-Gaulle between La Gare de Lyon and La Gare d'Austerlitz. It was an incline bridge. Beautiful montage of black and white to be built but it was never built. I took the idea of the incline arc. The arcs are all vertical usually. If you incline an arc, you're accentuating very much the idea of [inaudible 0:10:42]. Even in the

transgressions, certain laws of the logic in which a structure is built, you can also highlight this relation. We are trying to go over something. Also, they are resources that are very poor.

As I said, the ornament of the bridge Alexandre III with those beautiful arms and with angels or whatever holding this. Think about what Bernini has done in the Roman bridge that brings you into Castel Sant'Angelo. He has done this sculpture of the angels. It's amazing. These are resources who elevate and dignify the place immediately. Not having those resources, in a way you are working just with a structural system with the artificial light which it is a big plus from our time. Bernini didn't have it at that time. Today they are beautifully lighted. They are white and the whole bridge is brown yellowish. They are very beautiful. It's interesting to see this. I don't know if I explained it well. Finally it is getting out of the poor resources we have, ordinate them

in a way that they can arrive into a superior level of understanding and dignify the place and object.

ROBERT GREENE

One of the themes in the book is obviously in any creative endeavor, you have to work with people and politics enters the picture. Even in science, you have to deal with politics. I imagine in architecture dealing with clients and all kinds of restraints with people who control the money. There's a theme in one of my books about being a courtier in life. Anybody who's successful has to end up becoming a very good courtier. Is that something you're naturally good at or you've had to develop? I know you've said for instance the best way to defend your work is to make it really good. I don't remember what your expression was, but that is almost a strategy in how to deal with clients in a way. Is this something that you have become better at over time, or are you naturally a gifted courtier in dealing with clients?

SANTIAGO CALATRAVA

First of all, with a client you have to demonstrate to him that you are working with him as, let's say, a good lawyer would do or a good doctor. They are prepared to understand. A lawyer is defending my interest or a doctor is defending also my interest telling me to do this and that than to be maybe an architect. I think I tell you in a certain point in my life when I was very young, I was thinking about becoming a doctor. My mother was pushing me a little bit. My brother Joseph was a doctor. My mother was saying you maybe became a doctor. I was considering it. When this happens, people are more accustomed to this kind of approach than dealing with an architect. In many cases, you have the feeling you are part of the cost. In order to do whatever it is, you need to pay an architect and it's part of the cost. They call it hard cost and soft cost. You are part of the soft cost. It's not like this, isn't it?

First thing you have to demonstrate to a client is, "Look I am here to see. We are together working in a common commitment which is doing a building." [inaudible 0:15:09] to be a client is a job. The Romans were very strict in this matter. They made three different support of the project in [inaudible 0:15:18]. One is the commission, which is the client. The other is proyecto, who is the architect who makes the project. The other is construction. The three pillars are holding in a way that fit the building. Each one of them has to be independent. An architect has also a certain autonomy as much as a client. Both are carrying out an important task. It's almost interesting when you are working with a client and you see him involved in the thing.

For example, in the construction of the Station Liege, I saw in my client the [inaudible 0:15:59] and enormous emotion also in bringing such a special object to life. That is, in my opinion, something that you have to consider. Also the client has to

consider you are the kind of partner or you are an ally or you are an advisor and you are there to make the very best you can do to the service of the object. Finally, this is what would count. This is a principle. It's clear that you can be confronted to circumstances like that.

For example, when you work in a public work like that here, the [inaudible 0:16:41] maybe come in a certain point and say, "You see, the building costs so much. However, I can only afford this." You know that finally it is because the strategy was not well established from the beginning. The client knew I can go for this goal and you make it. If he makes it for this goal, he can't even make it. Something similar can be done for less money or whatever. It could be also a principle of what happened. Then in this case, my recommendation is always to enter in a logic of austerity. You understand the word austerity? Austeridad. These circumstances in which you have to rethink a project and go

back to the project can help you also in order to maybe take superfluous things out of the project. You look at this finally in a positive way, to rationalize, to go deeper into the design of certain parts.

The major part of my buildings, mostly are *a priori*, they are done with a criteria of having to do a lot of cubic meters of construction, a huge amount of cubic meters for little money. Finally the public works, they are not so expensive. Totally they are very expensive, but if you compare the amount of square meters to meters you produce in a bridge or whatever, finally they are low-cost buildings in relation to others like housing or schools and museums.

There are two things I want to underline. One is the fact it has been always, let's say, oriented toward the use of very industrial materials -- concrete, steel, glass, and stone pavings because they are more resistant but even asphalt pavings in some of the buildings.

You can make a choice from the beginning. I take those materials because I know my building has to produce a lot of cubic meters and a big span and things like that for a low price. That is a very important thing who already conditioned you in the choice. You are doing a station but you [inaudible 0:19:10] everything and say, "I can't do this station with titanium," or, "I cannot do this station with . . ." You have to go directly to those materials because you know they are economic. All of that it brings in a way a certain logic in the whole process. It's also almost a little bit like another landscape who conditioned you on the choice of the materials. You have steel and the option of working with color or working with concrete. Also you can get special tonalities in the concrete that makes it more related to place, but still you are working with concrete and you are working with steel. This is what is related to the economy.

It is clear that you see there is also a relation that can establish. For example, something often happened that you bring an idea up from. People think that that's enough. Then somebody else should work with this idea. You get very poor results with this attitude. You see, it's not the idea of the overall thing. It's like a crystal. Imagine a crystal. You have a big quartz or a big crystal. You break it. There are also small crystals. You go into the microscopic and they are also crystals. Then you make an [inaudible 0:21:03] and then there are also crystals forming the geometry. The idea should go into the fold. It should go into [inaudible 0:21:12]. It should go into the most insignificant part of the building. The whole thing should be [inaudible 0:21:19] from the same category. It's the opposite. Once the building is done, you understand the idea because those corners are telling you about it. Sometimes the [inaudible 0:21:30] you cannot understand. It's also very important in this matter. It is something

difficult to persuade to certain clients that the presence of the architect is necessary until the bitter end. The construction is necessary, and it is not only just you saying, "I do it like that and somebody else can build it." It's much more.

As [inaudible 0:21:59] says, "Gold is in the details." It is in the details. You have to have the perseverance to understand that those things are [inaudible 0:22:11]. It's not because I am touching them. Handrails and things like that, you will not forget them because you touched them. They are even more intimate and closer to you than maybe the roof or the filigree you can do somewhere else.

These points are enormously important to understand the relation to the client that you have to effectively develop strategies. Some of them are convincing him and saying, "I'm here to help you and I am part of your team."

ROBERT GREENE

Have you ever had to deal, without naming names, with a very difficult client?

SANTIAGO CALATRAVA

Often the difficulties . . . let me tell you. When you work for the public authority, you are a little bit in a situation in which you are not confronted. The principal head of the client is mostly a civil servant. It's not a prime minister. It's not the minister. It's not even the mayor. It's a civil servant, somebody who has been put there. I think something that helps in those circumstances are the way how the collectivity receives the project. Once you present the project and make it public, the people get an idea. Then the project starts defending itself, because there is a common commitment to bring this thing through.

Although you are not dealing with a king, you can solve many things based on the fact this person is responding to a necessity although he may do that in a very bureaucratic way. You should not expect somebody enormously illuminated. It happens also the opposite. Illuminated means somebody who is in enlightened, the same idea, or brings you

something [inaudible 0:24:22]. It can however happen the opposite. It happens that you work with people who understand this is a once in a lifetime opportunity. It's a once in a life chance. They want to deliver also. A civil servant and then they almost [inaudible 0:24:44]. Even people who maybe the day before had done very bureaucratic things becomes an almost defenders of the project and even more architects than yourself.

It happened to me, for example, in the station in Liege. Before the opening, I was at a dinner just before the opening. The boss of the railways, he was on the side with the workers. I held a talk and I said, "In this moment, the architect is Mr. So and So because he is commanding the workers or being there with them and encouraging them because he's very social." It's interesting to see those things. You also have to have the capacity to understand that sometimes you are confronted with people who grows into [inaudible 0:25:41] of loving a project and

supporting it which is great. So, you get all kinds of mixed circumstances.

As I say, I have less experience in the private sector because I work less in the private sector. I can imagine that it is difficult for somebody to . . . something I want to underline is the architect is not a person who receives a salary. He receives a honoraria, which is a Roman word. It means to honor the work that he has done. It's not paying the work. It's honoring the work. I like this approach. I think as an architect, what you also learn with the time is that we serve to a very ancient profession.

Also the result of the work, I want to underline those things because I'm recalling a little bit of things that I have said before. The things we do remain and go beyond our lifetime. We are serving a profession that has left incredible traces. Think of the bridges here in New York or think underground central or you think of [inaudible 0:27:28],

Chrysler Building [inaudible 0:27:32]. There are also testimonies of [inaudible 0:27:35], testimony of philosophy of light. There is even [inaudible 0:27:40] manifesto [inaudible 0:27:42], manifest of the liberalist all in defense of the freedom and in defense of the values of this country, the so-called idea of values of this country. I believe in so and so. Buildings can become in this matter and also reflects of [inaudible 0:28:04]. It's a profession.

I think it's very, very important to stay a little bit also over the everyday conflicts you see that declaration can deliver. Myself, also, I think it's very important to understand that you have an authority as an architect. Mostly it's the authority of putting people together and trying to get the very best of them. The word architect means the commander of the workers. The architect is the first worker. Arch means authority and tector means worker. It's the first worker and the commander of all the workers. In the nature

of the word itself shows you that you have to deal with a lot of people and that you have to command the people and that you have to establish strategies to bring things to fruition and that you have to find a light. A lot of sectors we see in construction and works very much commercial [inaudible 0:29:28]. Even with that, you have to [inaudible 0:29:30]. These matters are an interesting profession.

I come back to the pyramids. Why the reference to all of those ancient things? I think the profession today is not very different from what I'm sure it used to be maybe a thousand years ago. In the materialization it is because of the computer and all of those things. But in the philosophy, in the relation of man and work, you see it's almost the same. You see also it is an enormous source . . . you can [inaudible 0:30:07] enormous [inaudible 0:30:09]. You know the French. They have, in my opinion, an enormously high sense of beauty. Even in the everyday life. People drink a glass of wine and [inaudible 0:30:24]

about this kind of thing. A lot of it goes to the taste. What it happens to mean, the Station of Lyon, a worker comes to me and I want to thank you very much because you permit us to do those things. Craftsmen are accustomed to meters and meters and meters, but then suddenly they have to employ their skills. They have to show that they can do something, and they are proud because I can show through that. I let the testimonial [inaudible 0:31:04] doing the things well. That is very, very touching, this part of the relation that you can accomplish with other people through the site itself. Also it's another human aspect of the profession. You see people who start it a little bit and then at the end they became masters.

I remember the most recent case is in the Station of Liege. They started with the concrete. I wanted to have clear concrete. Clear concrete is done with white cement and sand and gravel from the [inaudible 0:31:42]. They do one piece. I put a fellow on my team

who is very perseverant. They have done at least maybe 100 samples. They had to repeat and repeat until this is good and this is good, that's not good, that's not good, that's not good. Finally we got a little bit. It was a very painful way to bring them so far because they are big industrial companies. They want to do just cubic meters and square meters. Finally they received the European award for the concrete.

ROBERT GREENE

For what?

SANTIAGO CALATRAVA

The concrete. It is an association in Europe who gives for the best concrete building or the building of the year. They received that.

ROBERT GREENE

For the Liege Station?

SANTIAGO CALATRAVA

For the Liege Station, for the concrete. They have done. You bring them into a dynamic and you show them I am capable. Finally I am capable. I can do that. Then from that

moment on, it's just a matter that you let them go because they can fly. They're flying and doing great things. It's also a crescendo because they think it's interesting and then they start to see the things they are doing, letting back some form. Then they perfect them and make the coming things even better. It's very interesting this plan. It's all about human relations. It's a little bit like directing or conducting an orchestra. Bring people together and they play together and finally it's a great . . .

ROBERT GREENE

That's interesting. I've never thought of that.

SANTIAGO CALATRAVA

Literally, the word architect means the first of the workers, archictecto, the super worker. Arch means superior, authority and then tector is worker. This is a very important aspect of this profession. [inaudible 0:33:52] the profession can be, but the system with which you work is not even concrete. It's not because you don't put your hands in the

concrete or in the steel. It's a human mass of people that you have to interest, challenge them, and bring them to things you see and companies you see. Even in this relation there are a lot of emotions and people willing to get this job, because they want to demonstrate, because they would like . . . not only for economical reasons, because [inaudible 0:34:25] have to subsist and everybody needs to eat every day. Things need to be paid. But finally, it's also an enormous. If you look like after 30 years, there is also a very high dimension of proudness and love put in these people, in the workers.

ROBERT GREENE

You've been doing architecture for many, many years and also dealing with engineering issues. You have a very deep knowledge from your experience. A very important theme in the book is when you know something so well, you get a feel for it, almost an intuition. The way a great pianist feels the music inside. It's not like when you were a beginner. Do

you have anything comparable like that in architecture? Where now you have, compared to 30 years ago, you have this sort of feel for what is right? You don't have to think so much, it's almost internalized? Is there anything like that in your profession?

SANTIAGO CALATRAVA

Certainly, there is the kind you see before. In the beginning, you have an enormous lack of confidence because you don't know how, because you have never done that. You [inaudible 0:36:00] and you need a lot of courage to go for it. When I look back to my previous buildings, if there is something behind that, it's courage. I say [inaudible 0:36:12] has to be like that, and I fight for it and I fight for it. But the [inaudible 0:36:19] is a piece. To make a bridge that is living the relation between the [inaudible 0:36:28] and the master. I was maybe 37 or 38 when I had that done, maybe 40 when it was completed. It needs a lot of faith and courage to come into a matter that has never been done before.

We made the point, never done before. I think although maybe you have 50 years' experience, when you go into something that has never been done before, you feel the same way. There is the problem. It's the repetition. A problem often is I am doing an arc and another arc and another arc and another arc. That's also not [inaudible 0:37:30]. So I have done an arc incline, an arc big, an arc small, an arc down, an arc up. It's also repetition there. It's important also to understand and come back to the emotion of the first day, because the incertitude excites you. As you know, doing a mistake, it's very important to [inaudible 0:37:55] living inside. On the first day, anything is possible. It's very important there is no routine.

ROBERT GREENE

[speaking Spanish]

SANTIAGO CALATRAVA

[speaking Spanish]. New challenge, the black painting. Getting and doing those things, getting into the interior mysteries of

yourself. Goya and the black paintings. Then you know in an architectural composition because you chose the example of Goya. La Quinta del Sordo where he painted that, Promenade San Antonio de Florida, painted simultaneously. San Antonio de Florida is the light of the day and you look up and you see this fellow and around into the sky and the sun, and in his house, at the same time, the darkness and mystery. At the same time, the same man. It's also an architectural composition. Here is something with two sides of the light. This kind of composition is very important. Of course, it didn't survive. La Quinta del Sordo was removed and fortunately the Prado took the pieces you see and brought them to the mission. It could be grandiose to go today to Madrid and visit La Quinta del Sordo, see those paintings in his house, in the real scape, and then walk a promenade and then go to San Antonio de Florida.

ROBERT GREENE

I never will.

SANTIAGO CALATRAVA

These compositions are related to time and space and movement and getting from one side. They are pathetic also. You see walking from one to another. It's important, in my opinion, you see examples of those fellows. Even Rembrandt we say, "Oh, Rembrandt. The [inaudible 0:39:55] is enormous." [Inaudible 0:39:58] bankrupt, ruined. [inaudible 0:40:02] alone painting like he is painting. These are enormous testimonies. I'm telling you that because architecture requires a lot of maturity. If you look at the work of many architects, for example, Louis Kahn, the last Louie Kahn, grandiose. Or the works of Wright. We see Wright regenerate himself. He reinvented himself. Just to give you two American examples. But also San Carlo alla Quattro Fontane, Borromini was not concluded as his best work, the very last work of him. It's important also

that we keep the hope and faith. Also for I. M. Pei, for example. His work in Qatar, he has done a mission mature. It's a jewel.

ROBERT GREENE

Where?

SANTIAGO CALATRAVA

In Qatar, in Doha. It's a jewel. It's a masterpiece. Of course, you start learning the skills. You start understanding where the problems can go. You develop also a certain authority because you are not only you but also what you have done before. You can also show the people and have this and that and that. This also, under circumstances, facilitates things. On the other side, it does not matter. It's a new beginning on every project. It should be like that. If it is not, bad news. This is maybe the [inaudible 0:42:03] of the Book of [inaudible 0:42:04] that although you have been speaking Spanish all your life, it's also interesting maybe to learn to speak well in English, which I cannot do. [inaudible 0:42:18] try with another language. Because

the Book [inaudible 0:42:21] brings also to the routine. This is not good. The freshness and the spontaneity has to be there. Often are those emotions. For example, recently I have been giving some talks. I told my son Gabriel, who is an engineer and has been with me a while working, "Prepare me the talk." He prepares me the talk. I have not seen it. He has all the images. I go there and he started creating images and I have to say something. It's so interesting.

ROBERT GREENE

That's an interesting idea.

SANTIAGO CALATRAVA

You are saying about this what you are seeing.

ROBERT GREENE

You don't know what he's going to . . .

SANTIAGO CALATRAVA

I don't know how he has it structured. The things are coming and I have to speak about them. It's refreshing because it became the spontaneity of surprise.

ROBERT GREENE

I'm going to try that with my girlfriend. Maybe I'll ask her to put some images up for my next talk. Then I just have to talk about them.

SANTIAGO CALATRAVA

It's refreshing. Once I was invited to Yale and asked to give a talk. No talk, just let's put music. I took watercolors and I started just sketching. There were images here, music there, and watercolors here. It's maybe a little bit [inaudible 0:43:45], but it was interesting because the people received something different. The goal was to not give advice to the students. I want to give them my example.

ROBERT GREENE

You said that before. Teach them by example.

SANTIAGO CALATRAVA

They see somebody sketching. I say, "Maybe imagine you are here. I'm here." I'm alone in my room and I'm working on a project. Look how I do. Then I start just sketching and using watercolors and moving and so on.

Then they were seeing the images. The other side was the music.

ROBERT GREENE

What music did you have?

SANTIAGO CALATRAVA

Bach, *the Suite of Cello*.

ROBERT GREENE

That's a great idea.

SANTIAGO CALATRAVA

They are hearing good music, which maybe many of them don't know the Suites. I learned them when I was maybe 20 years old. Then they see somebody working.

ROBERT GREENE

It's a way to keep things alive instead of just repeating yourself over and over.

SANTIAGO CALATRAVA

There is a system. Architecture is from the mental. Every building is unique. Every circumstance is unique. This is what I discovered when I started in the beginning. The small commissions I received were first small and they were few. I have done them

with all the intensity. For me, it was equal. Another one comes, a balcony. Why should I add a balcony? Enormous problem to add a balcony. Or a small bus shelter on the corner of a street in front of a fountain is also an enormous problem.

ROBERT GREENE

With all of your experience making doors that open and solving different problems, maybe each building is new, but don't you bring with it a sense that you have mastered certain techniques and certain ways of solving problems that you didn't have when you began?

SANTIAGO CALATRAVA

It's true that you don't need to struggle so much. You can almost in a sketch assume a plan. You see a plan in a sketch. You see through the sketch a plan which because you have done this exercise every time. You can understand between the gesture you make in a couple of seconds and the result. You see already a link. I'm sure these exist because

you have done that several times. Otherwise, if you have done that for the first time in your life and you see you're missing that and that and that and you don't understand yet this is a matter of layers of work until this sketch becomes a really useful plan to get a building. You can interpret that in a double sense. There are people who think architecture is doing a plan. They don't see that architecture is a whole work getting from a sketch through many hiccups into a perfect plan. For many people, they maybe read only here but it is not true. The symphony of [inaudible 0:47:29] is complex and beautiful and can be orchestrated. Has started [inaudible 0:47:34] and a piano against the wall. I am putting notes [sings] which is the structure of the melody which then makes this movement of the Third Symphony which is amazing and does not [inaudible 0:47:50].

ROBERT GREENE

That's funny. I was listening to the Third Symphony the other day.

SANTIAGO CALATRAVA

It's enormous.

ROBERT GREENE

It's at the end of the Third Symphony.

SANTIAGO CALATRAVA

[inaudible 0:47:58] is the point of [0:48:01].

ROBERT GREENE

Very beautiful.

SANTIAGO CALATRAVA

[inaudible 0:48:05]. Here is a woman, Jessye Norman. I hear Jessye Norman [inaudible 0:48:08] Philharmonic years ago. [inaudible 0:48:12]. These things started as a kind of sketch, and then they get built up and built up. This work and the attention you have holding you, you see thinking of [inaudible 0:48:33]. This is something that exercise brings you. It consolidates in you the sense that I can arrive there.

ROBERT GREENE

This is the final question. Basically there's an idea that I have in the book which is a little bit philosophical. The idea is that every

person is born completely unique. Your DNA is unique. The experiences that you have in your life. Never before in history, never in the future will there ever be you exactly you. There's only one, ever. It's a rather strange thought if you think about it deeply enough. The point of what I'm trying to show is that if you learn something like architecture or music and you learn the rules which are very objective and outside of yourself, established thousands of years ago, if you go deeper and deeper into it, you're able to slowly express more of what makes it individual about you, and ultimately creates something completely unique, that reflects how different you are. Did you follow that?

SANTIAGO CALATRAVA

Yeah, I follow.

ROBERT GREENE

When I look at your work, there is nothing like that. You can not like it or like it. I happen to love it. There's nothing like it ever. I can't think of any other architect that

does work like yours. I wanted to ask you about this sense because I know you talk about transgression where each work is sort of transgressing the laws. Do you feel like it's something that you're expressing very deeply about yourself, something very personal in a way that makes you different, gives you a style?

SANTIAGO CALATRAVA

Joining your philosophical theory about the unicity of a person, first of all, we are now in conversation. We discussed at a certain point about the platonic sense of the idea, as the idea pre-exist. It is just bringing them to life through ourselves. Second, we use the word education or induction. Education is mostly taking out of one. Everything is in you and you have to take it out of you. It's a very important concept. I am in front of a young person and everything of himself is already embodied in himself. He may not know that. Certainly he does not know that. It's all in himself. He is a machine who has a spiritual

DNA which all the ideas are compressed in himself because he is a machine reading ideas. There is also another Greek approach which says that inside the man is a fountain.

ROBERT GREENE

Is a what?

SANTIAGO CALATRAVA

A fountain. Who does not [speaking foreign language].

ROBERT GREENE

Never goes out.

SANTIAGO CALATRAVA

Never goes out, if you don't stop excavating. Compare that to the fact that Michelangelo, when he saw a piece of marble, he said, "The sculpture is inside." I have to take out this that don't belongs to the sculpture. There is a sculpture inside. You can imagine inside a person is a fountain waiting to deliver ideas. We deliver [inaudible 0:52:24]. We deliver great things if you don't stop working on it. The work of excavating or cutting in yourself is interpretive. It's very much in yourself.

The source is in yourself. It's in your own interpretation of the world. It's even in the education, not induction, of your own senses.

ROBERT GREENE

What do you mean by the education and induction?

SANTIAGO CALATRAVA

Educare is taking out. Inducere is putting in. The word education from the beginning means taking out of this person his skills. It's a beautiful thing. I'm trying to [inaudible 0:53:27] you a little bit from my philosophical conviction. In a person is a machine to understand ideas. All the ideas are already in him. The root of the education is taking out this ability that he expressed. Also for each one of us is the fact that inside of us there is a fountain. You really have to work very hard on it in order that it never stops giving fruits. This is very much person-centric. Human is very much related to the single person, to yourself. I keep saying that one of the beautiful parts of my profession is the fact

that it permits me to express myself according to a vocabulary that I [inaudible 0:54:27] with pieces, with ideas you see who makes and you see of this type and so on. Putting them together in, let's say, a random way you see that I design myself in a logic [inaudible 0:54:52] and then delivers [inaudible 0:54:45]. This type of conviction I think is interesting. Like from your point that every person is unique. That's very important.

ROBERT GREENE

They don't necessarily realize it in their life, but they have the potential. The word in Greek from Aristotle is called intellecti [SP], and it's the realization of what is potentially inside of you. That is the point of education is to realize that ideal.

SANTIAGO CALATRAVA

You know about education? I'll tell you because you will go to the Metropolitan and you speak about Aristotle. The most beautiful painting in the Metropolitan for me is done by Rembrandt. It's the Portrait of Aristotle. A

Portrait of Aristotle who is putting his hand in the head of Homer, the boy.

ROBERT GREENE

Aristotle?

SANTIAGO CALATRAVA

Aristotle is putting the hand on a sculpture. . .

ROBERT GREENE

Oh, a sculpture.

SANTIAGO CALATRAVA

. . . who is the head of Homer, the boy. Then he has a wonderful chain. If you look at the chain, it's all done with matter. It's wonderful. It's pure gold. You go there and it's all done. That's really a masterpiece of the painting. The chain has a medal. The medal is the sculpture of his pupil, Alexander. You see one master, another master, the pupil.

ROBERT GREENE

That's beautiful.

SANTIAGO CALATRAVA

About education.

ROBERT GREENE

Is this at the Metropolitan?

SANTIAGO CALATRAVA

The Metropolitan.

ROBERT GREENE

Oh, okay. I'll go look at it.

SANTIAGO CALATRAVA

It's really quite a piece.

ROBERT GREENE

I'll look for that.

SANTIAGO CALATRAVA

[speaking foreign language] is a kind of metal with the head of Alexander. Once the disciple and Ethics the Nicomachea. Nicomachus was the son of Aristotle. It was written as an education book for Alexander.

ROBERT GREENE

That's right.

SANTIAGO CALATRAVA

They preserve a very good relationship because Alexander in his campaign was always sending him animals and other things he discovered for technology and all of that.

ROBERT GREENE

That's a great story. When you look at a bridge now that you did, do you have a feeling towards it? Towards your own work as if it were a child of yours?

SANTIAGO CALATRAVA

It's different. Not a sense of paternity.

ROBERT GREENE

Ownership.

SANTIAGO CALATRAVA

Not at all. You look at it as another creature out of you. I'll tell you, in all modesty, when you walk in a building, you discover so many things that belong to the synergy between the object and the natural shadows, the reflection. The light at this particular moment, the character of the work. It's always very nice to see photographs by other people and how other people see the things.

ROBERT GREENE

That's interesting.

SANTIAGO CALATRAVA

And how they interpret it. It even happens to me. Speaking about [inaudible 0:58:24]. In the doors of Ernsting, we built them but we built them in a closed position. I made the plans but I didn't make the shop drawings. The shop drawings, the drawings to execute the pieces, this was done by the company who executed the door. They made the profiles of each one. They made all the technical drawings necessary to build that in the shop. I delivered them, the technical drawings, that were necessary to make an offer and to make a bid and said, "I can build that." A young man who was close to me who has done those shop drawings, the doors opened. I was looking at that and said okay. I turned and he was kind to me. He was so moved for the fact that the door became that. I thought this door belongs more to him than to me because it touched him there.

It's very important because as I say, as an architect, you have to think more than

anything that you put people to the service of work. You also bring ideas for the people you know will fight. You even bring plans that they will realize. You have to understand it's also the work of a collective. This also mitigates very much whatever exalted sense about whatever. It saturates that.

I can even tell you, they are works done by architects who were . . . for example, Longhena who has done La Salute in Venice, the Church of La Salute at the entry of the Grand Canal which is a masterpiece. Longhena is not very well known as an architect. You always have to have in mind that in order to do a great piece of architecture it's constantly almost a great client behind or somebody with the will, an institution or a person with the will to deliver something special. It's not necessarily a great architect. It's very important to balance those things. Because as an architect you are in the middle of all of those things, you can see also there is a lot of parts that come from those

who put their hands at work and also a lot of parts from those who promote a building like that.

ROBERT GREENE

Well, I think that's it. I think I covered everything I wanted to get in.

SANTIAGO CALATRAVA

You know what I propose? Why don't we go and have a bite? We can go eat. ♦



CESAR RODRIGUEZ

ROBERT GREENE

Just tell me . . . well, you don't want to tell me your position now. We're going to keep that mysterious. Just tell me who you are and where you're from.

CESAR RODRIGUEZ

My name is Cesar Rodriguez. My home is Puerto Rico, although we currently live in Tucson, and we are making Tucson our new home. I am a retired Air Force officer, and currently work with industry.

ROBERT GREENE

Essentially there are four things I am going to be covering. I want to talk a little bit about your childhood and growing up to get a sense of who you are, and maybe if we could see the signs of what you would later become in your childhood; then talk about your training period, which I am very interested in; then talk a little bit about the missions that you flew; and finally, I have some general questions.

CESAR RODRIGUEZ

Sure, okay.

ROBERT GREENE

You're an Army brat?

CESAR RODRIGUEZ

I am.

ROBERT GREENE

Okay. Tell me a little bit about your father first.

CESAR RODRIGUEZ

My father was born in Puerto Rico. He is one of two children. As a matter of fact, his hometown, Guánica, Puerto Rico is where the Americans landed. He went to the University in Mayagüez in Puerto Rico as an engineer. I found out later on in my Air Force career that he actually wanted to fly first, but he didn't have the eyesight to fly so he went and joined the Army as an engineer, an infantry kind of person. We traveled all around the world. He did tours in Vietnam and in Greenland, where he was on remote.

ROBERT GREENE

Greenland?

CESAR RODRIGUEZ

Yeah. Thule, Greenland.

ROBERT GREENE

You were in Greenland?

CESAR RODRIGUEZ

No, we didn't go. Remotes are where you go by yourself.

ROBERT GREENE

Okay. How long was he in Greenland?

CESAR RODRIGUEZ

I think that was a one year tour.

ROBERT GREENE

Wow.

CESAR RODRIGUEZ

Yeah. You really learn to acclimatize to different shades of the sun.

ROBERT GREENE

You have to be alone a lot.

CESAR RODRIGUEZ

Yeah. The whole battalion that is up there, you're without your family so you become

your own family. I lived under those conditions when I was in Korea. My first assignment was a remote assignment. He did Greenland and Vietnam. We had a smattering of assignments throughout the United States. We were in El Paso where he learned air defense, and that's where I was born. My sister was born there as well. We were in Albany, Georgia; we were in Fort Sill, Oklahoma; we did Aberdeen Proving Ground, Maryland; and then we went to Panama. When we were there he was the Secretary of the School of the Americas when the Army used to train the Latin American officers down there. His last assignment was in Puerto Rico at Fort Buchanan.

Throughout all those moves and everything, the whole military piece kind of intrigued me. I really wasn't thinking aviation. As a matter of fact, the only flying I had done at that point was as a passenger flying from base x to base y, or driving. The whole aviation piece wasn't part of my youth. A lot of my peers in

the flying world say that they woke up and said 'I want to fly', and then that's their goal for their entire life. For me, it came very late in my time frame.

ROBERT GREENE

What was your goal? Were you thinking of just following your father into the Army?

CESAR RODRIGUEZ

Initially, I was thinking more in the medical field. I was thinking dentistry, actually. Then I had an awakening in college. My first Bio class was not a fun experience, and I don't know if it all was teacher-related or student-teacher.

ROBERT GREENE

At the Citadel?

CESAR RODRIGUEZ

At the Citadel, yeah. Then I pursued business administration. I'd been shown the way with several of the folks that I had worked with that I had a pretty good knack relative to business opportunities. So I was pursuing business.

At the time, an Army Infantry Officer was something that I liked, I liked the discipline of PT, the discipline of the organizational structure, taking mission statements and executing as a team. It all focused more around team building.

ROBERT GREENE

At the Citadel?

CESAR RODRIGUEZ

At the Citadel and really throughout my youth. The only individual sport that I played was wrestling. All the rest of them, football, baseball, everything was based on teams. Team building items became interesting to me, as well as what I saw from my dad's perspective, really became the guard rails, if you will, of the path that I was eventually going to pursue.

ROBERT GREENE

What were you like as a child, if you had to characterize? Were you competitive, studious, or not?

CESAR RODRIGUEZ

I was very competitive in the areas that I was interested in.

ROBERT GREENE

What would that be?

CESAR RODRIGUEZ

Sports, predominately. I wasn't very studious, and I wasn't an A student. I would say I was an average C+ or B student across the board. Pretty high energy is a way that I would describe myself, as well as independent. I was ready to get out of the house quickly.

At the same time, I think I was fairly loyal to the family concept even though I was playing sports late into the evening for practices and stuff like that. I tried to make it home as many times as I could to be at the dinner table with the family. We're a very strong Catholic family. My mother and father are a very traditional Hispanic-Latin family, and then I was the other side. I was the kid who was raised in the States. I was exposed to a lot of the things that were going on in the United

States in the 1960s and 1970s, 1970s mostly.

Those two cultures really did clash, and there were times when I was perceived to be...

ROBERT GREENE

A little bit of a rebel?

CESAR RODRIGUEZ

A little bit of a rebel. At the same time, the other piece of it was that I was very loyal and dedicated. It was not your classic, although I would offer that in the military, there are no classics when you're raising children.

You go to any base in the United States or anywhere in the world, and the demographics of your base are all the cultures and all the ethnicities. You learn a little bit from everybody. You're also involved with a fairly, I would say that in society if you look at where all your type A's tend to migrate, there's quite a few type A's in the military.

ROBERT GREENE

Why do you think that amongst the children?

CESAR RODRIGUEZ

Amongst the children, because your role models are people who are on the leading edge of defending America's freedoms. So when you think about somebody who's willing to sacrifice their life, they're also willing to do a lot of other things that's probably above and beyond the call of duty. It's not your average Joe that hears the calling to wear a uniform or Joelette either, because they're both male and female. Not the average person gets the calling, and as a result that calling requires a special . . .

ROBERT GREENE

Was your father sort of an intense person?

CESAR RODRIGUEZ

I'd say so, yeah. He was very much a disciplinarian at home. I guess there were times when someone would say he was sometimes mean. I just call that tough love.

ROBERT GREENE

Sure.

CESAR RODRIGUEZ

He's a very disciplined man.

ROBERT GREENE

Is he still alive?

CESAR RODRIGUEZ

He's still alive, yeah. Him and my mom are together, they're still in Puerto Rico.

ROBERT GREENE

I think we're the same age.

CESAR RODRIGUEZ

Okay.

ROBERT GREENE

We're both born in '59.

CESAR RODRIGUEZ

You look a lot younger than '59, born in '59. I've been ridden hard.

ROBERT GREENE

Yeah, I've been ridden hard too.

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

I know growing up at that time the military started going through a hit, it wasn't very

popular. Was that entering into your life at all, or something you felt?

CESAR RODRIGUEZ

It didn't really pop into my life until we were getting ready to deploy to Desert Storm. The truth was for the most part, post-Vietnam you had a small group or a small effort mainly led by veterans that were basically trying to clean up the reputation of the military in the eyes of the general public. The general public, even though we went to an all volunteer force and the volunteer force manned itself at the levels that the DOD wanted it to be, when the subject of the military came up post-Vietnam they were not emotional about it. So my era that joined the military in the 1970s and 1980s, we benefited by the Reagan era of making sure that the military was the strongest military possible. At the same time, there weren't a lot of folks raising the American flag and pledging allegiance if you will. That was Vietnam, and nobody really knew it was coming.

When we deployed to Desert Storm there were quite a few discussions about how we would be treated when we came back. The guys were starting to wonder, is this going to be an auto-step by the American public from, "Oh, remember when we were in Vietnam? We didn't like those military guys." Boom. And that was the mantle that we were going to have to be measured by. There was a lot of concern on how America would view Desert Storm, even though we had gone through the invasion of Panama and the Grenada incidents. Those were things that . . .

ROBERT GREENE

Like surgical operations?

CESAR RODRIGUEZ

Yeah, exactly. Surgical operations and there was always that bully that was there that we didn't want to deal with. The largeness of Desert Storm was closer to, "Okay, we're deploying a large contingent here. This is going to look and smell a lot like Vietnam."

How are we going to be viewed?" So there was quite a bit of concern.

But growing up as a kid, you're at the base, everybody is in the same scenario, so it really wasn't an issue. Whenever we lived at a different base where you commingled with non-military kids, the truth was, most bases and most communities embraced the base that they were there supporting.

ROBERT GREENE

You were moving around a lot, like two years here, two years there?

CESAR RODRIGUEZ

Yeah. We moved around quite a bit both as dependents, and then when I was the family member on active duty we moved around quite a bit.

ROBERT GREENE

Do you have any siblings?

CESAR RODRIGUEZ

I do. I have three brothers and sisters that are younger than I am. I'm the oldest in the family. I have a sister who's a year and a half

younger than I am, and then brother and sister twins who are four years younger than I am.

ROBERT GREENE

Okay. So were you sort of the more rebellious one in the group, or the one who was more independent-minded?

CESAR RODRIGUEZ

I'd say both. In the Latin community, obviously the males are treated differently than the females. My sisters always reminded me that I got special benefits and privileges as being both male and the oldest. I was definitely the rebellious, independent one.

ROBERT GREENE

The people that I've been interviewing all have a certain, maybe they didn't know exactly in what field they would end up in, but they had a certain predilection towards whether it was science or art, or whatever. It sounds like maybe yours was more towards the physical, like sports?

CESAR RODRIGUEZ

I would say you're right. The physical part of it was always what I considered a challenge because you want to put your body through the stresses to figure out if you can do it. And whatever training it was for an event, as much training went on physically with the muscle as well training between the ears in that particular space.

ROBERT GREENE

Are we talking about football or wrestling?

CESAR RODRIGUEZ

Football, wrestling, baseball, all of them. Each one of them had an individual component. I was never what I would call a single-minded person.

ROBERT GREENE

. . . more of a team oriented?

CESAR RODRIGUEZ

Yeah. I knew my role within the team, and I never wanted to be the weak link on the team. So that was my motivation as I moved

along. Even when I was a wrestler, there were 11 of us on the wrestling team, but I always knew that at the end of the day, it was a team score. And so I could win my match, but somebody else had to win theirs. I never put the onus or the pressure on myself that everything had to be only about me. I think that, when I combine the physical piece of it with team events, that's when I started to see the fruits, if you will, of the hard work.

ROBERT GREENE

Was it because you were competitive that you worked hard? Were you slow to pick things up? Did it take you longer? Did you practice more, or were you kind of . . .

CESAR RODRIGUEZ

I was not the golden boy in either sports or flying. And I think the answer is yes, slow to pick it up, but not afraid to pick it up. Willing to accept the challenge and bull my way through it.

ROBERT GREENE

So what would be the big satisfaction when you were growing up in sports? Was it meeting these certain challenges, or kind of mastering the mental aspect, or fitting in with the team and excelling?

CESAR RODRIGUEZ

Probably the number one driver would have been the end state of any season, which is to win, to win the championship. I remember my junior year, we won the championship in football and in baseball, but in football, we lost one game. So my senior year was to go undefeated and win again. So those were the self motivating pieces of each one. But at the beginning of the season, all of them started out with it's not that I want to be the quarterback, it's not that I want to throw more passes, it's not that I want to throw fewer interceptions, it was that we want to win. And then let's back our way into what are the individual actions that have to happen.

ROBERT GREENE

What position did you play?

CESAR RODRIGUEZ

Quarterback.

ROBERT GREENE

You were the quarterback?

CESAR RODRIGUEZ

Yeah. Quarterback, and then basically an infielder, second base, short stop.

ROBERT GREENE

What kind of quarterback were you?

CESAR RODRIGUEZ

More of a wishbone running quarterback.

ROBERT GREENE

That's exciting.

CESAR RODRIGUEZ

Yeah. So it worked out.

ROBERT GREENE

Did you play at the Citadel?

CESAR RODRIGUEZ

I started out at the Citadel on a sports scholarship, and then I very quickly realized that what little brain power was being

generated needed to be focused on the academics.

ROBERT GREENE

That takes a lot of time.

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

I've noticed in all of the people I've interviewed, in childhood, everyone seemed to be pretty disciplined and almost enjoyed the practice element, the idea of getting better and better at something. Because a lot of people don't have that. Were you like that at all?

CESAR RODRIGUEZ

Yeah. I learned early through some great coaching that if you practice, what you put into practice is a direct correlation to the outcome of the game you're going to compete in. I heard it in sports, when they said that practice should be harder than your average game. Then when we got into combat training, it was truly a lesson that we

learned as a result of a lot of the exercises that we were participating in, and the amount of discipline that you put into mission planning was directly correlated to mission execution. There have been some who will say that the U.S., when we went to combat operations, it was easier than sometimes combat itself. When someone who hasn't been shot at makes that statement, I kind of cringe.

ROBERT GREENE

Say that again. Maybe I didn't quite get that.

CESAR RODRIGUEZ

That training is more difficult. When you train the way we train, training is more challenging than combat operations.

ROBERT GREENE

And what makes you cringe?

CESAR RODRIGUEZ

Sometimes the people who would say that had never been shot at, and we could not replicate being shot at in training. So there was always what I called the golden BB rule. On any given day, a piece of triple A could fly

right through your airplane, and that was it. Or if you weren't paying attention and one of your sensors was telling you, "Hey, you've got somebody locked up onto you that . . ."

ROBERT GREENE

You're talking about in combat?

CESAR RODRIGUEZ

In combat. So we tried to make training as challenging as could possibly happen, but you can never replicate the fog of war in training. You can try to, but in the end you always knew, unless you did something dumb and you ran an airplane into another airplane, or you crashed an airplane, it wasn't 100% the same.

ROBERT GREENE

I definitely want to get to that in a little bit here. This might not apply to you, but I ask people, did you ever have a feeling that you would end up successful in something, or feeling like you had destiny on your side, or anything like that?

CESAR RODRIGUEZ

Not growing up. Growing up, when I look at . . .

ROBERT GREENE

I'd asked you if you had a sense of destiny. When you said not really growing up, but maybe later on?

CESAR RODRIGUEZ

When I grew up, we were a middle class family. Dad and mom gave us everything they possibly could. I guess, in one of the areas when I joined the Boy Scouts, I looked at the Boy Scouts and I go, okay, cool, this is a cool thing to do. But then I go, where do I want to be here? And I set my goal on becoming an Eagle Scout.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

And I got there. I didn't really appreciate at the time the amount of work that I put into it or that other people put into it to help me, but

it was the first time that I remember setting a goal and said, that's where I want to be.

And then I wanted to be the quarterback of the team. What I learned, and I never took it as destiny, I just looked at it as set the goal and then charge for it. At the same time, I'm a firm believer and I always learned that you can't do it by yourself. You have to be a good wingman in order to become a good flight lead.

That's really when the team concepts really started to become very clear to me. When a coach was talking about an entire play, I couldn't master all 11 positions, but I knew in space what everybody was trying to do. And that helped me out in understanding three dimensions of flying, three dimensions of space.

ROBERT GREENE

In what way? Tell me a little bit more about that.

CESAR RODRIGUEZ

Well, I would listen to the play as it was being described, and I could close my eyes and I could imagine okay, if I'm handing the ball off in this direction, what makes the most sense to execute a fake? Do I follow the play? Do I just stop? All of the little things that made the play work, not just the actual handing off of the ball became clear as I understood the entire space of the football field.

The same thing applies in the flying world. Aviation, the art of taking off and landing is two dimensional. It's simple. The art of applying the airplane in a dog fight, when you're vertically upside down and you no longer have a horizon and you're taking in sensors, both through your ears and your eyes, and then your hands are executing something, that's three dimensional.

So when we look at a battle, if all you do is lay out the spaghetti of a battle, then that's a two dimensional picture.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

But when you start showing vertical displacement, airplanes getting bigger and smaller, arrows going down, arrows going up, now you start to understand the complexity of employment. I think that started in listening to coaching, listening to my coaches talk about all of the different positions.

ROBERT GREENE

Getting that sense where you sort of could master the whole picture in the space of a football field, did that take time and practice and experience? Isn't it more a function of... because you can't think your way through that?

CESAR RODRIGUEZ

I was lucky when I got to high school. I had a coach who, for the first time, introduced

at the time . . . I graduated in '77, but at the time he was introducing us to watching video. So there was somebody recording the practice session, and then you'd take snippets of it, and then you'd start to look at the field from a God's eye perspective. And you'd go, "Oh, okay, now I see why he's cutting left versus cutting right based on how the defensive man was playing him."

So now I could take a snapshot in time. I didn't have to focus on what was going on 30 degrees to my right and 20 yards down. As my eyes scanned that piece of sky, I'd go, the defensive guy was leaning right so there's a high probability he's going to try to cut it to the inside. So I'd know my receiver is going to go to the outside when he gets his chance to break, so I'm going to throw it to the out . . .

Those are the kind of things that became clear when you looked at it from a God's eye perspective.

ROBERT GREENE

Right. That's a good thing.

CESAR RODRIGUEZ

That was the same thing in aviation. In the U.S. mindset especially, we don't script the conduct of the battle space in flying. While we have desired routes that we would like to fly and we have times to make each point, we give a general concept. It all really ends up with what time do the bombs need to be on target? What time does the air superiority need to be over the battle space?

And then backwards, if you need to punt, if you need to pump, if you need to do something differently, you're not so rigid that you can't react, and that's what I've learned.

ROBERT GREENE

Is that the Air Force, or is that sort of the whole military, the U.S. military?

CESAR RODRIGUEZ

I would say the entire military is pretty . . .

ROBERT GREENE

It's not always been that way.

CESAR RODRIGUEZ

It's not. That's right. The Vietnam era in the aviation world the word was you'd tell your wingman just to be in a position, and then tell me what your gas is and tell me if I'm on fire and everything else just shut up and color.

In today's world all the sensors are out there, and everybody's got to be listening and being part of the sensor. You have to be a part of the node in the entire network. So today there is a ton more responsibility on a young wingman and a young flight lead, for that matter. It doesn't matter whether you're young or old. Whoever has got that responsibility has a lot more than we did before in the prior years.

ROBERT GREENE

It's more like a mission statement type philosophy.

CESAR RODRIGUEZ

Yeah, exactly. Focus on the big picture, but recognize what your role is in getting that big picture done.

ROBERT GREENE

I know one of my great heroes military-wise, General Patton, that was sort of his philosophy. He was always so upset that that was not how others, Bradley and others were very rule oriented. Everybody had to be basically following one, two, and three. He was the exception, but I think we've gone back to more of the Patton idea.

CESAR RODRIGUEZ

Well, I think there are definitely times when you have to be Pattonesque in your execution. At the same time, the firmness of rules and discipline is what gets you the ability to be Pattonesque.

ROBERT GREENE

Yeah.

CESAR RODRIGUEZ

I think it's a building block. What we do today, when you look at the training environments that young pilots are going through today, the first phase when you get to pilot training is black and white and don't step outside the box.

ROBERT GREENE

Sure. It has to be.

CESAR RODRIGUEZ

Then once you've demonstrated that you're not going to kill the instructor or kill yourself, then the box gets a little bit bigger. Then you start applying judgment.

ROBERT GREENE

Okay. That's a good segue because I want to get to that now. I'm moving on here to the training period. Why did you decide to go to the Citadel? Was there any particular reason?

CESAR RODRIGUEZ

I think the biggest reason was really if I had not chosen a disciplined structure, and I chose it myself, if I had not chosen a

disciplined structure, then I probably would still be in college today trying to figure out the John Belushi way of getting out.

ROBERT GREENE

So you knew back then, you had an instinct, that you needed something pretty rigorous.

CESAR RODRIGUEZ

Exactly. Yeah.

ROBERT GREENE

Good. That's smart.

CESAR RODRIGUEZ

I kind of drove that into the kids. I said, don't let somebody else make decisions for you as you're moving in life. If you know you need to do something differently, then do it. I think at that point I knew that I needed to not be in school in Puerto Rico. I already had a lot of examples of high propensity for failure within the university programs in Puerto Rico because it was a very liberal... if you want to come to class, come if you want to. Pay your bill, and that wasn't the way I wanted to operate.

Now, there were many days that freshman year at the Citadel where I was questioning my judgment.

ROBERT GREENE

Is it a very harsh place?

CESAR RODRIGUEZ

Very. It's very tough. One of the beauties of the plebe system, like at West Point, the Air Force Academy, the Citadel, VMI, Naval Academy, was you take all these folks who are class presidents, I was one, captains of various sports teams, I was captain of three teams. I wasn't a valedictorian by any means, but when you take all these folks that have all these accolades from their schools, the first thing that happens at all these institutions is you bring them down to a common denominator.

The common denominator is you can't live by yourself as an individual. You need to depend on your roommate and then those members in your freshman class. And when the freshman class bonded into an entity, then

everything else was gravy. Then it all starts to evolve, and then the class becomes a stronger class, the class earns certain privileges from the upperclassmen. The class ultimately graduates, and now here this November I'll go celebrate my 30th reunion with my class of 1981.

ROBERT GREENE

Are you still close to them?

CESAR RODRIGUEZ

Not as close as I'd like to be, because the Citadel is really an East Coast, South Carolina club, and now that I'm out here in Arizona it's a little bit tougher. But we stay connected on e-mail and things like that. You've got to break that organization. Those members of the organization that are going to stay and make it through the four years, once they become a class then they become very strong.

That was something I knew I needed, that self-discipline. I didn't need people yelling at me 24/7, but that was part of the deal.

You got it. In the end, a lot of those little bits and piece of discipline that I learned at the Citadel were the ones that enabled me to kind of focus on the task at hand when combat operations were kicking off. Now, you've got to say, "Okay, focus, be engaged, understand the big picture, but you've got to understand your role in it."

ROBERT GREENE

And that's something you picked up at the Citadel?

CESAR RODRIGUEZ

I think I started picking it up as a kid, but at the Citadel I definitely honed those skills.

ROBERT GREENE

How did they instill that? Could you say?

CESAR RODRIGUEZ

I guess the truth is they beat you down. They beat you down to a point where you really start to understand where are your strong points and where are your weak points? Now you start to work on the weak points.

ROBERT GREENE

That's interesting.

CESAR RODRIGUEZ

You don't lose focus on your strong points because the team still needs those, but there's points there, there's areas there. There's emotional roller coasters that you had to go, why is this bringing me down? Well, let's figure out how to work it up and make it part of your total package.

When we talked about the Citadel, we would say the "whole man" concept. It wasn't just about marching. It wasn't just about shining your shoes. It wasn't about having a crisp uniform, but it was the whole man, the religion, the team, the community. All of those things were being built around you, but in order to build those things they needed everybody to come down to a common line.

If you show up at Harvard and your dad is the President, or your family owns billions of

dollars, and you walk in the door with that reputation, you're already at the top.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

If you were to do that at the Citadel, you're still a knob. Everybody comes down to the bottom. That's why when you start a class . . . I remember in my class at the Citadel, we probably started in, I think it was almost 700 or 800 freshmen. We only graduated 300, so almost a 50 percent attrition rate over a four year period.

ROBERT GREENE

They just drop out? They can't handle it?

CESAR RODRIGUEZ

People can't handle it. They can't figure out that balance of how to master their balance. Some people are always looking in life for an easy button. It was a very different world for me.

ROBERT GREENE

Maybe their family sort of pushed them to go there, and they couldn't hack it.

CESAR RODRIGUEZ

My first roommate, his family said, "You have three choices of going to school. You can go to the Citadel, you can go to the Citadel, or you can go to the Citadel.' They had a family lineage of generation after generation. So the pressure was on him, and he goes, this isn't me. So he bolted.

ROBERT GREENE

So it made you sort of self-critical. You could look at yourself. That's kind of an interesting skill to have.

CESAR RODRIGUEZ

Well, you had to be self-critical but at the same time willing to take critique, understanding that from that critique you're going to find a way to get better.

ROBERT GREENE

Could you internalize it to the point where it makes you look at yourself, even when someone's not yelling at you?

CESAR RODRIGUEZ

Oh yeah, definitely. You knew what the end picture needed to look like. And so you look at it and you go, "I'm not there yet. I'm not . . . oh, I'm there now. And then, okay, what's the next challenge?"

ROBERT GREENE

What were the weaknesses that you had to work on?

CESAR RODRIGUEZ

I thought for a lot of time I was very accepting of criticism because you had a coach figure who was giving you that criticism. So the coach, he knows the big picture, yeah. At the Citadel, that criticism was coming from your peers, a guy, because when I went there, we were an all male school still. But it was a guy who was a year older than you giving you criticism, and you

go, hold on a second here. How did he earn the right to give me this? That was a weird, bizarre awakening for me to be able to take criticism from your peers.

But then when we got into the flying business, the only difference between... one of the beauties of flying in the Air Force was when you got into the room and you were a flight, it didn't matter if you were a four star general or a first lieutenant. Whoever's in charge, whoever's the flight lead is in charge.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

Of course you had to pay homage and due respect to the four star general who might be flying with you, but when you flew he answered up as number two, three, or four, whatever he was doing. He had to be in the formation that you told him to be in, and then you debriefed at that level.

When you learn how to take criticisms from your peers for the good... Now, the other thing that I learned, I also learned this at the Citadel. You will learn something from everybody, good or bad. One of the things I used to tell my lieutenants and my junior NCOs is that as we are growing up, you should always have a book of lessons. On the right side of the book, write all of the things that you want to repeat, that you're seeing from other leaders. On the left side of the book, write the things that you never want to repeat because you'll learn those mistakes from every one of your commanders.

When you become a commander, when you get into a leadership position, start reading from the back. Read the mistakes that others made so that you don't repeat them. Then read from the front and take those lessons that you saw your mentors and go, okay, how can I put my spin on this kind of thing that so-and-so's doing?

ROBERT GREENE

Is this your idea?

CESAR RODRIGUEZ

Yeah. That's how I mentored my officers and my junior NCOs.

ROBERT GREENE

What is the idea behind it, if there's a philosophy behind it?

CESAR RODRIGUEZ

The philosophy is that even bad commanders and bad managers and bad leaders will teach you something that will help you in the long run.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

All too often, the natural tendency is when you don't like somebody, you shut them out.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

And you don't listen to anything they say. You don't watch their habits. You don't learn

from them. And like a teacher, if you have a bad teacher, you need to learn from that bad teacher.

So the key in the military is everybody has their own one or two pieces that is unique to leadership, but leadership is a growth process. It's a contact sport, and it's a growth process. It's got to keep growing. So the way you learn more about leaders is to read and to see how other leaders work, good and bad.

ROBERT GREENE

Why start with the bad? I think it's very valid and interesting.

CESAR RODRIGUEZ

Well, as you write the book, you will find more good things to write about than bad things. As you start to think about your opportunities for command, I always say go to the bad guys and remember early, because that's what's going to stick in your brain. Don't do this. Don't do it like this. Don't say it like this, because in the end that's how you're going to shape it.

And people are going to look at you or I or anybody else, and they will find good and bad things to write in their book, and that's okay. There's nothing wrong with it. But the real failure or the real foul, if you will, is somebody's mistakes that you intentionally did not want to repeat. When you saw somebody treat somebody badly when they really didn't need to do it, when they could have done it in private, but they humiliated them in public. And then, all of a sudden, you did the exact same thing at a different degree. Did you learn your lesson?

ROBERT GREENE

Yeah. I think I see now what you're talking about, because a lot of times you'll have a negative experience with the leader, but you don't ever think that you're capable of doing the same thing.

CESAR RODRIGUEZ

Exactly.

ROBERT GREENE

And so it's kind of a blind spot that you have.

CESAR RODRIGUEZ

Oh, yeah.

ROBERT GREENE

So you're sort of making yourself aware of that.

CESAR RODRIGUEZ

You make yourself aware of it, and remember that when you get put into leadership challenges, you don't get the chance to go back and read the book.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

The book is somewhere back there, and you're at your desk or wherever so you've got to live it. You've got to breathe it. And what you don't want to do is rebreathe the bad.

ROBERT GREENE

Right. Okay. When did you decide that you wanted to fly, that you wanted to go to the Air Force? Is this while you were at the Citadel?

CESAR RODRIGUEZ

While I was at the Citadel my roommate, Jim Myers, one Friday afternoon says, hey, tomorrow all the services are having their flying exams. Basically, it's an aptitude test. He wanted to fly and he says, "What are you doing tomorrow?" I go, "Nothing really." So he says, "Well, let's go take the test tomorrow." I said, "Okay, fine."

Jim and I were very competitive in different sports, but we also were very competitive as roommates to make each other better.

ROBERT GREENE

Yeah.

CESAR RODRIGUEZ

And so he says, "Okay," because I really wasn't even tuned into that. So we went out and we started off that morning going to the Air Force, and we took the, it was about a two hour test, we took the AFOQT test there. Then we went to the Navy and took their Naval Aviation Qualification Test. Then we went to the last one of the day, it was the

Army. So that Saturday we spent it with a little number two pencil, filling in little boxes, from 8:00 in the morning until 3:00 or 4:00 in the afternoon.

We really didn't think much of it. All of a sudden, about three months later, the results started coming back, and the Air Force comes back and says, hey, you qualified for Flight School.

ROBERT GREENE

How did they determine that? What was the testing?

CESAR RODRIGUEZ

Well, it was the Air Force Officer Qualification Test. You take a battery, like an SAT, basically, is what it is. You take an SAT test, and then they score you. You get scored nationally across the board. It has everything, math, art, language, aptitude, symbology.

Somebody built this test for the Air Force and the Navy and the Army, and somebody said, hey, if you look at this test, if they score this

bandwidth, then they can probably handle the academic rigor of flying. If they score below this bandwidth, then you might want to consider them for something non-flying.

ROBERT GREENE

So there's an academic rigor to Flight School?

CESAR RODRIGUEZ

Well, we haven't even gotten to Flight School.

ROBERT GREENE

I know.

CESAR RODRIGUEZ

It didn't even talk about it. Even if you were a rated pilot with all of the knowledge of aviation, this test was not going to test that knowledge.

ROBERT GREENE

I wonder what it was testing.

CESAR RODRIGUEZ

That's the same thing people ask when you're doing an SAT or an ACT.

ROBERT GREENE

Yeah, but that's sort of general college aptitude. This is more geared towards flying.

CESAR RODRIGUEZ

Well, it's first geared towards officership.

ROBERT GREENE

Yeah.

CESAR RODRIGUEZ

To see if you're qualified to be an officer in the Air Force. And then, the second piece of it is if you score a certain bandwidth, then you could score well in pilot training.

ROBERT GREENE

But did you get the same results from the Navy and the Army?

CESAR RODRIGUEZ

No, interestingly enough. I qualified for Air Force Flight School, and the Air Force Flight School was two schools. One is pilot and one is navigator. In the Air Force test I qualified for Flight School. In the Navy test, I qualified for their navigator program, and I didn't

qualify in the Army program. Now, that was the third test of the day.

ROBERT GREENE

You were tired.

CESAR RODRIGUEZ

I was tired, but you would think that they should have all come up with the same result, hey, good candidate to be a flyer. My roommate qualified for Nav School in the Air Force, and then he qualified for pilot in the Navy. He ended up becoming a Marine Corps helicopter pilot.

So that's how it kind of started.

ROBERT GREENE

So really, you kind of backed into it.

CESAR RODRIGUEZ

I did, yeah. When the Air Force came out and said, hey, we have this opportunity for you, then it also became a financial opportunity to relieve some of the burden on my family to pick up a scholarship. A lot of things lined up that worked out in my favor.

ROBERT GREENE

Okay. How did they first train you? Is it all simulators pretty much? What are the first steps that are involved?

CESAR RODRIGUEZ

Well, the very first step was when we went to summer camp. While you're at summer camp, you know who's going to pilot training and who's not. That kind of information was already announced. They started to break you apart. And then the pilots, we got to go to a simulator. For me, it was done at Charleston Air Force Base. So we got to fly the 141 simulator, and it was non-graded. Oh hey, wow, this is cool. No big deal.

Senior year, the flight screening program kicked in.

ROBERT GREENE

The senior year where?

CESAR RODRIGUEZ

At the Citadel. So the flight screening program kicked in, and they basically send you to a local FBO to learn how to fly.

ROBERT GREENE

You had taken this test when you were in your junior year?

CESAR RODRIGUEZ

My sophomore year.

ROBERT GREENE

Oh, I didn't realize that. Okay.

CESAR RODRIGUEZ

My sophomore year. So senior year, I go down to the local FBO in downtown Charleston, and then I'm going through a program with them to learn how to fly a Cessna 172.

ROBERT GREENE

Really. They started that level of airplane?

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

Really.

CESAR RODRIGUEZ

The goal there, successful completion of flight screening is that you're able to solo. So about four, five flights into the program we go

out and we're doing our basic flight and do some acro and do some pattern work around there. And so my instructor pilot says, alright, let's go ahead and land it. So we come in and we land, and he says, alright, go over there to that parking area. As we get to the parking area, he opens the door, closes the door, and then he gives me a salute and says, go fly. I was like, gone.

ROBERT GREENE

This was literally like your first time?

CESAR RODRIGUEZ

No, this was my fifth sortie.

ROBERT GREENE

But you weren't alone?

CESAR RODRIGUEZ

Now I'm by myself. When he says, go fly, I'm going to take the airplane. I'm going to make my calls to tower. I'm going to take off, and I'm going to go out and fly.

ROBERT GREENE

That's a little bit daunting.

CESAR RODRIGUEZ

Yeah, it was pretty amazing. Now here I am, all by myself. I can't rely on anybody else to land this thing for me. Taking off . . .

ROBERT GREENE

If he was there, he could help you land if you let him.

CESAR RODRIGUEZ

Oh, he could have been on the radio and said, okay, here's what you're doing. Here's what you're doing.

ROBERT GREENE

No, but when you're together...

CESAR RODRIGUEZ

Oh, yeah. When we're together, his hands are not on the controls, but he's not too far away from those controls.

ROBERT GREENE

Okay. I was just wondering about the first time you land, what's that like? How do you know how to do that?

CESAR RODRIGUEZ

Well, when you're with the instructor, you do a lot of visual pictures because landing is really a replication of a picture. There's a certain angle of attack. There's a certain runway perspective that you want to touch down at, and there's a certain speed. Once you master those three things, it's really easy to come in and land.

ROBERT GREENE

Yeah, but the first time?

CESAR RODRIGUEZ

The first time, so you come in, and you go around, and you come around. The first time there's probably about three or four what I would call death events that if nobody takes over, you would probably kill yourself. And then, all of a sudden, the picture is starting to make sense, and then he lets you go a little bit further, a little bit further and then next thing you know, you get that little... the two main tires touch and you go, oh, cool.

And then, he goes, "Okay, push it up. Let's take off again and do a touch-and-go," and then you start to memorize that picture.

ROBERT GREENE

Wow.

CESAR RODRIGUEZ

And you get very comfortable with that picture. Then of course there's days when there's cross winds and so now you get to deal with that. Your flying skills start to improve as you start to recognize that there are variables to the picture.

ROBERT GREENE

You don't have to think about it. Certain things become automatic. And then there are other problems.

CESAR RODRIGUEZ

I guess you could say that they kind of become automatic, but at the same time that was the one thing that every instructor always told you, when you start thinking it's automatic, then you're in trouble. Get out of the business. Focus on... get back to the

basics. Get to your cross check. Get to your cross check. Altitude, air speed, altitude, air speed, attitude, air speed. And then, you realize it's not automatic. You've got to put it where you want it.

ROBERT GREENE

Right. So you had your first solo and you managed?

CESAR RODRIGUEZ

Got my first solo and managed, and then I got about three or four sorties under my belt all by myself. Then I went up with a check ride with a check pilot. The check pilot is only allowed to take control of the airplane if he feels that you're putting him in harm's way.

So the check pilot sits there. He's a bump on a log. Every once in a while you kind of look over there and see what's he doing. He's writing down some notes on his knee board, and he's just sitting there the whole flight. You were required to do X number of things. However you want to get them done, you do them accordingly. Then you come back and

you walk into the room. You don't even know how you did yet, although you kind of have a mental picture of how you did. And so he starts going down, did this wrong, did this wrong, you did this good, blah, blah, blah.

And you kind of want to reach over and peek to see if he's got something down there that looks like a P or an F. Did you pass or did you fail?

And then at the end he goes, congratulations. You passed. You completed your instrument check. You passed your ride. And then, you go, whoa, that was cool. And then, depending on how much money was still in the account, because this was all based on a dollar amount, if you soloed early and you passed your check ride early, then you had a lot of money left, and then you can go out and do a lot of flying.

ROBERT GREENE

You did?

CESAR RODRIGUEZ

And I did. So I would take off on Sunday afternoon after church, go down to the FBO, check out an airplane, and then go and buzz the beaches in South Carolina.

ROBERT GREENE

How fun.

CESAR RODRIGUEZ

Just cruise around and enjoy, and I was like going, this is cool.

ROBERT GREENE

Did you do it pretty quickly?

CESAR RODRIGUEZ

Yeah. It became fun to fly that little Cessna around and be at the controls.

ROBERT GREENE

So you realized this was what you were kind of meant to do, or it clicked?

CESAR RODRIGUEZ

It clicked with me. Again, at this point all I was doing was flying, the basic part of it. A lot of folks when they go flying, several of my classmates, that's all they talked about

their entire life was flying. And then the first time they got into an airplane, they started throwing up because their physiology did not agree with flying.

ROBERT GREENE

You mean a jet? What are you talking about?

CESAR RODRIGUEZ

Even the Cessna's. For them, the art of getting into the airplane and flying was emotionally a roller coaster for them.

ROBERT GREENE

Yeah.

CESAR RODRIGUEZ

Some of them threw up. With motion sickness, they could never fly. Some of them got claustrophobic because even though you look at it and you've got this glass bubble around you, it's a pretty small bubble. And when you start realizing that it's only inches away from you and you go, oh, and people get claustrophobic.

There are a lot of physiological events that go on to determine whether flying is what you want to do.

ROBERT GREENE

I wonder what percentage of people can actually endure it?

CESAR RODRIGUEZ

I don't know if they've ever come up with that mathematical formula. I used to take a lot of journalists when we were at Holloman Air Force Base, where we had the two seat AT-38s there. We would take a lot of journalists up and fly them to expose them to what we were doing in the military, in the Air Force especially, in our training environment.

There was quite a few journalists, actually only one of them that I had to really come back and immediately put the airplane back on the deck because she went into a total panic mode. Once we took off, the whole time you knew she was nervous. You could hear it in her voice. I just kept saying, relax, take your mask off, enjoy the view, blah, blah,

blah. She was a mile a minute, and in the briefing she was very calm.

ROBERT GREENE

You never know.

CESAR RODRIGUEZ

You never know. So when we got in the air and she had to keep the mask on because now we were obviously under positive pressure breathing, and she had the G suit on. And the sensation of the Gs on her body, she just went, get me down, get me down. The first thing I was telling her was get your hands away from the controls, from the ejection seat, or the canopy rail. Keep your hands away from there. Because at that point, I did not know if she was really in control. So I had to declare an emergency and come back and land and stop the airplane on the runway and just get her to calm down and popped the lid open. It was her own torture chamber. It was a torture chamber.

ROBERT GREENE

How long were you up for?

CESAR RODRIGUEZ

Oh, it was about 15 minutes.

ROBERT GREENE

Wow.

CESAR RODRIGUEZ

But it was her torture chamber.

ROBERT GREENE

Wow.

CESAR RODRIGUEZ

And she wrote a great article when we came out of that, but she goes, I didn't realize everything that was going on there.

ROBERT GREENE

My girlfriend's a little bit like that. She can't even get on a roller coaster.

CESAR RODRIGUEZ

Oh, wow.

ROBERT GREENE

If you're driving on a mountain road, some people, they sort of panic. It's very irrational.

They can't control it. It's almost a vertigo type thing.

CESAR RODRIGUEZ

Yeah, exactly.

ROBERT GREENE

Yeah, anyway.

CESAR RODRIGUEZ

It was a lot of fun finishing up my senior year at the Citadel and getting to fly on Sunday afternoon.

ROBERT GREENE

So then, now you're off to regular . . . where do they send you next?

CESAR RODRIGUEZ

Then I went to pilot training at Vance Air Force Base in Enid, Oklahoma. That's when I learned the whole thing about... there's flying, and then there's flying. And now you've got an instructor pilot next to you.

In the big scheme of things, the pilot training has to do several things for the Air Force. That was the one piece of it that I didn't get for awhile. I like going, "Okay, why is this so

hard?" And I couldn't get it, but the reality of it is pilot training has a mission.

They've got to produce pilots that are ultimately going to fly either single seat airplanes that cost \$75 million, or in the case of an F-22, \$150 + million, or they're going to fly in an airplane that has three or four people on board. And there's always going to be senior supervision, and there's going to be a check list, and it's going to be challenge and response.

And so, they've got to take this group of folks that just showed up and figure out who's going to fly an F-22 and who's going to fly a 141. That's an incredible responsibility.

ROBERT GREENE

Sure.

CESAR RODRIGUEZ

And the truth is, they don't have much excess space or time. So if you're not cutting it, you're done.

ROBERT GREENE

Right

CESAR RODRIGUEZ

There's no second chance. So the first couple sorties...

ROBERT GREENE

You have to really focus.

CESAR RODRIGUEZ

Oh, yeah. My assessment of pilot training was cram four years of college into ten months, and then on top of that, not only do you have to handle the academics but now you've got to find the physical rigor to survive every sortie

ROBERT GREENE

This is in ten months?

CESAR RODRIGUEZ

In ten months. Because when you get into that jet, you are in a wrestling match with the airplane and Mother Nature, and you're going to sweat your tail off.

ROBERT GREENE

So they put you in a jet right away?

CESAR RODRIGUEZ

Yeah, the T-37 was a subsonic jet, a side-by-side trainer. So your instructor pilot was right next to you.

ROBERT GREENE

What was your first experience in that like?

CESAR RODRIGUEZ

It was day and night compared to a Cessna. First of all, you're wearing a mask. You've got a ten pound helmet. You've got a 40 pound . . .

ROBERT GREENE

Ten pound?

CESAR RODRIGUEZ

Oh, it was huge.

ROBERT GREENE

Wow.

CESAR RODRIGUEZ

You've got a 40 pound parachute on your back. The air conditioning of a T-37 was really like a blow dryer in your face. It was non-existent. You were just sweating.

ROBERT GREENE

What are you sweating from?

CESAR RODRIGUEZ

Both the internal cockpit temperature, and of course the stress, is all happening at the same time. It questioned my judgment. The first couple times, I'm sitting there going, all right, did I pick the right thing? Again, it goes back to many of my scenarios.

The first couple exposure points, I always question my own judgment. But then the next piece of it was, okay, no, no, let's focus on what's really important here.

ROBERT GREENE

Did you do this before?

CESAR RODRIGUEZ

Let's . . .

ROBERT GREENE

Oh, like at the Citadel?

CESAR RODRIGUEZ

The Citadel, exactly. You start to focus. Okay, let's break this down. What do I need to do now? What do I need to get better at?

Where do I need to be in two weeks? Where do I need to be in four weeks? What's the goal here?

So my instructor pilot, I remember we were talking about this as we moved out a little bit. He says, "You know, the first couple of sorties that we flew, I didn't think you were going to make it."

ROBERT GREENE

Why did he say that?

CESAR RODRIGUEZ

Well, because he says, "You were a little bit panicky. You were uncertain. What you demonstrated on the ground and in the simulator as far as being assertive, in the air you were a scatterbrain. You didn't have your priorities, and then all of a sudden you kind of structured yourself, and you got yourself into a battle rhythm. You got good cross check going. You had good communications going."

ROBERT GREENE

What was the turning point for you?

CESAR RODRIGUEZ

Well, I think one of the turning points was when I busted two rides in a row. I had never . . . busted means you failed the ride, and I was going, "Man, I've never failed anything, really. Yeah, I've gotten a C on a test before, but I've never busted. I've never had anybody write a grade sheet on me, and at the bottom it said unsat." I was looking at that grade sheet, and I was like going, "Oh my God."

I'd also seen, because of the environment we were in, we started out with a big group and all of a sudden, the next day you come into class and somebody next to you is not there, and you go, "Hey, what happened to Johnny?" He goes, "He washed out yesterday." Whoa.

ROBERT GREENE

So you were pretty close to having that happen to you?

CESAR RODRIGUEZ

Yeah. I felt like it, and my instructor kind of said, "I wasn't sure how you were going to

do.” And again, they’re not there to babysit you.

ROBERT GREENE

How did you turn it around then?

CESAR RODRIGUEZ

Well, I think it came down to self-analysis. I said, “Okay, if I’m going to do this . . .” and that was one of the other challenges, okay? I always asked myself, “If I wash out of here, what are people going to say? So I was going, “Uh-uh, I don’t want that. People are going to go, ‘Oh, man, Cesar went to pilot training, but he washed out.’” No, I wasn’t going to do that.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

So I really kind of hunkered down and had to set my goals in a lot of areas.

ROBERT GREENE

How could you control yourself the next time you flew so that you weren’t feeling panicky, that you were more controlled?

CESAR RODRIGUEZ

Well, I did spend a lot more time, personal time, in the simulator because the simulator is the exact same thing except you’re not flying.

ROBERT GREENE

Yeah.

CESAR RODRIGUEZ

So I would jump into the simulator when there was some break down time, and then I would either go with one of my classmates, but the key was it was something that I forced myself to do.

ROBERT GREENE

Just getting yourself used to the feeling, so that you’d know that you wouldn’t get that panicky?

CESAR RODRIGUEZ

Yeah. You had to get into the rhythm of the whole thing. It’s the same thing when you drive a car. You’ve got your license, but are you really a safe driver? Well, not really. You’ve got to expose yourself to it, and you’ve got to get a rhythm and a routine going. And

that was kind of how I had to go through Flight School.

When I finished the first phase of it, which was the T-37 phase, I would say I was in the middle of the pack in my class. Class ranking ultimately determined your selection of what airplane you were going to fly.

ROBERT GREENE

The middle of the class wouldn’t cut it.

CESAR RODRIGUEZ

The middle of the class just meant, hey, you were not going to get the airplane you wanted because at that point I also started to realize that I wanted to be a fighter pilot.

ROBERT GREENE

Why did you realize that?

CESAR RODRIGUEZ

Well, when you look at the Air Force at large, if a fighter pilot came into the room in the Air Force, everybody turned their head. Oh, fighter pilot’s in the room. When you looked at the Thunderbirds in an air show, fighter pilots in the air. There was things about it

that started to become, that's my goal. That's what I want to be.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

There were a lot of guys in the class that said, I just want to go fly a 141 and then transition to the airlines. Then, I go, no, that's not what I want to do. When I got to the T-38 phase which was now the supersonic trainer . . .

ROBERT GREENE

That's the next step up?

CESAR RODRIGUEZ

That's the next step up. I had a great instructor, Wheels Wheeler. Wheels was his call sign, an F-4 pilot. We sat down and he says, what's your goal? And I told him, I said, I might not be the golden boy and I don't have the hands of the golden boy . . .

ROBERT GREENE

What are the hands of a golden boy?

CESAR RODRIGUEZ

Well, the naturalist. The flying comes natural to you.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

I don't have those hands, but I'm not quitting. And he said that was an incredible statement to him. He says, "Okay, if you're not quitting, then I'm going to make you the best pilot you can be."

ROBERT GREENE

Cool.

CESAR RODRIGUEZ

So Wheels beat me like a red-headed stepchild a lot of times, and he talked to me like a lot of people should have talked to me, maybe, in my development phase of life. And he laid it out straight. There was no sugar-coating it.

ROBERT GREENE

What sort of things was he telling you?

CESAR RODRIGUEZ

Oh, he would say things like, "You can't fly your way out of a wet paper bag." Now, I'm sitting there going, "Okay, what's he telling me here? Wet paper bag, even a fly can fly out of a wet paper bag. There's going to be a hole in it somewhere. So he's telling me, holy smokes, you suck."

And then there was times when I did it right. He was the kind of leader that that was what was expected. So he didn't say great job, Rico. He just says, "Okay, let's go to the next one. Let's go to the next one. Let's go to the next one." So from the middle of the pack I ended up becoming third overall in the class.

ROBERT GREENE

Out of how many?

CESAR RODRIGUEZ

When we graduated, 41.

ROBERT GREENE

41 started?

CESAR RODRIGUEZ

No, 70 started.

ROBERT GREENE

So out of 70, you ended up number three.

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

Is that the ten month period?

CESAR RODRIGUEZ

Right.

ROBERT GREENE

What was it like the first time doing the sonic . . . I forgot the name.

CESAR RODRIGUEZ

The supersonic T-38?

ROBERT GREENE

Yeah.

CESAR RODRIGUEZ

That airplane was an airplane that would talk to you. When you over-demanded angle of attack on a T-38, it told you, hey, if you keep pulling, I'm going to fall out of the sky. The wings rocked. This was an airplane that talked to you when you did certain things.

So now you could start adding a different sensor to how you flew the airplane. You applied your ears and the senses at the end of your fingerprints, so you could start feeling the buffet. And then, being able to spin at 720 degrees per second, that was the roll rate of a T-38.

ROBERT GREENE

Wow.

CESAR RODRIGUEZ

At .9 mach. You could just slap it, and you could do 720 degrees in aileron roll per second. Things like that, you go, oh, this is flying.

ROBERT GREENE

How did you do that the first time? I'm always interested in the first time, like the landing the first time. Did you just kind of roll?

CESAR RODRIGUEZ

Well, it was one of those things really where the instructor said, you remember when you read this in the performance of the airplane?

And I go, "Yeah. But what does 720 degrees per second mean to you sitting right there?"

ROBERT GREENE

Yeah. I have no idea.

CESAR RODRIGUEZ

I can't fathom it. So he says, "All right, put your hands on the rails." Because he didn't want your hands in the way. He says, "Put your hands on the rails. Okay, we're going straight and level," and then he slapped the stick.

ROBERT GREENE

He did it for you?

CESAR RODRIGUEZ

Yeah, he did it from the back seat. I was like going, wow. And then, he says, "All right, over to you." Of course, the first time I did it, I actually pulled a little bit so it didn't do 720 degrees per second because the key was you had to stay at zero G. And so, I had a little bit of a roll on it. He goes, "Well, that wasn't an aileron roll. That was actually a premature

barrel roll." I go, "Huh?" He goes, "Yeah. Don't you remember reading it?"

So there were things that were starting to come together, flying that airplane. Plus the other piece I think that was a motivator was Wheels told me, he says, dude, you've got about two and a half months to go from the middle of the pack to something where you want to be. You don't have any time left. You've got to be on your A game every day, no questions asked. You've got to change. You've got to reapply yourself.

ROBERT GREENE

And is that more simulator time or more air time?

CESAR RODRIGUEZ

Everything. Everything. It was sim time, academic time, because it was a total package. Your academic classes, your flying schedule, all that comes together, and you're still growing up to be an officer, too.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

All of that combined really forced me to focus those last two and a half months so that by the next time the instructors came together, they go, "Okay, what's the ranking? What's the class ranking?"

ROBERT GREENE

Yeah.

CESAR RODRIGUEZ

I had a place to be. That was a big turning point for me. If I wanted to be a fighter pilot, these next two and a half months just make it or break it.

ROBERT GREENE

Do you think if you hadn't had Wheels Wheeler as your instructor you might not have made it? Is he sort of the key there?

CESAR RODRIGUEZ

I think Wheels was the key. Wheels was one of these kind of guys who was also not the golden boy, but he saw things in me that he saw in himself. He goes, "All right. I'm in. I'm committed to being your instructor pilot."

ROBERT GREENE

It was kind of a mutual thing.

CESAR RODRIGUEZ

Exactly.

ROBERT GREENE

That's interesting.

CESAR RODRIGUEZ

And it was interesting. There were three of us in our group. One of the guys just wanted to be a heavy pilot, wanted to fly 141s, and his goal was to be an airline pilot. And Wheels said, "Okay, fine. If you don't want to challenge yourself, I will train you to do what you want to do." So he gave us exactly what we were going for. He looked at my grade book and he goes, "This is going to be a challenge." He was very upfront. That was ultimately what made the difference.

ROBERT GREENE

Wow. You must have been pretty proud of yourself or happy about it.

CESAR RODRIGUEZ

I was extremely happy, yeah. It went back to a couple of things. Other instructors came back and said, "You definitely weren't the golden boy in the class, but nobody ever doubted your commitment to trying to get to your goal."

ROBERT GREENE

Everybody gets the same amount of hours flying. It wasn't like you actually got more.

CESAR RODRIGUEZ

No, that's right.

ROBERT GREENE

You had to focus more or what?

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

Work harder at the other stuff?

CESAR RODRIGUEZ

There definitely was a lot of alone time which is hunker down, focus on what's going to happen. There was also a lot of what I would call 'light your hair on fire' and

remember that you're supposed to have fun in life. So we partied pretty hard when it came time, when the window was there to party.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

But everything that you were doing, you were doing it to the max extent possible. And that kind of aura, if you will, kind of . . . when you're doing it, you want to be the best at it.

ROBERT GREENE

I'm just thinking. Because you all have the same number of hours that you're actually flying the supersonic plane, what is it that makes you now catch up or excel past the others? Is it just the time in the simulator, or are you just . . . I guess I'm missing a piece here.

CESAR RODRIGUEZ

It's not a linear progression.

ROBERT GREENE

I know.

CESAR RODRIGUEZ

It's not a linear progression. I think of it as in the end, those instructor pilots have to base their output on the mission, on their task at hand. They've got to answer a lot of questions. Can this guy make decisions on his own? I think that was one of the things that elevated me in my growth as a pilot. To make decisions on my own and not second guess myself and move forward. Be assertive in how to fly the airplane, and at the same time be assertive in how to conduct yourself as an officer.

They wanted to know, can you be a good team builder? Can you build a team on and with this person? All of those things that can't be measured on a grade sheet went into the discussion, is Rodriguez qualified to be a fighter pilot?

ROBERT GREENE

I think the fact that you were competitive and you asked him to challenge you, so he gave you more things that you had to do.

CESAR RODRIGUEZ

Right.

ROBERT GREENE

And maybe also being a quarterback and being in that position where you were being assertive, where you were kind of used to things like that.

CESAR RODRIGUEZ

Yeah, no doubt. That ten month period was a composite sketch of my entire life. Every chapter of my life was somewhere in that ten month period, compressed either into a one or two minute vignette or into a week long . . . I remember when I did the back-to-back busting in the early phases, when I busted two rides in a row, the next thing they did was they sat you down for a week. And that was the longest week of my life because the one thing you wanted to do was get back in the airplane and prove that this was a fluke.

Obviously, they'd seen this before. So they're preparing two paths. Wash out or stay in the

program. They've got both roads paved. That fork is ready to be taken. You're going to go on one of these two because they don't have enough time to spend . . .

ROBERT GREENE

It's kind of good in a way. It just makes everything clear.

CESAR RODRIGUEZ

It is. It was very clear, but it was also my own personal torture chamber. I didn't know if I wanted to sit there with a bottle of whiskey in front of me or go in the simulator and fall asleep at the controls, just trying harder and harder and harder.

ROBERT GREENE

You had to force yourself past those demons.

CESAR RODRIGUEZ

Right. Yeah. Oh, yeah. There was no easy button for the Rodriguez ten months, ten and a half months of pilot training.

ROBERT GREENE

Probably that made you a better pilot in a way. When people have things come easy, they . . .

CESAR RODRIGUEZ

Well, it definitely set the course for how I would conduct myself in all my future training. I knew walking in the door that flying was not my . . . I was not a bird, a natural flyer.

ROBERT GREENE

You had work at it.

CESAR RODRIGUEZ

I had to work at it. So every squadron that I went to, I knew I had to work at it. Every training event, from wingman to flight lead, from flight lead to mission commander, from mission commander to instructor pilot, every one of those was a lot of work. Unfortunately, when you know that there's that amount of work, and then you start piling in other things like family and community and church, you've got to balance all of that.

ROBERT GREENE

Yeah.

CESAR RODRIGUEZ

I would say that probably in the big scheme of things that the easy button to cause somebody else to sacrifice is really the family side. It was easy to take time away from the family when I needed to study harder, and that was wrong. If I could go back and change things, I'd be, "Okay, let me find some other place to take time away from." But don't take it away from family because in today's environment and even in my flying career, we were deployed all the time.

ROBERT GREENE

Yeah.

CESAR RODRIGUEZ

In the early phases before Desert Storm, we were deployed to Red Flag in Las Vegas for flying exercises, Cope Thunder in the Philippines. We were always in a training mode somewhere, and that takes time away from home station, away from home.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

After Desert Storm, we've been at war ever since. So we were deployed six months here, nine months there. You get home for two or three weeks. You're on the road again.

ROBERT GREENE

It's rough.

CESAR RODRIGUEZ

The family is the one who suffers the most in that area.

ROBERT GREENE

Moving forward from that ten month period, you were training for the whole rest of the time that you were flying, as you said.

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

What are some of the skills that you start to accumulate, or it pretty much during that ten month period you kind of...

CESAR RODRIGUEZ

Oh, no. The ten month period, when you look at what it really takes to become a fighter pilot, that ten month period is, yeah . . .

ROBERT GREENE

Just the beginning.

CESAR RODRIGUEZ

Yeah, it is. If you were to measure it with a 12 inch ruler, that ten month period is the first quarter inch.

ROBERT GREENE

Of a foot?

CESAR RODRIGUEZ

Of a foot. It is the basic of learning how to fly an airplane. At that point you could get into another airplane once you went through the studying of the systems piece and learn how to turn it on. You could take off and land pretty much with any airplane in the world.

Let me get some water.

ROBERT GREENE

No problem. Sure. Want to take a little break?

CESAR RODRIGUEZ

Yeah, or just a water break.

ROBERT GREENE

Okay.

ROBERT GREENE

So we don't need to go into everything here, but I am curious of the kind of skills that you've amassed. It's not like they're replicable for people outside of flying, but there are some things with a mental aspect and just the things that you ended up mastering. I'm just kind of curious about them.

CESAR RODRIGUEZ

Well, I kind of convey these when I talk to folks that they are skill sets that are interchangeable it's not just flying. But it kind of goes back to what I was learning in my younger days as far as team building. So once I graduated from pilot training the one thing I learned across the board was your reputation, good or bad, follows you everywhere. So you're always, when you get your first flight commander in a fighter

squadron he's not telling you to watch your Ps and Qs, he's telling you how you perform in an airplane is what opens and closes doors for you from here on in. This is your skill set, this is your business, be the best that you can at it.

So while at pilot training you learn those basics of how to take off and land, and you the basics of flying some formation flying. Like, I mentioned, if you were to measure that on a 12 inch ruler that's the first quarter inch.

Now you go to another training base and at that training base, which was Holloman Air Force Base, which is fighter lead-in school. Now you get all these folks who are prior fighter pilots who are your instructors and you've got all these guys who are soon to be fighter pilots as the students. The key here is, again, there's no babysitting, everybody's going to lay out what has to happen and it's up to you to get there. As we would say, "No one's going to tell you how to suck the egg."

You're just going to have to realize that the egg has to be sucked at the end of the day." The big boy syndrome was alive and well.

ROBERT GREENE

What's that?

CESAR RODRIGUEZ

It's, "You are responsible for yourself, you're a big boy. No one here's here to babysit you because in the end when you get into your airplane, you're in charge of it."

ROBERT GREENE

How many other pilots were in your group with you?

CESAR RODRIGUEZ

This is a class of like 28 or 29.

ROBERT GREENE

Is it different kind of personality now because now you're all the fighter pilots?

CESAR RODRIGUEZ

Well, you're growing up to be a fighter pilot, you're not there yet.

ROBERT GREENE

So it's a different type of person?

CESAR RODRIGUEZ

Oh, yeah, yeah. The competition just got bigger. If you were to use a baseball analogy, we are now in AAA we just came out of AA and we're now in AAA. Everybody's looking at, not only are you looking, you already know what airplane you're going to go fly. So there's guys in the room, like myself, I knew I was going to go fly an A-10, there's guys who were going to go fly an F-15, there's guys who were going to fly an F-16, an F-4, F-111. I mean, you already had that assignment.

So everybody comes to this place to learn the next set of skills. Not only are you flying formation, now you're doing tactical flying. Not only are you doing tactical flying, but now you're doing both air-to-air and air-to-ground gunnery. So you're throwing your pink body at 500 miles an hour at a little dot on the ground and you're going to execute a 6G pull, and you're going to release the bomb, and the score on the ground is the output. Not all the hard work that got you

there, end the end if you shack the target, then you got a shack, that's your output. If you're a 100 meters long or 100 meters short, that's your report card to the world. So every event from here on in is going to affect who you become and it becomes part of your reputation.

ROBERT GREENE

So you have to really focus everything, you can't have a moment of . . .

CESAR RODRIGUEZ

There's no moment for a bad hair day. You have to be in sync. You've got to be synced up, you've got to be on your game. The schedule gets posted, you don't get to say, "I don't feel good," or, "Can you move me until tomorrow?" No, the schedule's posted, you're flying. Now you've got to do it.

At the same time, you have all the other social cues, social, what I call, the social traits that now people start to define as being a fighter pilot. You go to the bar and you're the last one there. You play the game of Crud.

I'm not sure if you're familiar with what the crud is, but it's like a game that's played on a pool table, but it's not with pool sticks, it's with two balls. It's actually a Canadian game that was played by the Canadian armed forces, but it's called Crud.

ROBERT GREENE

You don't play with sticks?

CESAR RODRIGUEZ

No.

ROBERT GREENE

What do you use?

CESAR RODRIGUEZ

If you combine football, because you can touch the ball with your hands, and soccer, because the objective is the four corner pockets.

ROBERT GREENE

So you're throwing the ball with your hands?

CESAR RODRIGUEZ

Yeah. So there's an object ball and there's a shooter ball. Then your playing field is a

pool table. Now on that pool table you can't get on top of it, but you own the space that is directly around you. So if you want to block somebody, and it's football, you're a lineman versus a defender. It can get pretty violent, it got very challenging. If you ever get a chance to go see a crud match in a fighter bar, you look at it from the outside and you go, "And these guys are flying \$150 million jets. My God, I can't believe it." But it's just one of those things.

ROBERT GREENE

So you're have to live up to certain social expectations? You have to drink hard, be good at Crud?

CESAR RODRIGUEZ

Yeah, everything you did in the fighter world was big. It's not just the flying, everything was big. So there was a lot of pressure as a young kid. You want your reputation to be a good one because when you leave from this training base to the next training base the first thing that's written on the grade sheet

is, "Hey, he's either a shit hot fighter pilot material," or, "You need to work hard on this guy." And you're always being challenged.

So that was the model that was coming out of Holloman Basic Fighter lead-in School to teach you the basics. It was really a economic model. You take an airplane like a T-38, you treat it like it was a high end fighter, except you don't get all the computer gizmo stuff that's working it, and you get the guy ready to go fly his F-15, or his F-16, or something like that at a very economical price.

Then from there you went to your fighter. So you've gone from pilot training, in the AA, now you're a AAA at Fighter Lead-in School, then now you've been called up to play in the bigs, and now you show up at your primary base, A-10, F-16, F-15, whatever it is.

ROBERT GREENE

This is after how many years now?

CESAR RODRIGUEZ

This would be approaching your . . .

ROBERT GREENE

How old were you?

CESAR RODRIGUEZ

25, so you'd been about a year and a half into the system. You're still a 2nd Lieutenant, getting ready to become a 1st Lieutenant. So then I come to fly the A-10, which the A-10 has no two-seat airplanes. So you do a lot of simulator time and then the first flight it's all by yourself, they're nobody else in the cockpit breathing air with you. You're all there by yourself. And the same thing all over again, you've got to prove yourself, you've got to earn the respect, you've got to all the hard stuff. And when you come out of your A-10 training base another report card goes to the next level. At the next level is when you're operational.

ROBERT GREENE

And that would be the F-15 for you?

CESAR RODRIGUEZ

Oh, no. I was operational on the A-10 first, when I went to Korea. Then when I came

back then I went into the F-15 training. So every one of those steps, except for pilot training happens when you change airplanes.

ROBERT GREENE

Right. But you'd been through it so many times it's kind of like old hat.

CESAR RODRIGUEZ

Yeah, so know it's your reputation is what following you around. So when you get to your Base X, your next airplane, people go, "Okay. I've heard of this guy."

ROBERT GREENE

What was your reputation at that point?

CESAR RODRIGUEZ

I think everybody recognized that I was a solid pilot, willing to work extra hard. I definitely had the skill set to be an instructor pilot and a mission commander, which is one our ultimate tests because now you can handle the bigger responsibility of, not just what's going on in your airplane or your flight, but now you're in charge of everybody. If somebody needs a decision made, you're

Johnny on the Spot, you're the decision maker as the mission commander. So my reputation was, there was no top to my ceiling, I could get there. It just wasn't going to happen overnight. I was going to work hard to get there. That was kind of my mindset. At this point I knew that everything that I was going to go out and do was going to be a graded event, there's always somebody watching and good or bad that was going to be part of your legacy in the flying world.

ROBERT GREENE

But you probably had gained some confidence at this point because you'd passed though it so many time before. You knew you could if you worked at it hard enough.

CESAR RODRIGUEZ

There was a lot of confidence, but at the same time now my peer group is really a bunch of guys like me and a bunch of guys who were naturally gifted. Everything that they touched, flying wise, was golden.

ROBERT GREENE

Really? What is it that makes somebody like that?

CESAR RODRIGUEZ

Well, I guess using the most current analogy, look at a LeBron James kind of guy. I mean, here's a guy who at age 14 people know that anything he did with a basketball was going to be phenomenal. Now it's just a matter of putting the right package around him.

ROBERT GREENE

Yeah. But also there's something up here that's not good with him.

CESAR RODRIGUEZ

Well that's true, exactly.

ROBERT GREENE

Oh, but anyway, yeah.

CESAR RODRIGUEZ

But it's the same thing in flying. You could see guys do certain things with an airplane, because everybody there understands aerodynamics, but when you see a guy take an airplane and spin it, or flip it, or work

seven or eight different things on the radar, there was capability there that you go, “Whoa!”

ROBERT GREENE

I just wonder where that comes from because you can kind of imagine it like where people are born musically, or basketball, but where would someone come with these kind of skills, natural talents for flying, since it’s so unnatural? Is it like good hand-eye coordination . . .

CESAR RODRIGUEZ

That’s definitely one of them. When people ask me, “What would you compare flying an F-15 to?” And I go, “Okay, if it’s just take off and landing, this is like getting into your car, starting it, and driving out the back door, it’s no big deal. Now to employ an F-15, go sit at a piano, put all ten fingers on keys and start producing music, Strap some wings on there, and now pull 9G’s. Can you do that?” They go, “Oh, my God!” The visual picture is, “No, you can’t.” But that’s what you’re doing

in an airplane. Everyone of your fingers is doing something, and you’re pulling 9G’s, and so that’s the visual picture that I go, and so you’ve got to work at it. The guys who can play good music and do that, they’re there, they have that natural gift.

ROBERT GREENE

Fascinating.

CESAR RODRIGUEZ

The rest of us, it might sound like “Chopsticks,” but we’re still playing music and we’re still pulling 9G’s and we’re doing our job, but the other guys are truly concert pianists.

ROBERT GREENE

So what would be the other kind of skills set? You were mentioning before things that could be replicable outside of flying, what were some of the other skills that you acquired over this period of training leading up to the F-15?

CESAR RODRIGUEZ

Well, I think the first and foremost one is recognizing your limitations and working on

it. In every phase of flight, every program that you go out and fly, you know as you go out there. It might be the immediate feedback of dropping a bomb consistently short. “Okay. There’s something here that I’m not catching and I need to work on it.” Well those are the same things that apply on the outside world, is you’ve got to be your own worst critic. You can’t just look in the mirror and say, “Whoa, I’m looking good today.” The Rico in life, the Cesar Rodriguez in life says, “Okay. There’s something missing here, I’m not on my A-game.” So I do a full scan of what is missing. I go, “Okay. Be on the lookout, today you’re not listening well, today you’re email skills are dog shit. Something’s going wrong. Focus on it and always try to become better.” And that was one of the things you learned in the flying world is, on any given day you’re going to have a good, you’re going to have a bad day; the thing is, don’t have a bad day and kill somebody or yourself.

The other piece was team building. As you moved up in the flying pecking order of your squadron, when you're the wingman then you've got to be the best wingman, period. You're flight lead says, "I want you to fly two degrees forward of the 3/9 line then don't be three degrees forward or don't be six degrees aft, be two degrees forward. Build that picture, see that picture, be part of that picture." Don't let there be a reason for questioning what he told you to do, or she told you to do, and you're just lazy because that's really what it amounts to. Everybody can at two degrees line-abreast, but if you're not there then that's just pure laziness and that's part of your reputation. So you learn to be meticulous about your duties as a wingman. We also used to say, "The wingman is needed in two places, besides flying." One, you need to be in the vault. We have classified vaults and that's where all the publications are, all the study material is. You need to be in the vault studying when you're not flying an

airplane or you need to be at the operations desk waiting for somebody to fall out of a flight and then you jump in and get into that flight.

ROBERT GREENE

Get more practice.

CESAR RODRIGUEZ

Get more practice. Now the hours really start to play a game into how much exposure because there comes a certain point where simulator exposure isn't helping you any. It actually develops certain bad habits. So you really need to be in the air, pushing the air, dropping the bombs, shooting the rockets, launching missiles, all the real things that need to happen.

So those are the two places, if you are a young Lieutenant and you weren't in one of those two places then the old heads would at you going, "Oh, you're one of those." And they would call you a seagull because you had to throw rocks at you to make you fly. When you start looking at people's call signs, you

realize that their call signs come from certain aspects of the community, of who you apply tough love to your community.

So you learn the skill of being very precise at what you're doing. Then you start to formulate what I call "the bigger picture." You start to understand, "What's the role of the A-10? What is an A-10 two-ship do? What does an A-10 four-ship do? How are other people who need the A-10, or the F-15, or whatever?" Then you start to really see the same picture that I started to see on the football field when I could see it from a god's eye view. You see the role of the A-10 providing close air support, you see the role of the F-15 providing air superiority and air dominance. You can see the role of the command and control AWACS airplane and you start to go, "Okay. Not only do I know where my airplane is relative to that target that I'm going to kill, but I know where everybody else is."

ROBERT GREENE

How long did it take to get to that kind of point?

CESAR RODRIGUEZ

You know, people say that it takes you about 250 to 300 hours in the airplane, but I would assess to be really how much exposure you have to that big picture. I was lucky when I was in Korea I participated in the big exercises where all the players came together. In the two years that I was there I did it seven times. The average Lieutenant would go to one flag event a year. So when I came out of there at the two year point I had already seven Red Flags or Cope Thunders under my belt. My peers that started out with me, they had two big events under theirs.

ROBERT GREENE

This is like large-scale exercises?

CESAR RODRIGUEZ

It is. It's a large-scale exercise. If combat is the world series, then Red Flag is the playoffs. So at the playoffs, everybody is, for that mission,

it probably last about three hours, everybody is on their A-game. If they're not the world, because every airplane is instrumented, so everything that is being done by all the players can be replicated on a big digital screen. The first time you hear, "Stop." Then every airplane has a nomenclature number. "Please, pair up airplane 22 with airplane 24." And now you've got two guys who are doing something else completely wrong in front of the entire audience.

ROBERT GREENE

They have a view?

CESAR RODRIGUEZ

Oh, yeah. And you'd hear other people get it done to and then you realize how you can't get small enough in your chair because now it's on the big stage. Not only is it on the big stage, but they keep zooming in, and zooming in, and zooming in, and then you realize, one, you either you got really close to killing somebody, or two, you were completely blatant of the rules, and you go, "Oh." But

those kinds of exposures in the playoffs, when the World Series comes around you go, "Ah, yeah, it's just a curve ball, who cares?"

ROBERT GREENE

Right, right.

CESAR RODRIGUEZ

So those level of exercises really notched up your awareness of what's going on in the big scheme of things.

ROBERT GREENE

I keep coming back to this, but it's seems like in the moment your really have to like be in the moment and kind of focus and not be distracted. Is that something that after flying so many times that it comes naturally to you? Or are some people not good at that, the ability to really be there and not thinking of other things?

CESAR RODRIGUEZ

It really comes down to two things. One is, yeah, your ability to stay focused on the event at hand and that event could be that you know that there are troops on the ground

and if you don't put your bomb in the right spot one of our guys is going to die. That's an amazing amount of pressure that you have to be able to do. The other piece of it is, is really what I call the "everything else that surrounds you." I make it a point in my discussions when I talk to various forums the single most distracting event in your life when you're doing anything. If you don't have your family, if you don't have your personal life in order, you will see every one of those mistakes in the seconds that transpire and you will doubt your ability to perform.

ROBERT GREENE

I never heard of that before, that's very interesting.

CESAR RODRIGUEZ

If you're lying and cheating to your family, you're going to feel it the air when you're flying in a high intense mission. Because one of the things that goes through your mind, for me all the time, was, "Is today me day

where I'm going to die?" You ask yourself that question all the time. Just asking yourself that question makes you reflect and you go back and you go, "Ooh, do I want to clean this up? Do I want to clean this up? All those little messes back that are back there?" So if you're living a life of lie, cheat, and steal, it's going to haunt you and it's going to haunt you when you least want it to, when you need to be focused on something else. And in combat you don't get a choice. The minute you're not focus, guess what? You're either going to drop a bomb on a friendly or someone's going to kill you because in most cases we're not the ones who are defending, we're the ones being on the offensive. So somebody's protecting the homeland and if there's no other motivation in life than to protect your homeland that person is a superman. They might not have the technology that we have, but that person's going to give it all. For me, if I'm over their territory, I go, "Aah, I don't like this picture."

I might be able to run away and try it again another day.

ROBERT GREENE

They don't have a choice.

CESAR RODRIGUEZ

They don't have a choice. Their choice is, die fighting to defend or that somebody else raise their flag over their nation. It's an incredible motivator and I saw it in combat. When you pair up with your four-ship, your team, and you to the gym together or you go to the chow hall together, you sit alert together, you fly together, you get to know each other really damn, very good. I could walk in one morning and I could look across and go, "Dude, what's going on?" And if it's causing you to question what's going on then I have to start wondering, "Are you going to be able to do the job that I need you to be doing today?"

ROBERT GREENE

So if you're bringing any kind of baggage from your personal life to the job that you're doing, it might cause when you're talking

about a half a second of decision time it could interfere enough to really . . .

CESAR RODRIGUEZ

Oh, yeah.

ROBERT GREENE

So you need to be, not only focused, but have to have your personal life in order and everything else in order?

CESAR RODRIGUEZ

Yeah. It's the equivalent of when people say, in the whole reaction time discussion, when you see a car in front of you and you go by a major structure if you can count to three potatoes, one potato, two potato, three potato, you've got enough distance that if he or she applies their brakes or does something you can avoid the accident. In the combat operations we tend to be inside of that buffer zone, we tend to be inside of that one potato, two potato range, so you don't have the luxury of extra time in some of the decisions we make. I'm not saying that combat is 24/7 high-end, high intensity, but when you're

there it is high intensity. So all those other things that are distracting you are taking time away from that one potato, two potato reaction time that's left.

ROBERT GREENE

Mm-hmm. Because I would imagine, even if you had problems with your girlfriend or your wife, whatever, and your family, and you're in the plane that you just have to forget all that, you'd be so focused on life and death, but you're saying no. I've never done that.

In most cases you can focus, but in those little snapshots of time when you recognize your own humanity because when you recognize you're not Superman then any second could be your last. So then you're thinking about everything. You hear about people who tell stories of near death experiences and how so much flashed before their eyes in such amount of time, it's the same scenario.

ROBERT GREENE

Yeah, it's weird.

CESAR RODRIGUEZ

It's the same scenario. So for me, part of my ability to stay focused in my Air Force career and to a certain degree, I'd like to think, also in my business career, is I feel like my family is my cornerstone.

ROBERT GREENE

Right, okay. I think I understand that, that's clear.

One last thing before we get to your missions. As far as learning how to work with a group, I imagine flying alone is one thing, but now you're with – I don't know how many you're flying with in formation – that's a whole other skill that you have to learn.

CESAR RODRIGUEZ

Well, I think it's the core of a team that wins. That's where I go back to, I learned this lesson somewhere in my life, it just so happened to be on a football field. If all you focus on is offense then you probably don't have very many skilled players on the defense. So a coach has to make sure that or she puts

all the right people in the right places and that's how a Dallas Mavericks team beats a Miami Heat team. You've got all the right people at the right time doing the right thing. It wasn't about Dirk Nowitzki, it's about how a team outperformed three individuals.

ROBERT GREENE

It was very much so.

CESAR RODRIGUEZ

I agree. It's a phenomenal lesson in life. The same thing applies in the flying side. Every step you take in flying is intended to help you, not only become a better pilot in the airplane you're flying but also to understand your role with other airplanes similar and dissimilar, and how an air campaign comes together. The fighter pilot ego tells you that the air campaign starts with the fighter pilot, it's all about me. I can laugh at that nowadays because there was lots of times when I thought and I believed that it all was about me. But when I became a better officer and a better fighter pilot is when I really realized who all

the other players were on my team, on our team because in the end it was a success for everybody. So once I started to learn what the capabilities were of other airplanes I wasn't just a bystander, I was now able to make smart decisions about bringing electronic combat to the fight here, or bringing C2, command and control, closer over here. That is an art.

ROBERT GREENE

It's a leadership art.

CESAR RODRIGUEZ

It's a leadership art, yeah. Because now you understand all the pieces of on the playing field and you need to also understand the enemy better than he understands himself. That's where you get the Patton folks who take on the responsibility of a disciplined force and then you think outside the box. In the specific scenario no one's doing anything different, all you've done is repackaged it a little, but in order to repackage it you have to have people that can think. You can be a

disciplinarian and then you can kind of be a little bit open at the same time.

That's really what I think makes the difference in US aviation when we talk about the fighter pilot community, not only Air Force fighter pilots and Navy fighter pilots, but I would argue that in today's world the whole fighter pilot mindset is a lot more than people who fly an airplane. The fighter pilot mindset really applies to our young troops who are controlling airpower from the ground. It applies to the young trooper who's patrolling a flight line with an M-16. The fighter pilot mindset is about winning as a team. When those two combinations come together then you're always going to win. But not everybody gets it and even in our air force. Everybody says, "Well, I'm not a fighter pilot. I'm not expected to win." I go, "Why would you ever wake up in the morning if you weren't expecting to win? Why would you want to get out of your nice comfortable bed and experience life's challenges?"

ROBERT GREENE

But wouldn't a wingman have a different mentality than the actual pilot?

CESAR RODRIGUEZ

No, because a wingman is also a fighter pilot, remember. So the wingman knows exactly where he or she needs to be, they know what the end state is. If you're flying your airplane into what looks to be a mountain the wingman's going to go, "Hey, we don't need to do this." They need to come up voice and say, "Hey, we need to get out of here. I'm here to support you, but I'm also not here to die and I'm here to support the big mission too." So the wingman's an active participant so that's where I go back to, if you learn to become the best wingman because now as a wingman you're actually thinking slightly ahead of the flight lead, but you're not overriding him. You're not making decisions that are not come from the . . .

So you understand the hierarchy of decision making, you understand the end state that

you're trying both to achieve, but you also understand we're the vulnerabilities. When we tell a wingman that I want you to check my six, there's a special area back there behind the airplane that human can't be checked unless there's another set of eyes over here. So I'm checking your six, you're checking my six, we're checking our flanks, we are providing mutual support to each other. That's where I sit in a briefing room and we've been flying together for four months straight, if I don't see the same sparkle in your eye, I already know there's something going on. The human interaction of the team requires you to ask the question, "What's going on today?" Or if you're sitting on your end as the wingman and you go, "Man, Rico said that thing twice today. He normally never says it, something's triggering it. What's going on? What do I need to know?"

ROBERT GREENE

I see what you're saying.

CESAR RODRIGUEZ

So you have to be in a supporting and supported role at all times. Then you mature from there. You learn how to fly your 2-ship together and then it gets bigger and bigger and bigger.

ROBERT GREENE

But I think what you were saying is that even on a foot soldier level you have to be thinking in terms of, you can't just be following rules all of the time. You just said that you have to have the fighter pilot mentality, really.

CESAR RODRIGUEZ

Yeah, and the fighter pilot mentality isn't breaking rules, although there are some that would argue that that's the only thing that fighter pilots do is, show them a rule and he'll break it. The truth is that there's probably very few people that are more disciplined to adherence to the rules because that could become the difference between life and death. But as you're growing into your fighter pilot skin it's more than wrapping an airplane

around you, it's how you are with the team. You know what your weaknesses are, you would've conveyed those weaknesses to your team. If you're the decision maker you would have hired people to cover your weaknesses. Some people go, "Why is so and so on the team?" "This guy's a math whiz. You can walk into a room and he can give you the math answer that you that question's going to come from the gallery." So they take the action early.

The fighter pilot in you is the one that says it's about winning. Winning sometimes is at all costs if it's a life and death situation. If it's not at all costs it's at the right time.

ROBERT GREENE

Right. What about the amount of information that you have to handle six, eight, ten screens going on all the time, is the something that you just end up learning to live it and you see the bigger picture after a while? Or isn't that extremely distracting?

CESAR RODRIGUEZ

Remember when I mentioned the story about once I got to see the football field from the god's eye view, I could scan the field and take small pictures and while I'm looking over here I know which way he was leaning. That's kind of how flying in an airplane is in today's environment. So as you look at the technology that each of the airplanes has, as you get into it. The first airplane that you fly has what we call steam power gauges, altitude, airspeed, and attitude, the same things that the Wright brothers had when they first took flight. They wanted to know whether they were straight and level, they wanted to know if the nose was up or down, and they wanted to know how fast they were going, and that was it.

So now you take that concept and you build a crosscheck around it. That crosscheck is your safety crosscheck. If you don't know what your altitude, attitude, and airspeed are, then you've got to come back. Your instructor pilot

would ingrain it in you. You would sit there in a simulator and he would intentionally be talking to you about all kinds of different things and when we started getting three-dimensional 360 degree domes, he would say, "Hey, look over your right shoulder." And then he would say, "What's your altitude?" Then if you had to come back in, he goes, "You wasted too much time, the bandit's now gone, you can't see him anymore. He's did a maneuver." Then you started to prioritize and optimize what your scan pattern was. So anytime you came across your altimeter, your basic information you take the snapshot so that when you're over here looking you know that you were at 13,000 feet and that you were nose high.

ROBERT GREENE

I see.

CESAR RODRIGUEZ

So you process that information and you learn at each step of your development as a pilot, you got more and more complex. When

you first strap into an airplane and you start to hear the radar warning receiver and it's got like 20 different tones and it's got 30 or 40 different visual pictures and everyone of them represents something completely different. If you get task saturated, your scan pattern goes from out here and starts to focus on little things. When a pilot is misoriented or disoriented it's because he or she is focused on only one performance instrument and if forgetting about all of the other ones. So you might be flying the airspeed all you want, but little do you know you're driving 60 degrees nose low and hit the ground and you go into a controlled crash.

The perspective of taking in that whole big picture is that you're not reading "War and Peace" in every instrument, all you read is the two words at the beginning, you're scanning "War and Peace," here, here, here, and that's your mental crosscheck. When I drive my wife, and other people when driving with a pilot, they'll see us just kind of perusing

around and they think that we're out there enjoying the view. Well yeah, we kind of are, but it's also the habit pattern that we've developed that I don't have to come inside the car and stare at odometer or anything, I can just know it or I can also sense it as I'm driving. So it's a whole different sight picture as you bring in information.

ROBERT GREENE

But it's a function of how much experience you have.

CESAR RODRIGUEZ

Oh, yeah. No, this was one of those areas that you don't go from here to here over night. You go from here to here to here by the number of hours that you're flying.

ROBERT GREENE

You're slowly widening your scan]

CESAR RODRIGUEZ

Exactly. You expand your aperture with hours in the airplane. You can open up the aperture a little bit in a simulator, but a

simulator has physical boundaries that you just can't open the aperture up completely that you gain from flying in an airplane, pulling G's, being upside down, as you grow. But interestingly enough if I pulled out my PS3 game right there, I can't do computer games. I can't do a crosscheck, you know how the computer game usually has little square corner that kind of give you the look of what's out in front of you, I can't do that.

ROBERT GREENE

I wonder why, I wonder what that is.

CESAR RODRIGUEZ

I don't know if it's just because I've convinced myself I'm an old guy and that's new kids stuff. But the other thing is, for me, computer games were never part of my day-to-day, we didn't grow up with that. So maybe I just have that mental block that says I'm not good at computer games. But I sit there and look at the, you know.

ROBERT GREENE

But they would expect you to be like the master.

CESAR RODRIGUEZ

That's right, yeah. I get kids who come up and say, "Hey, I want to play the F-15 game with you." And I go, "No, you don't."

ROBERT GREENE

They have an F-15 game?

CESAR RODRIGUEZ

Yeah, they have a F-15 simulator. And I go, "No, you don't because then your bubble, what you perceive me to be will no longer be."

ROBERT GREENE

That wouldn't happen to me. All right, I wanted to talk about you missions now. Did you want to go ahead or do you want to take a break?

CESAR RODRIGUEZ

Yeah, let's keep going.

ROBERT GREENE

Okay. So was the first mission essentially the one in Desert Storm? I know you were in Panama, right?

CESAR RODRIGUEZ

We did Panama and there weren't any engagements. Really what we did was we sat off the coast of Cuba and waited for the Cubans to see what they were going to do, if they were going to try and interrupt the armada as everybody headed south. But that was really kind of the first exposure to the real, if you will, a real tasking order of how we were going to react and respond as a squadron. For what we had to do . . .

ROBERT GREENE

There weren't any tense moments though or were there?

CESAR RODRIGUEZ

I'd say the only real tense moment was the fact that once you got on the airplane you had live missiles on board, but no there wasn't

anything other than what exists on every sortie, it's really the unknown.

ROBERT GREENE

Right. So the first real mission where you, maybe, felt that real adrenaline would be in Desert Storm?

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

And the first kill or the one that he describes, one of your wingmen kind of saved your hide, perhaps.

CESAR RODRIGUEZ

Yeah, I was airborne on the night of the 16th when we pushed across the border just because it was all part of the normal routine that we'd been there for the whole time. So knowing that the war was kicking off and we were in the air that was an intense moment, if that's the right word, or series of words, but that was intense because then you knew, "Okay. Now someone's going to be shooting at us at any given time." Then you fast

forward three days to the 19th and new we're already kind of in a battle rhythm because you're flying sometimes two or three times a day. Some missions are four or five hours long. Some are seven, eight, nine, ten hours long. You don't know and you've got to be on your game at all times.

Then on the afternoon of the 19th, we were up doing a defensive counterair mission and the AWACS controller comes up and says, "Need you guys to get some gas and get ready. You need to contact these other guys, there's another mission coming up and they want you to be part of it." So this kind of one of those areas where you go, "Okay. We're going to think outside the box." Because in some structured environments if you don't brief it, you don't do it. But the reality of it is we were doing the job that we were tasked to do, whether it was briefed or not briefed. It's just a matter of the pieces of the puzzle changed with new people, new airplanes, but

the end state we knew exactly what the goal was.

So when you take a big Red Flag event and you've got all these airplanes in the air. In Red Flag you spend half a day planning it then a full day executing, and then debriefing it. In this particular case we just went up and did what we were supposed to do.

ROBERT GREENE

Just focusing on the mission.

CESAR RODRIGUEZ

Focus on the mission, focus on your role within the mission. Then everybody else also knew what the big picture was for the outcome. So when we got on the frequency I recognized a lot of the voices from missions that we had been on already or briefings that we had done together. So there was a familiarity there, everybody knew what the standard was. This mission commander had the basic items that he needed to brief us all on so that we knew what was going on. Then obviously an opportunity for a Q&A real

quick. I mean, we were all in the air at the time. Then he goes, "Okay. Everybody go to your respective frequencies and here we go."

So everybody had the time hack, they knew exactly what time we were crossing the border and then we executed accordingly. Of course now the fog of war kicks in and as things would happen the first set of F-15s that crossed the border they engaged the enemy first. They engaged a series of MiG-31s and F1s. In the end they end up killing the two MiGs, the F1's nobody's able to account for at that point. They punched their fuel tanks off so they don't have enough gas to make it to the target area. So Mole and I proceed to the target area as the last remaining Eagles. We already got guys who were dropping bombs on the target. We pick up hostile contacts northeast of the target area and we start to run our intercept off of those guys. As we were running our intercept we're monitoring all of our sensors, doing everything that we're supposed to be doing, when we realize that

we've actually been pulled into a SAM trap, surface to air missile trap.

ROBERT GREENE

Oh, it was, it was a trap that they were pulling. Oh, it was in the article.

CESAR RODRIGUEZ

Yeah, it was a trap that they pulled us into. So as we were chasing these two guys down and we were just outside of shot range so we couldn't shoot at them, now all of a sudden our radar warning receivers start to light up and we're like, 'Oh, my God.' Then just as that's happening the first guy pops up off of my left 9 o'clock, when the AWACS controller says, "Hey, pop up contacts 330 for 10."

Well at that point, completely out of habit, I executed a hard maneuver, jettisoned my fuel tanks, throw my radar in the direction of the 330 bearing, and sure enough I pick up a radar contact. Then I start to do ID matrix for determining friendly or foe. I the meantime my wingman sees the fuel tanks

coming off and he sees this big cloud of vapor and he's like going, "Uh-oh. Rico's dead." Because he didn't hear me call for anything, he just knows it, and all of a sudden he sees the airplane fly out of that vapor cloud and then he realizes that I'm . . .

ROBERT GREENE

Where's the vapor from?

CESAR RODRIGUEZ

It's the condensation from pulling G's in the air environment, then possible also from the residual fuel of the fuel tanks coming off and spraying some fuel in the air. But then he sees me come out of that and then I start doing the ID matrix and he follows in pursuit, so he's about three or four miles behind me.

ROBERT GREENE

Doing the what matrix?

CESAR RODRIGUEZ

Identification matrix, I.D.

ROBERT GREENE

Yeah, yeah.

CESAR RODRIGUEZ

So as I'm doing the that matrix at about six miles or seven miles the MiG locks me up with his radar so I can see it on my RWR, radar warning receiver, and I notify Mole. I said, "Hey, I'm spiked. I need to get out of here." So I do a defensive maneuver both to the south and then vertically, and I'm pumping out a bunch of chaff, which it like a aluminum strips, it's intended to hide my airplane in an aluminum cloud. So he now continues to do his ID matrix on the guy who's locked onto me. When he completes the matrix he's got clearance to take a shot and he takes a shot. We he shoots and he maneuvers towards my airplane so we have some semblance of mutual support, he calls out, "Fox." Fox is the radio call that says, "Hey, there's a missile in the air." So I look over my left shoulder and track a missile over my left shoulder over the tails, and then off to the right side, and I see the AIM-7 stop smoking. Once the AIM-7 stops smoking

then I just kind of follow that last little trail of motor smoke and I, "Boom!" I finally find the MiG, who's about three and a half miles off of my right wing, still pointing at me, so I know that he's still trying to kill me. Then about the same time when I finally pick him up visually Mole's missile hits him smack in the nose and kills him. And like you said, he's saves my bacon.

ROBERT GREENE

Do you think that it was matter of a second or two that he was going to fire at you, the MiG?

CESAR RODRIGUEZ

Well, I don't think the MiG had a chance to shoot at me because I knew what his radar capabilities were, and I was going everything technical to defeat his radar. So it kind of goes back to understanding what . . .

ROBERT GREENE

What would've happened if Mole hadn't hit him?

CESAR RODRIGUEZ

What would've happened was some point him and I would've ended up on a collision. He would've been too close in range to deploy a weapon and at that point then I would've turned into him and would have got into the classic dogfight, a visual dogfight. But I knew what was keeping his radar from giving him a fire solution to employ the weapons as far as my knowledge of his airplane. That was my sole goal in life was to defeat the mother radar. The missiles aren't going to come off the rail if the radar doesn't have a shoot solution.

ROBERT GREENE

So you don't know if you would have been killed at that point? We can't really say he saved your life, but he saved you from something.

CESAR RODRIGUEZ

That's right. He definitely saved me from a dogfight at that point, which would have ultimately been a bad thing because

subsequently, now we know that there's a guy who's ten miles behind the leader. So now if Mole and I tie up with this guy then we're not paying attention to the big picture sky and this other guy would have gotten one of the two of us. So I think we can make the leap of . . .

ROBERT GREENE

What ever happened to the other guy? After you . . .

CESAR RODRIGUEZ

Well, the other guy is the guy who I will have ultimately dogfight with because Mole kills this guy, the AWACS controller comes back and says, "Hey, there's another unknown contact 10 miles north." We turn to the north and then Mole does his ID matrix, I do my ID matrix and we split up because he gets a friendly and I get a hostile. So once we both determine that we're not sure what it is then the tactic is called a visual identification , a VID, intercept. So Mole splits high, I execute a VID from low to high. When I cross off the

bandits left wing, about 50 feet off of his left wing, that's the first time that in could see the Iraqi silhouette, then Iraqi flag of a MiG-29 and I call, "Bandit, bandit!" Then him and I get into the classic two circle fight. I turn towards his tail, he turns towards my tail, and we start maneuvering. As it turns out it's the only dogfight of Desert Storm.

ROBERT GREENE

Is that right?

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

Wow.

CESAR RODRIGUEZ

So the dogfight ensues starting around 8,000 to 10,000 feet and it, by default, it always migrates downhill when you're using G and radial G, God's G, to pull to your advantage. So the fight continues through about two 360's, I am positioned after of the bandit at about 4,000 feet, 3,000 feet, slightly outside of his turn circle, and will pull a little bit of

lead on him, lock him back up, get ready to employ an AIM-7, when he starts a downward spiral and then tries to do a split-S from about 600 feet. At that point I know that his airplane can't do it and I can't do it either, so I pull up into the vertical to kind of get into a perch position over the top. He continues with his split-S maneuver, I can see his afterburners cooking, he's looking over his left shoulder and then he ultimately hits the desert floor, and then follows into a big fireball that goes for, who knows, five, six, seven miles. That whole momentum is causing that fireball to keep moving.

ROBERT GREENE

He just lost his situational awareness?

CESAR RODRIGUEZ

Lost situational awareness, yeah.

ROBERT GREENE

Or he panicked or something.

CESAR RODRIGUEZ

A little bit of both.

ROBERT GREENE

If you guys were higher up would you have eventually won this dogfight?

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

Well, you did win.

CESAR RODRIGUEZ

If we were higher up I would have actually had another opportunity with a missile, which one the reasons I was at that particular position. Then we come out of there headed south. Now, he has one missile expended, I have no missiles expended, we were out of gas. We needed to find a tanker and then we needed to get home.

But yeah, that was an incredible first encounter for me. Although it was my seventh combat sortie, it was my first one where I actually not only saw two fireballs on their side, but been actively engaged doing everything that I had been trained to do. I physically, at that point if someone would've

said, “Let’s go ahead and reconstruct this mission.” To be honest with you, I don’t remember a lot of doing a lot of things because they were habit patterns from training. It kind of goes back to the lesson that I learned as a little kid in sports is, the harder you train in practice, the more, first of all the habit patterns you will exercise are the right ones, and then two, hopefully the outcome will be the right one as well.

ROBERT GREENE

Well, in this article he sort of highlights the fact that you were really experiencing quite a bit of fear at some point. Is he exaggerating or . . .

CESAR RODRIGUEZ

Oh, no, no, no. Every time I strapped in to the jet fear was there 100% of the time. That’s where I kind of go back to training can prepare you for when someone’s trying to kill. I’m always in awe by our policemen, you can do a lot of great things on a tactical range, but no one’s ever shooting at you. So what

happens when someone’s start shooting at you; one, you hope you don’t develop a pause effect where you kind of wait and you go, “Well, what am I doing?” You develop at least the instincts to survive. But you recognize that on any given day or any given moment that you are human and you’re one lucky BB away from checking out.

ROBERT GREENE

Was the fear any larger than normal when you sensed this guy was, this MiG was basically locking into position?

CESAR RODRIGUEZ

During the flying engage piece I don’t remember there really being fear. That was an adrenaline rush that I still don’t know how to replicate. As a matter of fact, that adrenaline rush in all three of my MiG kill cases existed and the first time caused almost three days without sleeping.

ROBERT GREENE

Really? Finally when you got back?

CESAR RODRIGUEZ

When I got back and kept trying to go to sleep or rest, three days I was on an adrenaline rush. The second time that I got my MiG kill the same thing happened and I had to go to the docs and say, “I need a big sleeping pill,” and that one didn’t work very well either. So during the three and half, four minutes of the engagement I can’t tell you that there was fear there.

ROBERT GREENE

That all? That’s as long as it lasts, about three of four minutes?

CESAR RODRIGUEZ

That’s about it, yeah. When you’re in the air for an eight hour period and then you’ve got three minutes of high adrenaline like that you go, “Holy smokes! What can the human body not do?” But yeah, that’s how it was.

ROBERT GREENE

So don’t time, it’s like in boxing or something, you don’t have time to sit here and actually think out your maneuvers, you have to

just execute them based on habits that you've acquired?

CESAR RODRIGUEZ

That's right.

ROBERT GREENE

Although, have you ever had similar exercises where you've had to be in a dogfight like that?

CESAR RODRIGUEZ

Oh, yeah. When we trained in day-to-day training, except for the art of employing a weapon and obviously living within what we called the training rules, the minimum altitudes and stuff like that for peace time operations, everything that I did from the first moment that we got told that was a bandit and we recognized that we were in a SAM trap, we had trained that in both simulators and in the air all the time. That was the bread and butter of really basic F-15 flying. So the output was exactly what it should have been, how we trained.

ROBERT GREENE

And then the maneuver that you guys did where you split and he went high and you went low, that was something you practiced?

CESAR RODRIGUEZ

We practiced, the only difference is, sometimes your altitude split might only be two or three thousand feet. Well in this time it made sense that we were almost three miles apart. Mole went up to 25,000 feet and I was down at . . .

ROBERT GREENE

Why does that make sense?

CESAR RODRIGUEZ

Because the bandit was coming at us at almost 10,000 feet so you want to be extreme to each other. One of the rules is, never let the bandit see both of you outside to the same piece of sky or the same piece of glass. So in order to do that, if the bandit wants to see both of us, if he at the point knew there was two of us there he has to be looking down there and then he's got to be looking up there,

two completely unnatural acts. Whereas if we were both right here then all he has to do is just basically keep an eye on us both and he can fight us both at that point.

ROBERT GREENE

I see, wow. So it was something that you were familiar with because you had practiced it so many times, but it was the adrenaline rush, which you had never gotten in of the other moments before because you knew this was life and death?

CESAR RODRIGUEZ

Exactly, yeah. And when we came and we looked at the tapes, that's when a lot of the things started to come back because you go, "How did I lose my tanks? Where did I do hat?"

ROBERT GREENE

You don't even remember doing it? It was utomatic?

CESAR RODRIGUEZ

Don't remember, don't remember reaching down, automatic.

ROBERT GREENE

Wow.

CESAR RODRIGUEZ

We don't even practice that in real flying. The only time we ever practice the hit you tanks button was in the simulator. So there was pieces of the simulator training and the pieces of the real flying that all came together.

ROBERT GREENE

Why did you jettison your tanks?

CESAR RODRIGUEZ

So that I could maneuver better because tanks become destabilizing and at this point I needed high-G capability.

ROBERT GREENE

Wow. Isn't it amazing sometimes what the body and do when you're not even aware of powers like that?

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

Aren't you aware of that adrenaline that there's something that goes back millions of years to fighting a leopard or something?

CESAR RODRIGUEZ

Oh, yeah. It's amazing.

ROBERT GREENE

And also the ability to not have to think of it, just to do what you did like that, you can't even explain it really.

CESAR RODRIGUEZ

No you can't. Physiologically I couldn't tell you how it happens. I've talked to flight surgeons and I go, "Guys, I don't know how it happens. All I know is if I was instrumented during that portion of combat operations the report would probably come back and say, 'The heart can handle a lot more than we give it credit.'"

ROBERT GREENE

Yeah, I'm sure.

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

Well you were also younger. I don't know if at our age if that would happen.

CESAR RODRIGUEZ

No, that's true. Yeah, exactly.

ROBERT GREENE

Yeah. Is there anything on that . . . oh, the Kosovo campaign, was it kind of frustrating working with the alliance, working with the NATO team and all of that, where it's more political now and you're flying with people that have different capabilities?

CESAR RODRIGUEZ

It is, it is and there's multiple frustrations. In the Kosovo campaign you have the first part that I consider an extreme frustration was you had a US lead leadership team, General Clark as an Army officer failing to apply lessons learned in Desert Storm in how to utilize airpower to his advantage.

ROBERT GREENE

Wesley Clark?

CESAR RODRIGUEZ

Yeah, he was the SACEUR.

ROBERT GREENE

What were his mistakes?

CESAR RODRIGUEZ

Well he tried to micromanage the targeting of targets to appease the NATO politicians and at the same time, to a certain degree, probably more so to, I guess the right terminology is to reinstate in the ground forces that they would be the premier fighting force in current and or future operations. So what I'm getting at is, during Desert Storm, even though they call it the 100 Hour Campaign, the Army was basically able to move through the deserts of Iraq and supposedly annihilate and defeat the Republican Guard. The truth was that the air campaign that happened before that pretty much annihilated the capabilities of the Republican Guard and probably a bunch of girl scouts could have done the same thing. Not what the Army wanted to hear as they were going through

a downsizing modernization effort and they wanted to be seen as the premier fighting force. Well the truth is that the premier fighting force is neither the Army nor the Air Force, it's a joint force. When you build the right team together you will win.

Well, in the NATO campaign General Clark, his decision making was very clouded, in some cases by the politicians that he had to appease as the SACEUR and the also his personal vendetta to make the Army a more relevant force for the operations.

ROBERT GREENE

He came from the Army I've heard.

CESAR RODRIGUEZ

Oh, yeah. He was an army officer, no doubt. But he failed to let his lead airman, then Lt. General Mike Short, put together an air campaign to support the mission. The mission kept changing so as a result every time General Clark would tweak the mission then he was also tweaking the application of airpower. A complete missed lesson by him

and his staff that we learned in Desert Storm, put everybody into the right sync mode, have a common mission for the campaign, and then execute and move forward.

ROBERT GREENE

For Desert Storm would we be talking about General Powell or Schwarzkopf? was the commander, Powell was his Army . . .

CESAR RODRIGUEZ

Well, Schwarzkopf was the commander. Powell was his Army . . .

ROBERT GREENE

Who did it right in that case?

CESAR RODRIGUEZ

Schwarzkopf did it right. He did it right, he got the mission from President Bush, supported by the UN Counsel. The mission was to liberate Kuwait, period. Then Schwarzkopf was the overall commander. The Army commanders probably feel like Schwarzkopf got a little bit too much into their business because of being two Army guys, that's beside the point. But Schwarzkopf

let Horner run the air war and they were all synced up to execute the war that needed to happen.

ROBERT GREENE

Well they didn't have to deal with NATO. There was an alliance, but it wasn't . . .

CESAR RODRIGUEZ

That's true, but you should not underestimate the role that the US Congress played like a NATO, second guessing everything that was being done by the president.

ROBERT GREENE

I mean, in the end it comes to the leader, the man at the top, and if it's Clark it's Clark.

CESAR RODRIGUEZ

That's right. So Clark can't hide behind the politics of NATO, but he did. He threw NATO under the bus, claiming that NATO wanted to micromanage the target sets. The truth is when you're the general you go, "Hold on. You either give me this whole enchilada or take it back, one or the other."

ROBERT GREENE

So how did this affect you flying your missions?

CESAR RODRIGUEZ

Well, from the position of maintaining air superiority and dominance it really didn't affect me per se. But it did affect the folks who were dropping bombs because in a lot of cases instead of an air campaign looking at attacking the centers of gravity of an enemy and neutralizing them so as to achieve a desired end state, what happened was the air tasking order would target the same target over and over. So the saying was, and some of the guys who were dropping the bombs would tell, he says, "I put hundreds of thousands of pounds of ordinance through that same little piece of sky because nobody would give us the right target set." It wasn't until several weeks into the campaign than General Short basically kind of said, "Hey, you either let me do this my way or I'm done, I'll quit." Then they finally got it. But I think deep down

Clark really wanted this to be a 24 hour wonder and then declare a political victory and the NATO could walk in and do all the parades they wanted to, But when this thing went 30, 40, 60, 70 days, the people said, "Oh." So somewhere in there the light bulb clicked.

But yeah, leadership is ultimately responsible. If I was giving out a report card based on what you were supposed to bring to table between Clark and his staff, and then the air forces of all the NATO countries that played, I'd say that NATO probably go into the C-, D+ overall in that campaign. Because there were lessons, it kind of goes back to my book, good lessons/bad lessons. The lessons that Wesley Clark forced the entire campaign to learn were bad lessons that had already been learned in Vietnam and in Desert Storm and we repeated them under his watch.

ROBERT GREENE

Did that have any impact on the third, your final, kill there in the Kosovo campaign?

CESAR RODRIGUEZ

No, because the good thing about night one of the war is that when we kicked the football off they didn't know that we were on the field and we were kicking.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

So they were in the react mode. We had achieved operational surprise on night one. So the event that happened was, find them, identify friendly or foe, and then take them out of the fight, and we were able to do that. I would say the biggest difference from night one of Desert Storm and night one the Kosovo campaign was, in Desert Storm we had a significant amount of time to spin up and we had a pretty experienced air force that went out and fought that war. On night one of the Kosovo campaign, in the case of the F-15 squadron, we had seven lieutenants that had just literally two months before

graduated from their fighter training unit, from their basic F-15 unit.

ROBERT GREENE

Who was responsible for that?

CESAR RODRIGUEZ

Well, that's the Air Force at large. You can't pick and chose, when you get assigned a squadron you don't get to pick so that everybody who goes there is as highly experienced . . .

ROBERT GREENE

You weren't foreseeing this campaign?

CESAR RODRIGUEZ

No, a squadron is a squadron is a squadron.

ROBERT GREENE

You didn't have the time.

CESAR RODRIGUEZ

Yeah. So that's where it goes back to, if your training plan is not strong in peace time then you're definitely not prepared to go to combat.

ROBERT GREENE

Right.

CESAR RODRIGUEZ

Luckily I think that I can say that because of the way these lieutenants performed, and they performed incredibly well, not only was our training really go and strong, but it was also great at Tyndall where they were learning how to do basic F-15 work. They came very well prepared to accept the challenge of becoming mission ready in a combat squadron and the ultimately testing their mettle in front of the enemy.

ROBERT GREENE

Are there any other missions that were worth discussing, like in the Iraq War or . . .

CESAR RODRIGUEZ

Well, Desert Storm II or Iraqi Freedom as people would like to call it, that was one of those that we as a country probably are going to second guess ourselves a lot on that one. But my position would be is what Saddam Hussein was doing to his people shouldn't be tolerated, period. Those actions by themselves merited an international intervention. In the

end Iraq is a sovereign state and will make its decisions in the future because of what the coalition was able to give back to Iraq and its people. And that's the lesson learned, we can't be fickle about world peace. When you're a superpower you've got to act like a superpower. You can't walk around and carry a big stick and then all of a sudden pull out a water gun. You've got to act like a superpower, you've got to be responsible like a superpower, you've got to invest like a superpower, and you've got to help the other people train so they can be good coalition partners. I hope that's the lesson that everybody takes and moves forward. Unfortunately I think the lesson that we have a lot of believing in today is that warfare has changed and we're never going to see classic air battles, we're never going to see the need for an air campaign.

ROBERT GREENE

Just wait for China.

CESAR RODRIGUEZ

Exactly. When you see the investments that are being made by the Chinas and the Russias of the world and then you've got the Hugo Chavez's in our region. We need to get back into the business or acting . . .

ROBERT GREENE

I think it's really China because they have the money now.

CESAR RODRIGUEZ

Oh, yeah.

ROBERT GREENE

Did you fly sorties in the Iraq War?

CESAR RODRIGUEZ

No, in the Iraq War I was the operations group commander in Al Jaber. I was basically relinquished to be the air component commander on the ground.

ROBERT GREENE

Well, you were in your 40s.

CESAR RODRIGUEZ

Well the main reason was they didn't have any F-15's at the base that I was

commanding. I had A-10's, F-16's, HH-60's, AC-130's, Harriers, Hornets, so I was there for a different reason.

ROBERT GREENE

Was there anything in that experience that we should know about as far as lessons that can be learned?

CESAR RODRIGUEZ

Well, two things. When I got there and we started to build the team up, I told everybody, "If tomorrow was day one of the war, what would you do today?" That's how I welcomed everybody who came to my base, every one of the squadrons. I said, "All right, if tomorrow is day one of the war, what are you going to do today?" In some cases I saw squadrons get closer together and focus on the basics. In one case I saw one squadron try to rebuild and redo an entire combat training plan and I stopped it. I said, "No, too late. You're going to go fight with what you've got so work on your basic blocking and tackling and don't try

and reinvent the wheels.” So I welcome them with those words.

Then the next piece of it was, we had a couple of options on how we were going to operate as big as an organization as we were. Deep down, it takes a lot of courage to quote, and you’re not really relinquishing command of your people because in the end I’m still ultimately responsible, I’m the commander. But all the other squadrons that were there, one of the things I told the squadron commanders, I said, “You got two ways we can operate. You can each operate as a little stovepipe and you want to be your own little squadron then I want somebody from each squadron at 24/7 be responsible to answer any question that I have. Then two, you have to make sure that your maintenance people manage only what you’re flying. And we’re going to do that times seven. Or we can all act like one big squadron, one super squadron. I can take one decision maker, so between the seven of you guys you rotate

the decision maker. You understand what’s going on? I want one decision maker from maintenance site issues. Then when I sit in the room and I occupy three chairs, whatever we decide, everybody marches to that tune.” And that’s how we ultimately decided. But I left it up to them.

ROBERT GREENE

That’s interesting.

CESAR RODRIGUEZ

Because in the end, I knew what my job was and my job was to convince them that we had to be as flexible and as efficient as possible. In the case of holding on to old stereotypes, so of them we were going to have to bust down the doors and just think differently.

ROBERT GREENE

And it worked.

CESAR RODRIGUEZ

And it worked and I built it around the concept of a quarterback is only a play caller. Even though he gets to touch the ball on every play, you still need ten other guys doing

basic blocking and tackling. So there’s no doubt in my mind the general has made me the quarterback. Now, you guys want to do the basic blocking and tackling times seven or? So it worked out really good. We built a very strong capability to deliver air power when it was needed.

ROBERT GREENE

I’m just curious, who’s your favorite quarterback in football? Like the one that you identify the most with.

CESAR RODRIGUEZ

Well, to be honest with you, the one I identify the most with was Johnny Unitas. When I was a little kid we were stationed in Maryland so we got to see several of the Colts games there.

ROBERT GREENE

Yeah. He was pretty much a bread and butter quarterback.

CESAR RODRIGUEZ

He was.

ROBERT GREENE

Nothing fancy, but he really got the job done.

CESAR RODRIGUEZ

He got the job done. He was a basic blocking and tackling kind of guy. As a result, I think, ultimately the team got better because it wasn't about him.

Now I would also say in today's world I would say that we look at a Peyton Manning as he's looking at that battle space, I kind of see the Peyton Manning in managing a battle space for a cockpit. You kind of know where everybody's at, there's a lot of things you're anticipating. You accept the risks with the reward.

ROBERT GREENE

Well the way his team is constructed and they play on artificial surface, it's very fast, and he's got a lot of weapons, I can kind of see what you're saying.

Okay. Just curious. Well, just some general Questions.

CESAR RODRIGUEZ

Let me just do a quick restroom break. Do you need to do the restroom?

ROBERT GREENE

Yeah, I do actually. You go first.

CESAR RODRIGUEZ

Well, there's one right here.

ROBERT GREENE

Okay. I'll go there. We're almost done.

ROBERT GREENE

One of the things in the book that I'm trying to highlight is that as you move further and further into a process of learning something, you reach a point where you're able to be more creative, bring more of your individuality and style into it. Is there anything like that in flying that you can say?

CESAR RODRIGUEZ

One thing I learned, I was talking to you about the Gathering of Eagles. At the Gathering of Eagles a couple weeks ago when we were in Montgomery, we had a young

lady . . . I call her a young lady. She's 92 years old. She was a WASP. We had several gentlemen from the World War II era.

ROBERT GREENE

What is WASP?

CESAR RODRIGUEZ

Women Air Service Pilots.

ROBERT GREENE

In what war?

CESAR RODRIGUEZ

In World War II.

ROBERT GREENE

I didn't know there were women pilots in World War II.

CESAR RODRIGUEZ

Oh, she would really slap you hard.

ROBERT GREENE

Little known story.

CESAR RODRIGUEZ

As a matter of fact, I can give you a name, and then you can do some homework on her. You'll fall in love with this lady. She's just a phenomenal human being.

So the full spectrum, World War II, Korea, Vietnam, Somalia during the Black Hawk Down, and then myself, we had the full spectrum of aviation represented there at the Gathering of Eagles. When you look at the very basics of flying an airplane, the same thing that they were doing in World War I and World War II with the basic airplanes, we're doing today with the F-22 and the F-35, and I did it with the F-15. You have that basic core competency of how to fly an airplane and how to employ it. The only thing that's really changing is what you wrap around it from the standpoint of the technology.

Kind of like that cross-check example that I gave you. The cross-check, with time you can expand your cross-check and open up from the basic performance instruments to all the other things that you're bringing in. Now, technology is bringing a lot of things to the table. Now you've got a wing, you've got an entire airplane that's a sensor. Sensors in the node, an entire communications decision-

making node that involves satellites and digital comm links. So now you are a sensor. You are a piece of the node. You also have the capability of affecting the outcome, because obviously you have some kind of weapon that you can employ. So, to go outside of the box as an individual, it's no longer the fighter pilot that's driving the outside of the box. It's really the technologists.

ROBERT GREENE

When would be the change from that? Is this including your era?

CESAR RODRIGUEZ

I think my era was probably the era that took . . . the lesson from Vietnam was we have airplanes that are not aligned with technology. So boom, now we go into post-Vietnam and the lesson that was applied was take technology, and take the airplane, and make them one. So that's when you get the F-15 and the F-16, and you get airplanes that are now . . . you design the airplane around

not only the human sitting in the cockpit, but everything is in a place that makes sense from the human's perspective because the human is the piece of the node that is transmitting. Now, the next generation is you've still got the human in there, but you also now have the airplane sensing and transmitting. It's receiving information, and it's pushing out information based on who needs it, when they need it, why they need it, things like that.

I think what we learned from Vietnam when we came to the Desert Storm era gave us the bedrock, the cornerstone of what we're seeing today. We brought the human, we brought the airplane, and then we applied the sensor technology to the F-22. Tied into this whole picture, not with the F-22 in the middle, but the whole picture as a whole, is now you've got unmanned aerial vehicles. But in the end, the decisions of that unmanned vehicle are made by a human. It might be 10,000 miles away, but that's the decision maker.

Now we've got to figure out how to do it better together. The truth is, that's the out-of-the-box thinking that exists now. You've got sensors that have persistence over the battle space. You've got sensors that have effect within the battle space. How do you use all this to achieve that air dominance picture? And that air dominance picture is no longer only measured by dog fights. That air dominance picture is now measured by decisions, whereas before, you had mano y mano dog fight, Zero versus P-39 type of thing. Now, you really do have enemy decision versus the coalition decision.

So it goes back to the lessons learned of NATO campaign. If you don't have a streamlined decision-making process, then the time it takes you to find an issue, study it, and make a decision, that's the determining factor for tomorrow's battle space. If you don't have it together, it's going to be very obvious when you get into those contested opportunities that time is the continuum

that's being contested, or you're trying to win that time frame to win the next battle.

ROBERT GREENE

Right. Are you familiar with John Boyd's OODA Loops?

CESAR RODRIGUEZ

We are.

ROBERT GREENE

Yeah, I'm sure you are.

CESAR RODRIGUEZ

And between John Boyd and also Warden, we studied all those at school. Yeah. That's a whole different chapter.

ROBERT GREENE

Yeah. It is a whole different chapter. I read a lot about him, as much as I could find. He kind of is the era of the maverick fighter pilot. That was sort of what you were expected to be. He brought that later to the Pentagon. His whole way of life was kind of nonconformist. But that maybe isn't the reality any more so much in the Air Force. He was in the Marines.

CESAR RODRIGUEZ

I think he was in the Marines. But now I think it's more... the attitude is in place.

ROBERT GREENE

The other thing that I'm mentioning and the point is that kind of Fingerspitzengefühl that we talked about with Rommel. Did you have that at all with the plane, where you were kind of feeling like you were sort of one with the plane?

CESAR RODRIGUEZ

Yeah.

ROBERT GREENE

You feel it at your fingertips sort of thing?

CESAR RODRIGUEZ

There was days when the ultimate hand-eye coordination effect of both seeing the battle space, targeting it appropriately, getting into your dog fight. Nothing went wrong. That happened more and more as you got more experience under your belt. But at the same time, that experience maintained a proficiency. On any given day, challenges

at home cause you to get distracted, the whole bubble breaks. The plan has so many intricate, single point failures that it was destined to break. So it would fall apart.

The real lesson in those events for me was not to focus on how well it went for me. Because you have to not only brief it, but you've got to debrief it. The debrief is where you really got the value. You got your bang for your buck in the debrief. It was very obvious to everybody in the room when you had a good day, especially as the mission commander, because there's no secret. What I learned out of all that was, okay, let's go find what I call the points to ponder, and turn them around. Had we not done this right, how's the outcome going to change? What would we have done at that point?

I take that now in my current capacity with Raytheon, because we do a lot of good things. We win a lot of contracts as a team, but we also lose a few. So I always ask the engineers,

really the bread-and-butter of Raytheon, I go, 'Why did we lose this? Did we over-engineer it? Did we forget to listen to the customer and then give them what we wanted to give them?' Sometimes when you have that kind of talent, you've got to harness it properly. We have that problem in the United States. When we are a superpower, we forget that sometimes being a superpower is first and foremost about being a good listener. So we always come in with the 'Here's the solution that you want', and the solution is a U.S.-centric solution. In the end, when you win the campaign or you win the war, what you've actually lost are some key allies. You've lost their trust. You've lost their ability to count on you. So that's where I look.

When I had one of those great days, the lesson I'd learn from my mentors was, hey, tomorrow you could have a really shitty day. And then if all you did in the briefing is talk about me, me, me, me, then what are you going to do tomorrow? So the real thing

is how does somebody else learn? Because somebody else had a bad day when you had a good day. So how do you raise the overall team performance up a notch? In order to win a war, you don't need the ability to spike up and be a great performer here and then drop down. You've got to have a sustained performance level by the entire team, and that's how you do it. That's how I learned to do it.

ROBERT GREENE

In the sense of where the plane itself might feel like you're almost sort of one with it, I compare it with the piano, for instance, or like chess. If you've been playing it for 10 or 15 years, almost the keyboard or the board that you're playing, it's in your head.

CESAR RODRIGUEZ

Right, yeah.

ROBERT GREENE

You don't have to think. It's like the whole pattern is there. Is that something that is analogous?

CESAR RODRIGUEZ

Yeah, exactly. When you walked out to a jet, especially as you got more and more time with it... because one of the things we didn't do was you didn't only fly your jet. Even though your name was on a jet, the crew chief stayed with the jet. That's probably more important, because the crew chief would hear something, and he or she would go, "Oh, hold on a second. That's not a foreign noise to me. I know how to fix that." So from the standpoint of delivering combat capability and making sure there was a jet available, it makes more sense that the crew chief would be tied to a jet versus a pilot.

So the pilot perspective, once you got to fly with your squadron, you knew what to do. You knew which jets had hot engines and which ones didn't. You knew which ones had a really good radar, which ones didn't. You knew which ones' RWR had a full 360 sensing capability or they were blank in certain areas. At that point, when you knew

that, you still got that airplane to do what it needed to do to win. That's what I called good karma with your jet. Because not everyone was the same, every one had a little difference.

But it goes back to the communications. It goes back to the communications with your crew chief. If I walked out to your jet today, the first thing you would say is, "Hey Colonel. How are things going?" "Things are going good." He says, "114, let me tell you something. She's got some blind spots on the radar, so be careful around 16 miles. RWR, make sure you put your wingmen on the right side, because the right quadrant's a little bit weak." The crew chief would tell you that kind of stuff, and that's the team that wins wars when you can dialogue with your crew chief like that, when your team is set up with the right people. So it kind of goes back to the very, very beginning of this whole discussion. It was never about I. It is always about teams.

ROBERT GREENE

Okay. Well, we've reached the final question. You sort of hit on it earlier. How does the experience as a pilot intersect with business? Is there something, without being specific about what you do, about these skills that are replicable? How relevant are they in the business world?

CESAR RODRIGUEZ

I think they're very relevant. In flying an airplane, you've got to make time-critical decisions that are related to the safety of the airplane, safety of the person flying the airplane, or the outcome of the mission. In business, same thing. Indecision is the number one killer of businesses from succeeding. Sometimes having 80% of the information and making a decision off of 80% is tactically smarter and business sense smarter than waiting to have 100% of the information and giving your competition a chance to outswing you, because the truth is, nobody in industry and nobody in the

military should be thinking that nobody is your peer. In the military, when we talk about a peer, and we talked about it earlier, the Chinas, the Russias. But don't exclude the Iraqs or the Venezuelas.

ROBERT GREENE

That's true.

CESAR RODRIGUEZ

They are your peer. You have to establish a level playing field. For Hugo Chavez to score a victory . . .

ROBERT GREENE

It doesn't take much.

CESAR RODRIGUEZ

All he needs is one black eye, because that's what we're going to measure him against. And if he achieves one black eye, he will have achieved a victory. From the U.S. perspective we need total annihilation, if there's something that exists like that. We need the enemy to capitulate and surrender, or we will have lost. If we lose one airplane or if one

scud gets through, our report card looks like we lost.

But Hugo Chavez can take the total beating of his life, and all he needs to do is get one little jab in, and he puts an American airman on parade, and he's achieved his victory. So when you look at what's required, what's the definition of a near peer, it's not how much money you have, it's not how many airplanes you have, it's not what your technology base is. It's what is required of your enemy to achieve the equivalent of a moral victory?

ROBERT GREENE

And that applies to business?

CESAR RODRIGUEZ

And that applies to business as well. That's probably more so in business, because we think we're a technological leader. You've got countries out there today, you give them some time, and they will reverse engineer anything. So where you made a fiscal and human capital investment to gain that time, you turn around and lose it in a shorter span.

So now that near peer, they may not be eye-to-eye, but they're definitely not below the chin. They're right there. They're waiting for you to make a mistake, to not protect your technology, to leave your computer systems vulnerable. They're waiting.

So in industry that wait period comes down to people failing to make decisions and being afraid. I never really felt like a stockholder in the military. In the end, the tools that I was given was given to me by a great country. But when you're on the industry side, you've got a little bit of pressure from your stockholders to perform. So you take that little bit of indecision, you take a little bit of indecision that we're not quite ready to make this kind of investment, and the next thing you know, your near peer just passed you.

ROBERT GREENE

And pretty fast these days.

CESAR RODRIGUEZ

It happens incredibly fast with technology. The brain power that exists around the world is phenomenal.

ROBERT GREENE

They're surpassing us in some ways.

CESAR RODRIGUEZ

That's right. We have this elitist thought process that we think we own the market on technology. And as a result, we actually hinder our progress, both from the industry side and from the regulation side that covers the industry. We've got a lot of people that don't really have the total picture. So the lessons of making decisions are the ones that are 100% transferable. Because in the end, as a fighter pilot, you've got all this sensor information. You don't have it all, and you didn't process it all. You're making a decision based on three or four pieces that are pretty good.

ROBERT GREENE

Wait too long . . .

CESAR RODRIGUEZ

That's right. People always say for a fighter pilot, if it gets too bad, you just reach down and bail out. I'm not sure that that's really the way fighter pilots look at it. We don't look at bailing out as Plan A, Plan B, or Plan C.

ROBERT GREENE

What happens to the plane when you bail out?

CESAR RODRIGUEZ

That's right. There's a lot more to making that decision. But on the industry side, decision-making is really the key. The other piece that's 100% transferable no matter where you go is really about team building. You've got to respect the people you're working with. You've got to recognize their strengths and their weaknesses. You've got to critique their strengths and weaknesses to the point where they get better. And when you bring the team together, you need to let them know why they're in that particular chair.

ROBERT GREENE

The mission.

CESAR RODRIGUEZ

The mission. I use the example of the fingerprint. A young airman, he or she might know their skill set better than anybody, but if they can't see their fingerprint on the mission, whether it's an airplane taking off or you protecting the flight line or whatever, if they can't see their fingerprint on the mission, then they don't really know why they're doing it. They just know they're good at it. When they see their fingerprint on that airplane that takes off because that's the mission of the day, it's pride. They're never going to give up. They're going to give you 110 percent, 24/7, 365.

ROBERT GREENE

As a leader then, you have to sort of make sure that they feel that level of involvement.

CESAR RODRIGUEZ

That's right. You've got to make the mission attainable. You've got to make it embraceable.

You've got to live with that mission as you develop the attitude to be a fighter pilot, to win, to build teams, to succeed. It's all one big bundle. But I use the example of the analogy is the fingerprint. If you can't see it, then it's not there. It's like when Trish and I built this house, we both had a different vision. If you look at the decoration, you know it's not me who decorated the house. Her fingerprint was on this shell that I was working with the engineer with. But if we didn't see the fingerprint, then all the hard work and the battles that we went through, when you do build a house you will find out how strong your relationship is. You can't get there from here. So when we both saw the fingerprint, we could both see that view out to the east. We could see the rooms where the kids were going to grow up. That's when we knew we had it right.

ROBERT GREENE

Are these sort of political skills that you've learned as well in dealing with the various

different levels that you went through? Is the military a very political atmosphere?

CESAR RODRIGUEZ

The one thing we learned in the military was if you don't understand your politicians and what drives them, what motivates them, then you have no room to complain about them. In the end, politicians are the ones who are going to tell me and the military to go do our job. That's how . . .

ROBERT GREENE

Politics by other means.

CESAR RODRIGUEZ

By other means. Yeah, exactly. Clausewitz was correct when he said, 'In war there are politicians'. If we didn't take the time to understand the political animal, then we lost the boat to complain or educate. We learned that coming out of Vietnam. If you look at the syllabuses of professional military education today, both officer and enlisted, there are dedicated seminars and dedicated portions of the curriculum that are focused on not only

understanding the law aspect of politicians that we all have to abide by, but then you need to get into their inner circle.

That's when we started coming up with organizations like Legislative Liaisons that were uniform wearers that were advisors to those politicians, because if they don't know our concerns, and we don't know their concerns, we can't reach. So politics is learned in the military. Politics is very well learned on the industry side. Everybody has a political strategy along with your business case, that if you don't have them both, you're kind of missing the boat.

ROBERT GREENE

Yeah. Very true. Well, I think that might be it. I kind of wore you out. Like a horror site, made you go around the track a few times.

CESAR RODRIGUEZ

I appreciate it, Robert. It was a lot of fun.

ROBERT GREENE

Okay, good. It was great material, some really good material. It's really going to help.

Actually, I'll turn this off. ♦

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