Disrupt Yourself Podcast

EPISODE 110: SAFI BAHCALL

Welcome to the Disrupt Yourself Podcast. I'm Whitney Johnson. I think, write, speak, and live all things disruption. Our guest today is Safi Bahcall - a physicist, a biotech CEO and the author of *Loonshots: How to Nurture the Crazy Ideas that Win Wars, Cure Diseases, and Transform Industries*.

Whitney: Safi, it is a delight to have you with us today and I'd like to thank you for being here.

Safi: Very glad to be here.

Whitney: First question for you is, where did you grow up and what did you want to be when you grew up?

Safi: I grew up in Princeton, New Jersey. Both my parents were scientists associated with the university there, and, uh, I guess despite, uh, that science background, I, I alternated between wanting to be a tennis player and wanting to be a spy. (laughs). Maybe like a lot of kids, sports and something cool-

Whitney: (laughs)

Safi: Or sexy. My dad was actually a tennis coach, uh, and so we bonded over tennis when I was young and he, uh, we were driving around to tennis tournaments. And spies, I don't know, I just liked reading spy, you know, James Bond or, uh, whatever that book was with the Eiger Sanction, I forgot the name, or Day of the Jackal. It was just great reads and I said, "I want to be that guy." (laughs)

Whitney: (laughs) so who were your, um, some of your tennis idols as a kid?

Safi: Oh, I grew up watching Pete Sampras and Andre Agassi, that rivalry, both of that generation. The Sampras-Agassi rivalry was so interesting cause it has such different styles. And then it continued years later in their biographies. They both came out with biographies sort of back to back (laughs) and it was like the rivalry all over again 20 years later. I would say this time Andre Agassi won his biography *Open*. I think it's one of the all-time great sports biographies.

Whitney: Fascinating. Well, when you were, you started talking about, about those two, it made me think of Brad Gilbert. Did you ever read his book, *Winning Ugly*?

Safi: I did not read that book.

Whitney: Oh, it's fantastic. If you're a big tennis aficionado, and it sounds like you are, definitely would recommend that book. And Brad Gilbert went on to be Andre Agassi's coach, so really interesting stuff.

Safi: I'm writing that down, thanks.

Whitney: So, okay, so you wanted to be a spy or a tennis player. At what point did you start thinking about, okay, so what do I want to study in college, and what did you study in college?

Safi: Uh, (laughs) it was a few steps, a few years between my wanting to be a spy and freshman year in college.

Whitney: (laughs) Okay, well you can walk us through. (laughs)

Safi: Yeah, I think by high school, I'd probably given up on that spy dream. But the theme or the strand that ran through everything was just a love of, of learning and kind of challenging myself and kind of joy of being uncomfortable, a joy of not knowing and then having the feeling that you're about to embark on a rapid learning.

So I, I have always loved going up that learning curve and starting at, finding something new to start at the beginning. So in high school, I think I jumped into math and, you know, there's just so many, uh, steps that you don't know anything when you're thrown into something and then it doesn't take very long before this whole new world becomes clear to you. And then I went into areas of physics and it was sort of the same thing. You have no idea how all these things work, and not that much study. All of a sudden, all these things become clear to you, and then there's still more ahead.

And so it's just going up these learning paths that I found so enjoyable, kind of similar to tennis. You know, you start and then you're going up the curve as you work on improving your stroke or your forehand or your backhand or your serve or your overhand or your volleys. And I just love that kind of continuous improvement and learning. At the time, I was playing a lot of tennis and doing a lot of science and math, and I just kept doing that through college.

Whitney: Interesting, and you know, what's interesting is thinking about the, the learning curves and, and that the thought that I had when you said you really like that feeling of being uncomfortable and then knowing that the comfort will come, it's almost like, I, I don't want to put words in your mouth, but I had the sensation that you enjoy the adrenaline of that uncomfort or the discomfort, knowing that the comfort's going to come. Is that-

Whitney: Is, is that right?

Safi: I think that's exactly right, and I think it's, it's a mindset. So you find that people who assume if they're in a difficult situation where they don't know something they'll never learn, it will always be difficult. Then they don't learn and grow as much because they're picturing the end as being constantly trapped in this swamp where they don't know.

But if you imagine some situation where you went into something where you didn't know it very well and then you grew and you became better and better at it. I'm sure there was a first time you did a first podcast, for example

And you probably didn't know, but then, it probably didn't take all that long before you figured it out and got better and better at it.

Whitney: Yeah.

Safi: If you take that mindset and you apply it to any other, you just get in that mindset of this is going to be like that other thing where I didn't know very well. Like riding a bike or playing at picking up a tennis racket or doing your first podcast or writing your first book or, if you're an entrepreneur, starting your first company where you make every mistake in the book, you know, in the first year or two.

Whitney: So you just opened the door to entrepreneurship, so you studied, you studied physics and then, um, I remember reading in your book, which is a terrific book, it's obviously gotten lots of, um, praise and, and laudatory reviews. How did you end up becoming an entrepreneur, because it doesn't sound like that was initially your path?

Safi: No, and I made a lot of sort of sharp left turns and sharp right turns in my career. A lot determined by the same kind of curiosity and love of learning. Whenever I've felt like I'd plateaued or I'd kind of mastered something, then I got an itch, like, what do I not know? What do I know nothing about and (laughs) and want to discover? And so, when I was, I was in academic science and I come from an academic science family and I enjoyed it but, after a few years, I got an itch. I'm like, what else is there in the world? I want to see what the 99.99 percent of the planet that is not living in a university, what are they doing? And to some extent, that is how the world really works with companies and people making stuff, not just sitting in an office writing papers.

So I shifted into the business world and then I picked up some business working at a consulting firm in New York that kind of takes in scientists and helps, teaches them about business. But I knew that I didn't want to be an advisor my whole life. I had an itch to build something.

It was around that time that I started to think about what is important to me in life. If you're in science, you kind of publish original papers and build up a career and get grants, where in your business, let's say you're managing money or trying to make more money. And, for me, what I just found personally satisfying is that having a goal of helping people, for example, helping people spend more time on Earth with their loved ones. Around that time, my father got sick and we lost my dad and I just felt in a very deep way that if I could be involved in something that could ultimately help give families more time on Earth with their loved ones, that's just a very powerful reason to get up in the morning. And if I could do something in that space, that would be really satisfying for me.

So that got me from, I'd done science, I'd done business, so then I wanted to do something that could bridge the two with that goal, and that led me to biotech.

Whitney: So on the biotech side, did you, um, did you found Synta or did they have you come in, you were consulting to them in some form or fashion? Talk to us about the evolution of that company.

Safi: Oh, I started Synta. I was, uh, at this consulting firm in New York called McKinsey and I was getting this itch. I wanted to be involved in biotech. I wanted to be involved in developing new drugs and new ideas in biotech and mixing biology and science and, and, and bringing together the people I knew in New York and in the business community to help scientists in universities who had promising ideas, help them get their ideas to patients, get them out of the lab.

And so I spent about a year visiting with different scientists at different universities that I knew and just talking to them and seeing what was out there. And then I came across, at Harvard, a group that had, uh, some very promising ideas, and I connected with a, uh, uh, a professor at Harvard who's now emeritus, um, who had some terrific ideas, and we were very, had a very similar spirit and approach, and so he and I ended up working together and starting Synta together. So we founded it in 2001.

Whitney: Okay, so you did this for 13 years. What was one of your biggest failures that subsequently led to a success as the CEO of Synta?

Safi: I would say one of the lessons that I learned the hard way, and maybe one of the most valuable lessons for the rest of my life, was on what it means to lead from the heart rather than lead from the mind. So, I grew up with a pretty analytical background, I had a pretty analytical framework for thinking about the world, and so when I worked with people and I brought people together into a team and into a company, it was a fairly analytical approach. Even though our mission was about saving lives, when I would talk about business and work with folks, it was pretty logic-driven.

That worked fine for a while, but I was missing the heart, which is that people want to be, in their workplace. They want to connect not just with the mind, but with the heart. And so you want to talk to them at that level. What are they afraid of, what really excites them, what's the music behind the words that they're saying, what are the emotions behind the logic, and I think I missed that in the first few years. And that's also kind of a fairly common consulting trap, you talk about the logic and the strategy and so forth, and you're not really paying attention to the humans and emotions.

And failing to do that, you miss a lot of important things and you miss a lot of important people issues. And I learned, probably the hard way, um, to pay much more attention to surface, you know, what's underneath the words and underneath the logic. What are people's hopes and dreams and fears, and how can you surface those and connect to those and talk to those.

Whitney: Could you share with us an example of that just to make it more concrete, 'cos it sounds like there's a really great learning in there that people could really benefit from?

Safi: We had worked very hard for many years to develop this one cancer drug. You know, somewhere between five or seven years, And we had run a large clinical trial and we had had encouraging early data, so we were all pretty fired up and pretty hopeful that this trial would go well. I remember the day that we got the news, um, was a very sad day. It was just incredibly disappointing because we'd put so many years of our own lives and we had so many people who had been working with us all around the world in this program that had a lot of stake and had a lot of, uh, hope and aspirations for this program, for this cancer drug.

And it was such a sad day and what I probably would have done with my, you know, more logical hat, is just talk about, all right, here's our options and here's what we need to do. But what I had learned was just to lean into the emotions, to lean into the fact, you know, where there were people crying around the table, and recognize that.

Whitney: What was sad, sorry, just back up for a second. What happened that was so sad?

Safi: Well, the, the clinical trial that we had for that drug, which would have gotten us FDA approval, failed, which means that the drug was-

Whitney: Oh.

Safi: Essentially dead. So that years of work were kind of over. Um, and that was a very sad moment for a lot of people. And I, you know, when we got the news, uh, and, you know, told people around the table the news, you know, there was just crying around the table.

And the wrong thing to do would have been to be logical about it. Well, here's, you know, these things happen and the probability is this and the odds are that and, you know, there are other things we can do and here's the next step. But the right thing to do, which I had learned the hard way, is to just lean into that emotion and then talk about how I was feeling about it, which is what I did. And share just, just the, the raw emotion, not the logic of it.

Whitney: And how did you feel?

Safi: Terrible. I felt like crying, too. I can't even remember if I did. I probably did, but it was, you know, you just feel you've spent years of your life on a project you've, you've talked to patients, people who have loved ones with this disease that are in hospital beds, and you're so hopeful that you have something for them, and you pour years of your life and other people and the employees and physicians that we worked with and the patients that we worked with, and then it fails. And so that is an incredibly sad and depressing day.

For many reasons, I mean, not just because, you know, the company, we would have to lay off, you know, a good fraction of the company, but [inaudible 00:19:11] because we had this drug that we thought could make a real difference in the world and it just failed. So that was a very sad day and, you know, sometimes you just have to go with that.

Whitney: So what happened after that?

Safi: Well, we did go, you know, we took time to mourn and then we picked ourselves up and figured out what we needed to do next and got that done, you know. We had to lay off a bunch of people, we had to close down various programs, we had to figure out next steps, we had to figure out financing and where to aim. You know, fortunately, we had very supportive backers and very supportive event employees, and I had a terrific Chief People Officer, who, you know, made sure everyone we had to lay off was treated with dignity and respect, and we worked with a firm to find them the best possible placements.

And, uh, you know, many of the investors that we worked with, of course, they were disappointed like we were, um, but we had followed the right process, we had done all the right steps, we'd been very transparent and direct about what we were doing, so we managed to get through that and raise enough funding, funding to keep the next set of projects going. It's just what we did.

Whitney: One other question on that before we, we jump to a different topic. Do you remember if there was an experience or someone said something to you that, that you moved from this place of, you knew in that moment to not go analytical, which is a skill set that you have and it's fine-tuned, but that you needed to really lean into the emotion.

Do you remember if there was someone who said, “hey, Safi, this is what we need to do,” or if there was an experience that you had had prior to that, that really helped you say, okay, here's, here's, here's the required behavior in this situation if I really want to, to help us be able to move forward in, in the best possible way?

Safi: You know, I did get some specific feedback which was pretty helpful, which is, there's a group of other CEO's that I would meet with, roughly once a month. And we would meet in a kind of a confidential setting where we could talk about anything and give each other honest feedback, which is very rare in the professional world because, especially if you're a leader, a manager, you're, it's very difficult to get totally direct, honest feedback, because people have a lot at stake in what you think of that, so they're afraid to tell you what they really think. So you have to work really hard.

But when you're with an independent group of peer friends, they'll just tell you whatever they think. They have no stake in the game, and, um-

Whitney: (laughs)

Safi: You're there for them just to help them. And so I remember one of them said to me when we were doing this and it was my turn, I was talking about some problem and, you know, one of them just said, "You're all brain. Where's your heart? You have a big heart but you're not showing it." And that just kind of stuck with me, and it was true. I, I do have a real, (laughs) even though I'm a physicist, I have a real heart. But I, I just-

Whitney: (laughs)

Safi: Wasn't uh, wasn't really letting it out and he said, “well, don't be afraid to let it out.” I said, "Oh, let me try that," and people responded.

Whitney: Mmm.

Safi: So then I saw that speaking to people with a heart, not just with the head worked, and it made me feel better, too, because I could be more open, I just, develop much deeper connections with both friends and colleagues.

Whitney: So interesting. I, uh, Kim Scott, who wrote the book, *Radical Candor*; she said, and I think this is so powerful, she said the leverage is in the feedback. Like we have so many people around us and if we're willing to listen to what they have to say about what we're doing well, about what we're not doing well, that's how we can get better a lot faster, which goes back to where you started the conversation, is this love of learning curves, which I think is really interesting.

So this brings us to the question, and this is the subject and topic of your book, *Loonshots*, how did you come upon this idea and what is a loonshot, exactly?

Safi: I was working, uh, for President Obama's Council of Science Advisors, and that was kind of a random circumstance that I, a professor of physics who I had been a teaching associate for many, many years earlier, ended up running this project for President Obama and how should we shape national research, and he recruited me because I, I think they wanted someone with some biomedical and some business, and they said, your job is to write the next generation of the Vannevar Bush Report. What should the next 50 years of national research look like to make sure we get these important new technologies that advance national interests in the United States?

And I had never heard of Vannevar Bush or his report, and we had three months to write a recommendation to the President. So that started me on some really rapid reading and history. And as I went back in history and I looked through, not only in my experience in business and in my field, but more broadly in U.S. history and what has driven U.S.

economic and science and technology success over the last century, the big ideas - the ones that change the course of science, business or history rarely arrive with blaring trumpets and red carpets dazzling everybody with their brilliance. They're usually dismissed for years or even decades and their champions are written off as crazy. There wasn't really a good word to describe it, so I made one up. I just called them loonshots.

Whitney: Very clever. All right, so talk to us, um, in the book you, you tell this really fun, I mean, one thing that I really enjoyed about your writing is that you're a great storyteller and you talked about Juan Trippe and Robert Crandall and different kinds of loonshots. So could you tell us the story, do a little compare and contrast so that people can understand and, and have illustrated for them what a loonshot can look like.

Safi: In that story I talk about the two types of loonshots, and the reason it's so important to understand what those two types are is that almost everyone has a blind spot for one or the other. And missing that blind spot can get you killed. And so here's what I mean by that.

So, Juan Trippe is a classic product-type innovator, meaning he would champion what I call these P-type loonshots. Those are new types of products or technologies that everybody says could never work. For example, the telephone when it came up, oh, you can't do that. If you can, it won't be important. Or the transistor, there's no way you can make a switch to solid state materials. Or personal computers or digital cameras, those are products that everybody said that couldn't work.

The other kind is a small shift in strategy that people say won't matter very much. A good example of that is when Sam Walton decided to move his retail stores to very rural America, which he did kind of on a random whim. His wife, he wanted to open a retail store in the big city, in St. Louis, but his wife said, I don't like living in big cities, I'll support you, honey, but only as long as we live in a town less than ten thousand people.

So he liked being married and he actually also liked quail hunting and he found one region of the country where there were four quail seasons, there are four states that met in a point and you could go quail hunting all year round. So he located his store in Bentonville, Arkansas. Who knew that there was this enormous demand out in rural America? So his store, Walmart, ended up dominating the retail industry and wiping out all these other players. And it was a loonshot, but a loonshot with no new technology. He just moved somewhere else and sold stuff a little bit more cheaply. There was no fancy gadgets or technology.

So those are the two types and here's why it matters. You asked about the story of Juan Trippe and Bob Crandall from the aviation industry. So Juan Trippe was a young guy who was an engine guy. He was a product guy. When he was young, he got his first plane, raised some money and he, you know, took off the propeller and he put in a bigger propeller. He carved out an extra seat so that he could he make it, instead of a one-seater, he could make it a two-seater. He could take couples. He was ferrying people from Manhattan to Long Island.

And he ended up starting a little airline called Pan American Airways, and he grew that into the largest, most dominant airline in the world. You had, the Beatles arrived in the United States on Pan Am, James Bond flew Pan Am. In a 2001 Stanley Kubrick movie, there was a Pan Am space ship with Pan Am stewardesses with Pan Am clothes. So it was this kind of dominant, awesome airline and he did it by going after these product innovations. One after the other after the other, bigger, better, faster engines.

So he went first from propellers and he added radio navigation so he could circumnavigate the globe, and then he was the first guy to develop jet engines when no one said it could work. Then he built bigger, faster, better jet engines. The problem with that is that it becomes a trap. And this is so interesting now, especially in Silicon Valley where I've been spending more and more time, and you see people focusing on just bigger, faster, better products, bigger, faster, better products. It almost always ends in a trap.

So what happened to Pan Am was that he just kept trying to get bigger, faster, better planes and bigger, faster, better engines and he finally stumbled, after developing the first one, the 707, then the next one, he heard about this super powerful engine, the 747, and he bet the company on that. A billion dollars, huge bet. The problem was there weren't enough passengers to fill that because, by that time, jet engines had become commoditized and there were a lot of competitors. Then when the fuel crisis hit and airline deregulation hit, he was left stuck flying these giant planes that no one was flying. So how do you win? What did he miss? He missed the small changes in strategy.

So Bob Crandall was not a product guy. He worked at Hallmark Cards, he worked at one of the computer companies, and he started to run an airline called American Airlines. And he came up with these small changes in strategy that didn't require any technology, something called frequent flyers. All of a sudden he found people loved it, so people started going with American Airlines. Small changes like flying hub and spoke instead of trying to fly everywhere all over one on one, concentrate in a hub and fly into that hub and then fly elsewhere. That ended up improving efficiency, shortening turnaround times. None of those was a fancy new technology. It was just sort of a clever strategy.

And here's one strategy that everybody said was crazy, take your reservation systems that your reservations agents use inside your company and give it away to everybody for free. That's what American Airlines did. They said, they took their reservation system and gave it to all the travel agents in the United States. And their competitors said, you can't do that, that's crazy. And they said, really? Why not?

They did and then guess what system that the travel agents starting using. It was called Sabre at the time, that was American Airlines' system. Suddenly, bookings for American Airlines went up, and everybody said that was a crazy strategy, but when airline deregulation hit, the only airline that didn't go bankrupt for the next ten or twenty or so years was American Airlines. Pan Am went bankrupt, every other one went bankrupt but American Airlines survived.

So the lesson there is that there's a lot of glory, so who made the cover of magazines? Juan Trippe, because while he brought, he brought jet engines to the masses. He closed the globe. He brought the old world and the new world together. It was an incredible triumph and it was sexy. Movie stars were flying Pan Am jets.

The stuff that Bob Crandall was doing was much less glamorous. I mean, you don't think that, you don't see frequent flyers making the cover of magazines. You don't see airline reservation system getting, you know, a Time Magazine cover, photo spread. But American Airlines survived and Pan Am went down the drain, and that's in part because Bob Crandall had met, mastered both types of loonshots and Juan Trippe had a blind spot for just the one type.

Whitney: So interesting. Interesting, interesting. You know, I was, I was in an airport in Brazil the day that Pan Am declared bankruptcy and so I just always had that really vivid memory of that, and have two million miles on American. So just fascinating to hear the back story behind airlines that so many of us have known and used and loved or, and lost.

All right, so let's transition and talk, you talk a lot about phase transitions, which I think is fascinating and I'd love for you, I want to read a quick quote and then have you, uh, connect the dots for us all. It's, it's the, it's from your book, Jane Austen - Pride and Prejudice. "It is a truth universally acknowledged that a single man in possession of a good fortune must be in want of a wife." And you talk about a triggering phase transitions and the control parameters. So can you talk to us briefly about phase transitions, why it matters in nurturing loonshots, and then connect it for us back to this idea or the quote of Jane Austen.

Safi: (laughs) All in thirty seconds or less, go! Hit the stop watch! You're on Candid Camera, go!

Whitney: (laughs)

Safi: My goodness, that was a-

Whitney: You can have-

Safi: That was an incredible list of stuff.

Whitney: You can have more (laughs), you have more than thirty seconds. So let's start with, why don't you explain what phase transition is first and why that's important.

Whitney: We'll start there.

Safi: All right, sure. Imagine you have a glass of-

Whitney: (laughs)

Safi: Okay, and then we'll see if we can end up back to Jane Austen. I don't know, maybe we'll throw in James Bond-

Whitney: (laughs) okay.

Safi: And Star Wars and seventeenth century astronomy, all of which is in the book, but-

Whitney: That would be awesome, so please feel free.

Safi: Imagine you have glass of water. You can stick your finger in and swish it around, and that's true for any liquid except, as I gradually change the temperature, all of a sudden, at a critical temperature, 32 Fahrenheit, the behavior of those water molecules completely changes. They become totally rigid. The water freezes into ice. Why? It's exactly the same molecules, so how did they know to suddenly change behavior? Why did they change behavior?

There's no CEO molecule with a bullhorn and a thermometer saying like, oh, you know, it's 33 degrees, everybody rush around and be sloshy and fluid. Oh, no, it's 31, everybody line up and be, oh, no, it's 33 again, everybody be ... there's no CEO, they just do it. Why?

That, in science, is what's called a phase transition. And it's triggered by a small change in structure. There's no, no one molecule that orders it, it's triggered when you adjust something, what's called the control parameter in this case, which is just a fancy word for something that you tweak that causes a big shift.

Every phase transition is a result of two competing forces. So I'll explain that and then I'll bring it back to what it has to do with teams and companies and why companies will undergo a phase transition. So every phase transition in nature is a result of two competing forces. In the case of water, one of those forces makes the molecules want to run around and be free. It's given a fancy name called entropy, but it's just a force that makes things want to run around and be free. The other force is binding energy that wants to lock every water molecule rigidly in place, 2.8 angstroms from the next one, not 2.7 or 2.9.

At high temperatures, the entropy force, the running around, wins, binding energy is very weak. And as you adjust the temperature, the relative strength of those two forces cross until, right at 32, they exactly break even and then, boom! The system snaps, and that tug of war flips sides and the rigid side wins.

Now, when you bring a team or a company together, you also create two competing forces. You can think of those two forces as stake in outcome and perks of rank. Stake in outcome and perks of rank. So by stake in outcome, I mean, let's say you bring a small number of people together around developing a new cancer drug. Well, everybody has as enormous stake. Why? If the drug works, everyone's a hero, I've been there. If it fails, everyone's unemployed.

Now imagine you grow the company. Now you need to add, you know, once you're 10 or 20 people, you need to add some team captains and maybe some vice presidents and maybe as you get bigger, some senior vice presidents. So now you start to have another motivating force, which is the perks of rank. Well, it, you know, when you're really small, it doesn't matter, if you're five people, it doesn't really matter who's a team member and who's a team captain. You just roll up your sleeves to save that project and make it work.

But if you're 500 people, well, there's a difference between being an associate and a VP and maybe a senior vice president. So now, perks of rank become important. As you gradually adjust properties of the company, for example, size is one example, all of a sudden at some point, perks of rank become more important than stakes in outcome. And at that point, you have a phase transition. The incentives shift from focus on, hey, let's all roll up our sleeves and make this thing succeed to, what can I do to get promoted, because you have a bigger stake in promotions than you do in the stake in the outcome.

So when that happens, you shift from an innovative culture to a political culture. So kind of the underlying theme is that there's so much out there about culture, culture, culture, but culture is what you see on the surface, like political versus innovative. Underlying culture is structure, what's driving those patterns of behavior. So if you reward rank, you're going to get a very political culture. Everyone's going to try to stab their neighbor in the back. If they come up with some crazy idea, they'll be whispering to your boss, I think that's a really crazy, look at all these flaws.

On the other hand, if you celebrate results and celebrate uniting around risky promising ideas, people will start to unite around risky promising ideas. You'll get an innovative culture. So underlying that culture is structure. So that's what I mean by phase transitions, uh, in general, in science, in how you apply it to the behavior of teams. It's an interesting insight, because I don't think people have really thought about teams or groups, behavior in groups, in this way before. People have spent so much time thinking about culture and the danger of that is that you miss the structure.

Fixing culture is very hard. Forcing people to watch two-hour videos and hold hands and sing Kumbaya doesn't have much effect, but changing incentives can be very easy. You

know, if you ask a bunch of molecules to line up rigidly and try to get them to line up rigidly one by one, that's very hard. But adjusting the temperature to get them to do that is much easier.

So that's what I mean by phase transitions and culture versus, uh, structure. The Jane Austen connection, sorry, go ahead.

Whitney: Oh, okay. All right, you're going to go there. See. I knew-

Safi: (coughs)

Whitney: You've got a big brain, so you could get there. All right, so take us to Jane Austen now.

Safi: What Jane Austen was saying there, that "It's a truth universally acknowledged that a single man in possession of a good fortune must be in want of a wife," she's suggesting that two forces tug at individual, or in this case, individual males.

One is the desire to go out and make your fortune and roam around and be free, and the other is to settle down. And that's a lot like the entropy and the binding energy. If you think of the binding energy as forming a family and having kids, and the entropy as running around to seek your fortune, she's saying that as you get older, the balance between those two shifts. And, suddenly, if you have a large group of them, you will get a phase transition between single men and married men.

Whitney: Okay, well done. Thank you for, uh, playing that little game with me. So as we start to move toward the end of the podcast, one of the things that you included in the book was this, um, idea of a magic number, and you talked about, um, quoting you just briefly, "Team size plays the same role in organizations that temperature does for liquids and solids. As team size crosses that magic number, the balance of incentives shifts from encouraging a focus on loonshots or project work to a focus on careers or politics."

It's a very elegant equation. I would love it if you would talk us through that briefly.

Safi: Sure. One of the benefits of understanding this stuff and thinking about group, the behavior of groups in this way and teams and companies in this way, is that once you understand a phase transition, you can begin to control it, to manage it. So, for example, with water you will actually get a phase transition as you lower the temperature, it'll go from fluid to rigid, it'll freeze, but that temperature isn't fixed in stone. That temperature can be controlled.

So, for example, when it snows overnight, you sprinkle salt on your sidewalks. Why? Because it changes the freezing temperature by making the binding energy a little bit weaker and it keeps things fluid a little bit longer. I'll give you another example. Raw iron is a pretty weak metal, but if you add a little bit of carbon, you turn it into solid steel. If you add a little bit of nickel or cobalt, you make it into this incredibly strong alloys that you can find inside jet engines and nuclear reactors.

So once you understand a phase transition, you can begin to control it. And that's what I mean by teams and companies. Once you understand the balance of these two forces and that if you change size, like as you changed temperature, you will get a phase transition, you can begin to control at what size, that's the magic number, whether you get a phase transition, just like at what temperature will water freeze.

So what you find, you know, with water, you add a little bit of salt and you can lower that freezing, you can keep the water fluid much longer. So with companies, you find that there are four control parameters that you can adjust, just like adding salt is one, or changing the binding energy is another, of a liquid, and changing the pressure is a third. Those allow you to raise the magic number, in other words, to make companies more innovative, to design more innovative teams and companies.

So that's what I mean by the magic number and understanding the forces allows you to have, in some ways, a new kind of science or new kind of set of tools for designing more innovative teams, companies or groups.

Whitney: Fantastic. So, um, I have listed here, so that the equation for everybody, and we'll include this in the show notes, it's M = ES squared, E times S squared times F, divided by G. Um, can you just talk us through? So typically, you've heard of Dunbar's number, everyone. It's the 150 number. It was popularized by Malcolm Gladwell. Um, so we look at, typically, that phase transition number as 150. And so, what I understand, Safi, is that you can raise that number if you play with some of these control parameters, like E and then S squared, etc. So could if you, if you could just talk through each one, one of those very briefly and quickly to give people an overview so that they can have a feel for your elegant equation-

Whitney: That would be lovely.

Safi: Sure. What you want to do is, you want to tip the, there are two forces acting on people, one that encourages politics and rewarding rank, and the other that encourages innovation and focusing on your project. So E represents equity fraction, which is what percentage of your incentives you're associating with results versus rank.

So if you pay somebody just based on base salary, you know, you have your 50,000 dollars if you're at this level, you're at $80,000, you're at $120,000, you're at $200,000, their focus is going to be entirely about getting promoted, which means elbowing their neighbors and stabbing them in the back, political culture.

High equity fraction means pay everybody the same at all ranks and just taking the extreme on it, but focus all of their incentives around the success of their loonshots or their projects. In those cases, those people are gonna do well. They're gonna focus on their crazy loonshots.

S is, uh, management span, so how many direct reports. So if you imagine a company with a thousand people and they have, uh, everybody has two reports or three reports, you're gonna have many, many layers, six, seven, eight layers. And so everybody's gonna be thinking about promotion, promotion, promotion. On the other hand, if you have a thousand people and you have 40 direct reports, promotions happen almost never. There's only two layers beneath the CEO, so it's not even worth your time thinking about a promotion. You might as well focus on your projects.

So if you want more innovative, more focused on results and ideas and nurturing crazy projects and less on politics, you want much wider-span groups. So that's the second one. I'll come back to the F, which is the more complex one, but let's go to the one on the bottom, G, which is the salary growth rate, which is just a measure of by how much does my salary increase as I go up each layer in the company?

Here's why that matters. If my salary triples every time I get a promotion, what am I going to be thinking about day or night? Getting promoted. Now, if my salary goes up by one percent every time I get promoted, am I gonna care much about being promoted? No, not

really. If, instead, I'm paid on, you know, on projects or incentives or other things except, besides base salary, why would I care about promotions? I'm just gonna focus on the project or the outcome.

So the last one I call F. It's a more subtle one. It's what I call organizational fitness. It's essentially a measure of how much does the company reward politics versus how much does it reward skill? How much does it reward politics versus how much does it reward skill?

So companies with very high fitness, politics have very little reward. Here's what I mean by that. If you take, if you're an average employee working on, let's say, a coffee machine design and whatever, making, building coffee machines, how much does lobbying your boss matter for whether you get promoted or your kind of bonus? Now, of course, everyone varies but, at some companies, the companies that we call very political, lobbying can have lot of effect. Individual bosses have a lot of power or a lot of say over their direct reports and how much they get rewarded or promoted.

Other companies, like Google as an example, or McKinsey as an example, they actually take the manager out of the equation, manager has very little say in how his or her direct reports do and how they're compensated. The manager will be interviewed, there will be some independent person who flies in and conducts some interviews and then flies out and prepares a recommendation.

In those companies, when the manager is taken out of the equation of ultimate compensation, there's much less politics. Why? Lobbying your, lobbying your boss for a promotion doesn't matter if your boss isn't deciding on promotions. So return on politics is a measure of exactly that, how much on average does politics matter in a company?

Now, how much does skill matter is, is a measure of how well inside that company are employees matched with their projects. And here's what I mean by that. Let's say your job is to design coffee machines and let's say you're like me, you're kind of aesthetically challenged. I would not be a very good coffee machine designer. If I'm assigned to the project of making coffee machines and it's like the end of the day, it's 4 o'clock, I've worked seven hours, I got one more hour in my day, am I gonna spend my extra hour on my coffee machine project or am I gonna spend it trying to schmooze my boss and convince him that my work is good and my neighbor's work is bad?

Well, if I'm not a very good coffee machine designer, if I work another hour on my coffee machine, I'll still make the same lousy product, so it's just not worth my time. I might as well be investing my time in politics. So, companies where employee skills are not very well suited to their job, you know, they're not very well trained or they haven't been optimized, those companies will be more political.

Companies where employees are stretched just enough, they're given, you know, it's like a string that's not too tight and not too loose. Also, you don't want an employee who's, you don't want to put Frank Lloyd Wright on that coffee machine project. Why? After a few hours, he'll be done. He'll have made a home run, Museum of Modern Art coffee machine, and then what's he gonna do? Nothing. He might as well walk the halls and talk about great he is and shoot down his colleagues so that he gets the next big promotion.

So, F, that last variable in the equation that you mentioned, is a measure of how much do politics matter versus how much does skill matter? And the organizations that are best have the lowest amount of return on politics and the best amount of fit.

Whitney: Love it, so elegant. So here's the question for you. Now, um, which lever, if someone's listening to this and thinking, all right, okay, I wanna to do this, I wanna get this right, which lever would you suggest people start with?

Safi: To some extent, if you feel comfortable thinking about incentives, that's a pretty straightforward one to start with. If you're paying everybody just based on rank and, you know, you're a large company, you're gonna be pretty sure that what you're encouraging is politics. So how can you design systems where everybody's got more skin in the game? That, it's not easy, but nothing about building companies is easy. It's all an investment.

I think part of the problem is that we've been scared of diving into these incentives things and kinda lazy. We said, ah, everybody had, you know, it's a hundred-person company or even a thousand-person company, everybody had a good year so let's write everybody a check for ten percent. Everybody had a bad year, we had a bad year, let's write everybody a check for zero.

The problem with that is, what's your motivation if you're four or five levels down? You really can't affect the entire, you can affect the one little thing you're working on. So if you want to start with something, think about how will you design incentives where people, what they get out is more connected to what they put in.

Whitney: Mmm. Yeah, and I just thinking, just briefly, for all of you who are listening and you're fascinated, absolutely go read, um, read this book. And in fact, we're gonna do one give-away - copy of the book for those of you who are listening, and we'll tell more about that in the outro, but one company or organization that, Safi, you said did this really well was DARPA. So I would encourage all of you to go and read about that in there.

Um, couple of final questions for you, Safi. What loonshots are you currently nurturing and cultivating in your career and life?

Safi: Um, well, this book was kind of a loonshot. People told me there's no way anyone would want to read about the intersection of physics, business and history, and, um, hopefully I'm starting to prove them wrong. So-

Whitney: (laughs) Apparently, we do.

Safi: Yeah, so, who knew? Yeah, no, people were like, yeah, yeah, nobody wants to hear that stuff, so, you know, you got anything about culture, you know, like the ten thousand other books that are being published. Um, that was kind of a loonshot.

Whitney: So, I'll ask you one other question that's kind of a, a, a add-on to that. At what point in your career have you been a loonshot?

Safi: (laughs) It's probably safer to say, at what point have I not been a loonshot? Uh, I think when, you know, you start a biotech company, most people, it's, it's generally about an idea that people think won't fit inside large pharmaceutical organizations. It's generally high-risk ideas. Although I did something very different than a lot of other companies, which is I ended up not working so much with traditional venture capitalists. I just stumbled into finding a group of investors who were very thoughtful and very engaged and wanted to work closely with me, more like partners, in building the company.

And so we built the company in quite a different way than one usually does, and that had a lot of, um, that in and of itself, building that company in that way, was kind of a loonshot.

Whitney: Any last comments or, uh, thoughts that you'd like to share as we finish up?

Safi: You asked me about loonshots in the future and I think about what I might wanna do in the future and, I, you know, for example, I've been in a cave for two or three years writing this book, so I'm just emerging and blinking and seeing the light, that there are real humans out there. So I'm thinking through options, but one of the things that I found very useful is, someone once told me, there are no experts of the future.

So when people tell you something can't be done and this is how the market's gonna evolve and it's never gonna be useful, just keep that in mind. There are no experts of the future.

Whitney: Hmm. It's lovely. Safi Bahcall, thank you so much for, um, being with us today and congratulations on the, the launch of your book, it's been a success so far and, a big success, I should say, and I suspect it will continue to be. Thank you again.

Safi: Thanks so much for having me on.

It's so interesting to see the push and pull of opposing forces in the life and career of this physicist turned consultant turned entrepreneur turned author.

There are always competing forces at play in our lives. Learning to lead with the head and with the heart. Reaching the mastery at the top of a learning curve, and instead of feeling the triumph of reaching the top, feeling the pull of that competing force - how can I jump to the bottom of a new curve and learn something new?

This idea of competing forces is woven throughout Safi's book. I love how he compares phase transitions in physics to the various competing forces that emerge as a business grows. And wasn't his equation elegant? His equation around team size --- that it plays the same role in organizations as temperature does for liquids and solids.

There are so many things that can feel out of our control, but my big takeaway is that even in a very complex system, like our work environment, if we will change by even one degree (like change the incentives, even slightly) what seemed like loonshots, will have a real shot.

Practical Tip:
Think about your team. Think about people that you work with. What's a small change you can make so that good ideas are more likely to happen? What can you do to preference innovation over promotion? Also, if you want to think more about this idea of "one degree," tune in to our podcast episode No. 93 with James Clear--he's the author of *Atomic Habits*.

For you personally, if there are changes you want to make, but aren't quite ready to change, sign up for our short audio course on **preparing f**or change. You'll get one email a day for five days with curated podcast episodes plus worksheets.

In the meantime, remember are giving away one copy of Safi's book *Loonshots*. If you want to be eligible, sign up for our newsletter at whitneyjohnson.com then e-mail us at wj@whitneyjohnson.com. Simply write in the heading Signed up. If you are already signed up, then good. We'll provide instructions this week.

Thank you again to Safi Bahcall for being our guest, thank you to sound engineer Melissa Rutty, manager / editor Macy Robison, content contributors Emilie Davis and Libby Newman, and art director Brandon Jameson.

I'm Whitney Johnson
And this is Disrupt Yourself.