Naval

Jul 9 2020

Matt Ridley: How Innovation Works, Part 1

Innovation is the child of freedom

29:49 Get podcast

Naval interviews Matt Ridley, the author of The Red Queen and, recently, How Innovation Works. Also see Part 2.

Transcript

Naval: I don't have heroes, but there are people who I look up to and have learned a lot from, and Matt Ridley, who is on the line, has got to be near the top of that list. Growing up, I was a voracious reader, especially of science. Matt had a bigger influence on pulling me into science, and a love of science, than almost any other author. His first book that I read was called Genome. I must have six or seven dog-eared copies of it lying around in various boxes. It helped me define what life is, how it works, why it's important, and placed evolution as a binding principle in the center of my worldview. That's a common theme that runs across Matt's books.

After that, I read his book The Red Queen, which laid out the age-old competition between bacteria, viruses and humans—a topic that's extremely relevant today. I also read his book The Rational Optimist, which helped me realize that it was rational to be optimistic, because of the technological and scientific advancement that we've had as human species since we first came across the stone ax and basic tools.

His book The Origins of Virtue helped me take a game-theoretical framework towards virtues and ethics. His book The Evolution of Everything continued that theme towards everything evolving. I'm sad to say I've missed one or two of your books in there, Matt. The Agile Gene, I have to go back and read that one. And most recently,

Matt wrote a great book called How Innovation Works, which will be out by the time this podcast is out there. I had the pleasure of reading an advance copy over the last week.

Welcome, Matt. I'm honored to have you here. Do you want to give us a little bit of your background and how you got into writing about science?

Matt's Background

Matt: Naval, it's great to meet you and interesting to hear that story of how you've read so many of my books and got the point of them. It's wonderful. I'm someone who's enjoyed writing all my life. I became a professional journalist after a brief career as a scientist. I only got as far as doing a PhD in biology and then decided that I wanted to be a writer instead. So I became a journalist. I was a science editor at *The Economist* for a number of years and also served as a political reporter and correspondent there as well.

I then became a freelance writer. That was when I wrote *The Red Queen,* which was a book close to the topic I'd been studying as a biologist, that is to say, the evolution of sex. From there on, I've been incredibly lucky because people have given me contracts to write books about things that interest me. At the moment it's about every five years that I do a book. But I don't do a book until I'm interested enough in a topic. It's a very difficult decision, plunging into writing a book on one topic and thereby not doing all the other topics you want to write books about.

The New Book

Naval: I read this book in preparation for this conversation, so it's suffered from becoming a chore. Because normally one reads purely for enjoyment at their leisure and this time it became more about hitting a deadline. That said, this has been your most impactful book for me since *Genome*. It was very revealing. There are two things about this book that put it in a different class than your previous books, for me.

One is that it corrected a long-standing misconception I had about how Silicon Valley works. I am steeped in Silicon Valley. I've been here since 1996, I'm an investor in hundreds of companies. I've started close to a dozen companies. I thought I knew this game as well as anybody, and your book corrected a serious error that I had in my mind of the framework of how Silicon Valley works. And we can get into that.

The second thing about this book is that it was actionable. The first half was this collection of incredible stories about inventors and innovators that would be fun, historical reading in its own right. But then the second half explains how innovation works, what helps it works and what stops it from working, what creates the conditions for it to work and not work.

So I recommend this book for two classes of people. One is innovators and would-be innovators themselves. If you're an entrepreneur in Silicon Valley, Shanghai or Bangalore and you're thinking about creating products—whether it's social media, launching rockets, building airplanes or genetic engineering—you need to read this book because it will give you a better view of the history of innovation as well as the future of innovation than any other book that I know of. That context will be incredibly important when you're trying to figure out things like: "Do I file patents? How important is the role of science? How important is the role of government? How long will it take for my innovation to be adopted? How much can I expect to sink into legal battles, vs. explaining things to people, vs. building the product?" So it's a must-read for that category of people.

The other category that it's very relevant for is government officials. Because to the extent that many of them pay lip service to the idea of building "the next Silicon Valley" or attracting entrepreneurship, they don't know how. People ask me this all the time, and I give them basic, vague things like, "Yeah, you need to have some freedom, you need to have nice weather, you need to have a university system." But this book has an actionable playbook near the end for how to foster that environment.

Matt: I'm very encouraged that you think it's practical and actionable because that's one thing I wanted to do in this book. Most of my books are, on the whole, thinking about the world, rather than changing the world. But in this case, I wanted to try and zero in on the practicalities of what innovation does involve.

Naval: There's one line that I pulled out from near the end of the book which is this idea that "innovation is the child of freedom and the parent of prosperity." I love that line. That's a great tweet right there. Child of freedom, as to how do you create innovation? You have a very expansive definition of freedom in there. And the parents of prosperity, why it's important. We can get into both of those, but I thought that was a good summary. I don't know if you meant that to be the summary, but that is the one that stuck out to me.

Matt: Yes, indeed. Your ideas are often triggered by other people's ideas. You almost need someone else to tell you what you're saying. This freedom theme, which ended up on the cover of the book, was pointed out to me by the first reader of the book, a very intelligent friend of mine, John Constable, who thinks about things very deeply.

He came back and he said, "Well, the basic theme is freedom. Have you realized that?" And I said, "I don't think I have realized that, no." I then rewrote some sections, and that's probably where that soundbite came from. It was one of the last rewrites.

Naval: Another theme that is very obvious and profound is that there's this conversation that goes on over and over about almost everything in history: Is history the product of a few great men and women, a few great accomplishments, a few great moments, a few great battles, a few great inventions that happen to come along, or is it an inevitable, inexorable and evolved process? You conclusively lay out, with lots of evidence, that innovation is an evolutionary process, rather than an invention process. And you call it *innovation* rather than *invention*. That seems a deliberate choice. Tell me about that choice.

Invention vs. Innovation

Matt: I try to draw a distinction between invention and innovation. It's not a distinction that is cast in iron, but I think this is the best way to think about it. Invention is the coming up with a prototype of a new device or a new social practice innovation. Innovation is the business of turning a new device into something practical, affordable and reliable that people will want to use and acquire. It's the process of driving down the price; it's the process of driving up the reliability and the efficiency of the device; and it's the process of persuading other people to adopt it, too. Thomas Edison captures this point very well. I don't think he used the word "innovation" much—he used the word "invention"—but he is mainly an innovator because he's not necessarily coming up with original ideas. He's taking other people's ideas and turning them into practical propositions.

Edison said this is a process of 1% inspiration and 99% perspiration. What I'm trying to do in this book is rescue the perspirators from obscurity and slightly relegate the inspirators, who will always think they deserve the most credit, and who sometimes complain about not getting enough reward because it's their original idea. I like to tell the story that Charles Towns, the inventor of the laser, used to tell, of a rabbit and a beaver looking at the Hoover Dam, and the beaver says to the rabbit, "No, I didn't build it, but it's based on an idea of mine." That is how inventors quite often think about innovations: "Come on, I had the idea!" But it's a huge amount of work and talent to turn an idea into something practical.

Naval: This is something that you learn in Silicon Valley very early on, that ideas are a dime a dozen. Every idea has been floating around. Even a lot of the old ideas that failed weren't necessarily bad ideas; they were just the wrong time.

In 1999, for example, we had the dot-com bubble. We had things like Webvan and Kozmo failed back then, but now we have Instacart, Postmates and DoorDash, which work. We had Pets.com, which crashed, and now we've had a big dog food company bought by Amazon for over half a billion dollars. So these things do work—they just need that right structure of previous innovations to build on top of. And sometimes you're jumping too far ahead. The previous innovations stack or the shoulders that you want to stand on, the giants don't yet exist, so you're trying to bootstrap too much.

Matt: One of the things I'm doing in this book is slightly downplaying the importance of disruption. Most of the time innovation is an incremental process. It looks disruptive when you're looking backwards. but at the time it's surprisingly gradual. The first version of a new technology looks surprisingly like the last version of an old technology.

Naval: This is the misconception about Silicon Valley that you fixed for me. I grew up reading science and scientists, and I originally wanted to be a scientist. But I was never very good. I knew I wasn't going to be a world-class physicist, and I wanted to make money, so I pivoted into the technology business, which I thought was commercializing science and bringing it to the masses. I came to Silicon Valley thinking that invention was a thing that I'd read about, where a genius inventor comes up with a new invention and it changes the world.

Oliver and Wilbur Wright created the airplane; Samuel Morse created the telegraph; Alexander Graham Bell created the telephone; Newton and Leibniz discovered calculus—without them we would have been stuck in the Dark Ages for god knows how long. That was my view of how the world worked.

> *"There's an old quip in Silicon Valley that the reason we do well is because we operate in the last unregulated domain."*

When I came to Silicon Valley, I looked around and I didn't see that happening. I didn't see a single genius inventor creating a single thing that suddenly changed the world. I saw, instead, lots of people doing lots of tinkering.

Somewhere in the back of my head, I adopted this mentality that, even though I am in Silicon Valley and even though it is the engine of innovation for the world today—or seems like it—we're not as innovative as we used to be. We've lost the great people; we've lost the audacious goals; and we don't invent new things. The lone inventor has gone away.

Your book showed me that that was a myth. That lone inventor never existed. Innovation is going on all around us right now, especially in the unregulated domains. There's an old quip in Silicon Valley that the reason we do well is because we operate in the last unregulated domains. But it didn't seem to me like there was innovation going on. Now I realize it's an evolutionary process with lots of people looking at it from different views. Perhaps I am in an innovative industry, but I just can't see it because I see the evolutionary process eternally, as opposed to the breakthrough process.

Individuals vs. Teams

Matt: I'm delighted to hear that that is what you're experiencing because I very much set out to make that point. It's not a case that there was a Golden Age when individuals invented things and nowadays it's teams that do it. It was always teams, in the sense of collaborators. They weren't necessarily working for the same institution. Our habit of giving the Nobel Prize or that patent to one individual has tended to pull out the great man of history and put him on a pedestal where he doesn't necessarily deserve to be. He's very important, but he's putting the last stone in the arch and other people built the rest of the arch.

In the book I describe one of my heroes, Norman Borlaug, who developed short-strawed, high-yielding varieties of wheat in Mexico and then persuaded India and Pakistan to take them up, and effectively kicked off the Green Revolution, which drove famine largely extinct on the Indian sub-continent and led to India becoming an exporter of food rather than a chronically starving country.

But where did he get the idea of these dwarf varieties of wheat which could handle higher applications of fertilizer and therefore produce greater yields? He got it in a bar in Buenos Aires at a conference from Burton Bales, a fairly obscure agronomist who happened to be at this conference but had seen Orville Vogel growing this stuff in Oregon and crossing different varieties.

Orville Vogel had gotten these varieties from Cecil Salmon, who'd been on Douglas MacArthur's staff in Tokyo at the end of the war and had visited agricultural stations in Japan and found these dwarf varieties growing. And they had been developed, crossed, hybridized and bred by Gonjiro Inazuka, and he had got them from somewhere in the Korean Peninsula. And at this point the trail goes cold.

If you then jump back to Norman Borlaug and say, "Yes, but he didn't persuade India single-handedly. He talked to M.S. Swaminathan, an Indian geneticist who picked the ball up and did a huge amount of work to persuade his countrymen to take up this technology." So there's a nice example of what looks like a linear chain of people, but, in a sense, it's also a team, a collaborative enterprise and a much more gradual story than it would be in the normal way of telling it.

Geographic Concentration of Innovation

Naval: This also helps explain why it tends to be geographically concentrated. If it was a breakthrough by lone individuals, you would expect innovation to be highly geographically distributed. But it tends to be very geographically concentrated where you're surrounded by other inventors, tinkerers and thinkers, because you're always building on little bits and pieces. We see that in Silicon Valley, where it's geographically dense and concentrated almost to a level that seems unfair to the rest of the world. One person's idea at a cocktail party goes to the next person at a coffee shop, goes into a prototype, which goes to a VC, who talks about it with the portfolio company, who then mentions it to another entrepreneur, and so on.

Matt: I'm amazed by how geographically concentrated innovation is at any one point in history. In the last 50 years it's been California, but there was a period when it was Victorian Britain. There was a period when it was the low countries. There was a period when it was Renaissance Italy. At some point it was ancient Greece. It was Fujian China for a while. It was probably the Ganges Valley at a different point. Why is the bushfire only burning in one place at one time? The key to this is understanding the ecosystem in which these innovative people operate. Because they're not only getting ideas from each other, daring each other on to be innovators and experiencing unique aspects of freedom that allow them to do it. They're also directly borrowing technologies. It became clear to me when I was writing about the harbor process, which fixes nitrogen from the air—a very important process for good and evil in terms of making explosives, but also in terms of making fertilizer—that it couldn't have happened without all the other industries around it in Germany that were producing the high-quality metals and chemicals that were necessary for this process. The same will be true in Silicon Valley: One idea won;t work without the neighboring company producing devices and programs that are necessary in developing your idea.

Naval: Now it's gotten to another level where, when you first create an innovation and launch a new product, you need customers. The early-adopter customers tend to be other innovative companies. In Silicon Valley we have a critical mass of thousands of innovative companies that will adopt products from each other, so you not only find your innovator base and your talent base in one place, but you also find your customer base in one place. That network effect ends up being very tight and, of course, the local politicians exploit it with high taxes and low services, constantly attacking and blaming technology for all evils, but it works for them because this has turned into the golden goose. It's the oil reservoir that will always be gushing, so they can get away with a lot.

Matt: Until it no longer is gushing. One of the patterns of innovators is that they move. They move from uncongenial regimes to congenial ones. The secret of Europe when it was at its most innovative was that it was fragmented politically. It's very hard to unify Europe because of all the mountain ranges and peninsulas. So, you end up with lots of different countries. A lot of the innovative people like Gutenberg, the pioneer of printing, had to move from his hometown to another town to find a regime that would allow him. The same is true, I reckon, of China during the Song dynasty, which is the period when it was most innovative. It was a surprisingly decentralized empire at the time. And it was possible for people to move around and escape from local rule that wasn't promising.

America is the exception that seems to prove this rule. Although it looks like an empire from the outside—a great, big unified country—once you get inside it you find that California has a quite different regime from other parts. Even this week, Elon Musk was talking about leaving California and moving to Texas because he's so upset with the way they're treating the end of lockdown. It's like a 15th Century European innovator threatening to leave one part of Germany for another part of Germany.

Crypto

Naval: For a long time I had thought, despite the poor political governance, California was impregnable. It had too much of a network effect; the lock was too strong. But now I can see the cracks.

This pandemic, of course, is accelerating things, forcing people to work remotely. Twitter recently announced they're going fully remote. Many of the companies that I've been involved with are wondering, "Should we even go back to having an office?" I wouldn't be surprised if the next Silicon Valley moves to the cloud. That would be an incredibly good thing for all of humanity, because then we could distribute it. Obviously, some things can't move to the cloud. You can't have a semiconductor manufacturing plant in the cloud, but a lot of the initial coordination, invention, social networking, conversation, design work can happen in the cloud.

There is recent precedent for this. I don't know how much you've been tracking the crypto revolution, but crypto obviously went through its big hype cycle a few years ago. At this point there's a lot of innovation going on in crypto. We're now in that silent under-the-radar phase where great entrepreneurs are building great products that will be more widely deployed in the next 5 to 10 years. What's interesting about crypto is that it's truly geographically distributed. Some of the biggest innovators in crypto are scattered all around the world. More than half of my crypto investments are outside of the Bay area, which is not true of any other class of investment that I do. Many of the top crypto innovators are anonymous, like Satoshi Nakamoto famously.

> *"I wouldn't be surprised if the next Silicon Valley moves to the cloud."*

Crypto companies raise money in public, in plain sight, by issuing tokens so they're not locked into the Sand Hill Road venture capital model. The crypto system is starting with finance but is laying the foundation for future companies to be built completely distributed with potentially anonymous contributors, anonymous funding, anonymous cash and anonymous developers. There's even a Holy Grail of crypto called *autonomous organization*, which are these companies that are smart contracts living in the block chain completely extra-sovereign outside of the state, able to engage in contract laws, contract enforcement, payments, dividends, investment, equity, debt, payouts, reputations and reconstructing the corporation—but modernizing it from the Magna Carta days to a modern code-based system living on a mathematical, reputation-based, anonymous blockchain.

I wouldn't be surprised if 10 years from now that the rest of the tech industry is just as distributed as the crypto industry is today. California and the Bay area will still do fine. They will still be a hub. I don't believe that innovators will get priced out of the Bay area, because innovators are the highest earners in history; they're the most leveraged people. They're leveraged through code, capital, media, labor, intelligence—they can create more than everybody else on a per capita basis. So they can always afford to live wherever they want to live. They won't be forced out by prices, but they may be forced out by regulations. They may be forced out by not being able to go to work because the government forbids them. They may be forced out because the place is no longer attractive to live

If they are forced out, it would be amazing for everybody if they moved the cloud rather than to another physical location from which we may be displaced. In the examples that you gave, they're punctuated. In between each one of them, there's 50, 100, 200 years that pass where there is no place to innovate. Therefore, the rate of innovation collapses. So if innovation is the flower of a well-tended garden, if you have to uproot those flowers and shift them, there is a huge deadweight loss to society when, for decades or perhaps even centuries, we have to wait for another garden to emerge and for people to coalesce there for this right magic soup of deregulation combined with innovators, good weather and a rich society— all of that has to assemble.

Matt: Thank you very much for that, because that has filled in a gap in my understanding in one go. I've always been interested in the fact that these innovation bush fires eventually are extinguished by some combination of chiefs, priests and thieves, if you like.

Naval: I like that: chiefs, priests and thieves. Or, as a wag might say, "Chiefs, priests and thieves—what's the difference?"

Political Fragmentation and Innovation

Matt: Right, exactly. So, in Ming China it's a very, restrictive authoritarian and interfering political regime that kills the goose that's laying the golden eggs. In Abbasid Arabia, not hugely different in the time period—we're talking about 1100s—a great, flowering of knowledge and innovation is crushed by a religious fundamentalist revival when Islam goes from being a very open-minded to a very closed-minded structure. Something similar is happening in Paris around the same time. Bernard of Clairvaux was burning books. I singled that out in a previous book as a period when it's possible the world could've lost this habit all together. It could've given up on innovation everywhere. The flame would've been extinguished.

> *"What if America does lose its mojo and we have to rely on China for the world's innovation engine?"*

Fortunately, the Italian city-states kept the flame burning. I write about Fibonacci, the Italian merchant who brings Indian numerals from North Africa back to Italy, and they spread around the world. It's lucky that somewhere keeps the show on the road at each stage in history, but it's not accidental. These are people escaping the other regime and starting it again. But I did worry that, in the old days, there was always somewhere else to go and in this global world. You could imagine a sufficiently benighted cult taking over the entire world and saying, "No, we don't want learning, innovation and technology. We want to stop everything."

It's very unlikely, but what if America does lose its mojo and we have to rely on China for the world's innovation engine? China is not a free place. It's a politically dictatorial regime, albeit there's a certain amount of freedom for entrepreneurs below the level of politics. If that's our only hope, it's not a great prospect. Maybe India can pick up the pattern. Europes not great at picking up the pattern at the moment; it's not a very innovative continent. It's trying to centralize all its decision making through the European Union.

But India has done this before. It was probably the first place to start all this going. A place of free thought and a lot of spontaneous order— a lot of spontaneous disorder, too. Maybe that's the place. But you've given me another prospect, which is this escape from the chiefs, priests and thieves into the cloud where it can be out of their reach for at least long enough until they work out how to reach it.

Naval: I think the digital innovation can escape into the cloud. Obviously, physical innovation requires physical infrastructure, and that would depend on the enlightened city state, a Switzerland type place or Hong Kong. A Singapore or a New Zealand. But then you have the small-market problem. You don't have many early adopters of the technology. Although you can build a prototype, you can't deploy it in volume. I do think physical innovation is in trouble, and you talk about this in the book. The speed of innovation has been very low in some places. For example, we can't travel any faster than we used to. Why is that? It's mostly for regulatory reasons.

One underlying theme running this whole book is innovation is a process of evolution. Like any process of evolution, it requires trial and error. Innovation happens by taking the body of innovators that surround you one step further, engaging in lots of trials and then having error and feedback from customers and the economy. All of those pieces are necessary. You need to have a body of innovators around you, which means there has to be a place where they can all gather, whether it's online or offline.

There has to be the ability to take lots of tries. You need venture capital. You need start-ups. You need a friendly environment to start a business. We don't like people making errors anymore, so we try to cover the downside risk. But by doing that we've also cut off the upside. Finally, you need the feedback loop from the environment, and part of that involves a large customer base.

> *"California doesn't create entrepreneurs. California attracts entrepreneurs."*

So I'm optimistic that we can do this in the digital domain. I can see that happening in crypto, for example. But I'm a little pessimistic in the physical domain, which is unfortunate because a lot of the big problems of humanity that we have to solve—like the energy problem, getting nuclear fusion working at large scale or the transportation problem, moving people around quickly with hypersonic jets, or even some of the biotech problems—these require physical infrastructure and large markets that are relatively deregulated. So I think you're right that we're down to India and China—and neither of those is ideal. China is not going to be a place where the next Jew fleeing the Nazis is going to go because China is not an integration destination. It doesn't attract the best and brightest.

California doesn't create entrepreneurs. California attracts entrepreneurs. China is not going to be an attractor, and it will always be limited because of that. Even though India has a lot of the other elements, it doesn't have the basic infrastructure to make it an attractive place to go. Because of its poverty level, India also has a very anti-innovation culture. Innovators in India often survive by keeping their heads down. You can see this in how India banned crypto. Hopefully that'll get overturned, but they can do things like that. Early on something got listed on eBay India that wasn't supposed to be listed, so they just rounded up the local eBay managers and threw them in jail.

The history of India fostering innovation recently has not been great. That said, there is a flowering going on right now in places like Bangalore, Mumbai and Delhi. Hopefully, as India gets richer and is run by a more competent government, we're going to see them step out of the way and allow India to become an innovation hub. The market there is large enough; they're poor enough that they could welcome it; they speak English; they're very well educated; there's a deep respect for STEM—so India could be one of these hubs. But they would also need immigration and clean, beautiful places where people want to live. Innovators are going to go live where they want to live because they're so productive.

You said something else very interesting: What about people who may create a global movement to stop innovation? That is very scary and very possible. Take environmentalism for example. It runs on two tracks today. There's local environmentalism that everybody can get behind—clean up my rivers, save the species, I want trees, forests and parks. Everybody likes that. Then it gets mixed into this global command and control environmentalism, which says, "You must stop progress. you must stop innovation, you must stop everything because you're destroying the environment." One of the things that you talk about in your book is how the world is refreshing, how innovation allows us to do more with less, and how we've become much more efficient as a society.

We're not going to be able to stop India and China from growing. We're not going to be able to stop them from innovating. We're not going to be able to stop them from modernizing. We can do what Elon Musk does: He says let me give them solar-powered electric cars and rockets as quickly as possible so they can jump through the wasteful phase of innovation, where there's a lot of environmental destruction, and get to the part where we can all afford clean rivers beautiful forests, nice parks and other species in our environment. By the way, I credit this to *Genome*. The book paints a picture of utopia.

Not in the sense of a top-down, human-enforced, platonic sense of this is how the world should be run, but in how the natural world is designed and operates, and our role in it. *Genome* paints a picture of paradise being a garden. This is in our deeply embedded myths: The paradise that Adam and Eve live in is a garden. They fall from grace, and they fall out of the garden.

Today in Covid-19 land, where do you want to be living? In your little apartment in New York city or a little flat in London? Or do you want to be sitting in a beautiful garden out in the sunshine? Humans inherently want a clean and beautiful environment, but that movement gets hacked by top-down command-and-control mechanisms by chiefs, priests and thieves who can then squander our existing resources as well as squash innovation, which prevents us from moving forward.