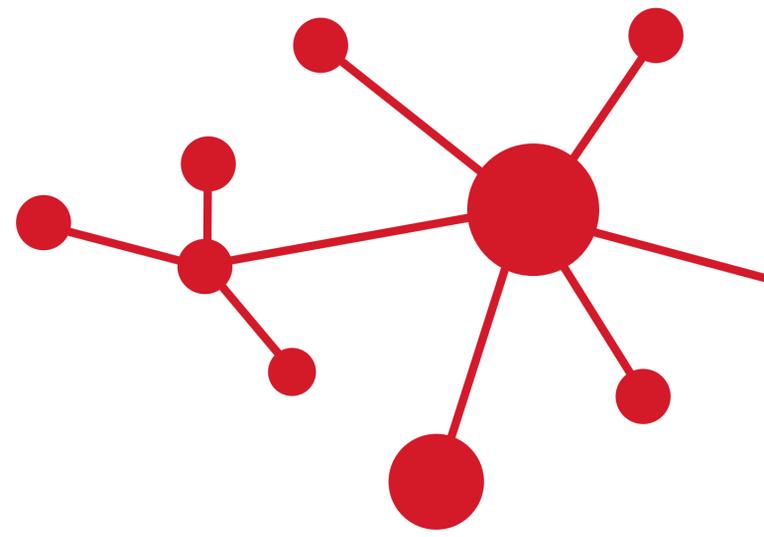


The Knowledge Project



Walter Isaacson:

Curiosity Fuels Creativity

EPIISODE #121

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Walter Isaacson is here today. He's been the president and CEO of the Aspen Institute, the chair of CNN, and the managing editor of Time Magazine. He's also the author of several acclaimed biographies on Einstein, Ben Franklin, Steve Jobs, and DaVinci. He's also written *The Innovators* and most recently *The Code Breaker*. Naturally, any conversation with someone who has studied and written about so many people will cover a lot of ground and this one does not disappoint.

Shane: Let's start at the beginning. You started writing about Ben Franklin and then Einstein, and then Steve Jobs, and then DaVinci. What made these lives worth exploring?

Walter: When I worked at Time Magazine or I was growing up, I knew a lot of smart people. It suddenly occurred to me that smart people are a dime a dozen and they don't usually amount to much. The real key was being creative. To be able, as Steve Jobs would say, to think differently and to be innovative.

I started looking at: what are the clues to creativity and innovation? And whether it's Leonard DaVinci or Ben Franklin or Steve Jobs, these are people who love to see patterns across nature. They were interested in everything you could know. By seeing those patterns, they made mental leaps that others didn't do. And so I've never been interested in powerful people necessarily, or poets or soldiers, I've been interested in creative thinkers.

Shane: What's your method for studying people and telling a story about them?

Walter: It's pretty simple. It's chronological; you begin at the beginning. A lot of historians don't believe in narrative or chronology. But I grew up in Louisiana and I had a mentor who said that two types of people come outta Louisiana: preachers and storytellers. He said, "For heaven's sake, be a storyteller. It's the way the Bible does it."

You start with a great lead sentence in the beginning, comma, and you make it a chronological narrative.”

And so all of my books use that as a guiding principle because that’s the way we lead our lives, that’s the way we learn things. That’s the way we develop our character, is step by step, day by day.

Shane: One of the things you do that struck me as surprising is that you print everything out at the end of the night and then you review it in the morning.

Walter: Things look different on paper than they do on the screen. When you see it on paper the next morning, you’re able to find those sentences or those phrases that don’t quite track or that read kind of clunkily, you see where the whole thing is kludgy in part. I love reading something on a screen, then I love reading it on paper. And then I love reading it aloud.

Shane: Let’s explore Steve Jobs for a moment. Jobs’ early mentor, Mike Markkula wrote him a memo in 1979 that urged three principles. The first two were empathy and focus, but the third was an awkward word, impute. But you said it became one of Jobs’ key doctrines. What does impute mean and how did it play in?

Walter: It was definitely an awkward word. But impute means: “what does something signal when you first see it? What does it imply?”

I remember getting my first iPod, a thousand songs in my pocket, that’s going to be great. And as you open the box, it opens up as if it’s a Tiffany jewel box, and cradled in it, is this wonderful object of desire, your first iPod, and it kind of imputes things.

It doesn’t just say, “Here, cut open the cellophane here.” It just has something magical.

Even when Steve Jobs did the original Macintosh, he made it so the boxes that they delivered them in, the boxes that you got your Mac in, had color. And the people there were saying, “Wait, that’s really expensive to make boxes for color.” He said, “Yes, but we need to impute. We need to impute the fact that this is going to be an object of delight.”

Shane: I think we still underappreciate that.

Walter: Yeah. I mean, you look at all sorts of junk things in our lives, from our TV remote controls to the packaging on our products, to the way perhaps our computer screens now work. You look at, I don't know, Microsoft Teams and it imputes that this is going to be a horrible experience, I'm not user friendly with you. So I think that we need to see life through the eyes of Steve Jobs more often and say, "What is this signaling to me? How can I make it more user-friendly?"

Shane: It's quite a contrast from an efficient hyper-focused world where profits come before products. But I think one of the keys to Jobs is understanding that products came before profits.

Walter: He said, "If you focus on making profits, you're going to cut corners, you're going to do things. You'll juice up your revenues, you'll cut your costs a little bit. You'll make a profit." But that way is a path to disaster. He said if you focus on making a really insanely good product, the profits are going to follow.

Shane: Well, your book on Jobs is a biography. So many people use it as a manual to achieve something great. What are some of the lessons that we can learn from Jobs?

Walter: We, biographers, don't write how-to books. I didn't write about Ben Franklin to say how to be a diplomat or a leader, or how to book with Steve Jobs saying how to run a company or for that matter. Jennifer Doudna is the latest hero of my books.

These aren't seven secrets to success or seven easy lessons for how to run a company. In fact, when people would come up to me and they'd say, "I used your Steve Jobs book." Like Elizabeth Holmes would—the person who invented Theranos or launched Theranos say, "Oh, I used your Steve Jobs as a how-to book." I'd go, "No, no, no. It's not a how-to book. Don't try this at home."

First of all, there's only one Steve Jobs, there's only one Leonardo DaVinci. You've got to study a whole lot of lives. You've got to figure out what's most comfortable for you and how you manage people, how you deal with people.

What are your goals? What is your mission? And that comes not from reading the 12 lessons to this or the 10 secrets to that. It comes from looking at other people saying what makes them successful, what makes them easy to deal with, what type of attributes do they have that you aren't going to have?

Even if I wanted to be as successful as Steve Jobs, I would never have all those attributes. So I got to play with the cards that have been dealt with me and play to my strengths. And that's what I try to do in my books, is I say, "I'm telling you about real people here, people made of flesh and blood. If you want to learn the lessons without understanding the people, good luck to you, but that's not the way I teach it."

Shane: Jobs is famous for his intensity. Where did that come from and how did he manage to avoid complacency?

Walter: He had a real focus to him. He cared. He had a passion. That passion was obsessive. I see it in a lot of people I've written about.

There was a playful and obsessive passion in Leonardo DaVinci. He just wanted to understand everything he could know about all things knowable. When he's doing the Mona Lisa, he's dissecting the human eye to see how light rays hit different parts of the retina. He's dissecting the muscles and nerves that touch the lips to see whether a muscle that moves the lips also moves the eyebrow, those types of things.

This type of people who realize that God is in the details is the people who make great advances. And I put Leonardo in that category, I put Ben Franklin, Steve Jobs in that category, Jennifer Doudna, as she's trying to understand the inner workings of molecules and realizes that the structure of a molecule, the structure of a piece of guide RNA, the way it twists and folds determines how it becomes a key to unlock the mysteries of life. That type of passion for the details is to me one of the keys to creativity.

Shane: I think you just gave a great preview of the rest of this episode. I want to get into all those people. Before we get there, I still want to continue on the thread of Steve Jobs a little bit because we're talking about the pursuit of perfection in the small details. Jobs worried about things that nobody would ever see, like how it was laid out on the micro board and what was behind the screen that nobody would ever look at.

How did that help him and how do you think that hurt him?

Walter: When Steve was young, he and his father built a fence around the backyard in their house in a little town in California. And his father said to the young Steve Jobs, “We’re going to make the back of the fence just as beautiful as the front of the fence.”

Steve said, “Why? Nobody’s ever going to see it. It’s facing scrubland, nobody’s ever going to know.” And his father said, “Yes, but you will know.” The lesson Steve Jobs took from that is that if you care about beauty, you care even about the beauty of the parts unseen.

And so Steve, whether it was the circuit board on the original Macintosh or the various types of ways that the chips were lined up, he wanted to make sure that the beauty of the parts unseen showed that you were a real artist. His father said, “If you’re making a cabinet, and the back of it faces the wall, you still use a good piece of wood facing the wall because that’s how you know you are a real artist.” So when Steve Jobs and his small team did the original Macintosh, the case was sealed.

You couldn’t open it up, you couldn’t see the circuit board, and yet he decided to make it beautiful. He asked the 30 engineers on the team to sign their names onto a whiteboard that they engraved on the inside of the case where nobody would ever see it, nobody would ever know, but their signatures were on the inside of the case. That made them into real artists.

Shane: What moments did you have where you were like, “Wow, I had no idea,” when you were researching Steve?

Walter: Oh, I think that the details of design. I remember walking around the design studio with him and Jony Ive. They were working on electrical plugs for European outlets and there were about seven different prototypes that they could use. Steve was fondling each one talking about the chamfer, which is the way a piece curves and about how it would feel in your hand—how it would delight people.

Now I must admit if you asked me about my Mac and how it plugged in, I don’t know that I even know what the plug that plugs into the wall looks like, exactly how it’s curved, exactly how it’s shaped.

But after Steve did that, I realized that you have to care and be passionate about the beauty of design and that the design includes the hidden things, the design includes the small things. It includes the details.

And so I've always tried to be a little bit more aware of why say a plug for one, a piece of equipment is so much cooler than a plug for another piece and what that says about the people who made that product.

Shane: Steve saw firsthand how money changed people at Apple and how a lot of the misfits started to act rich. I think he had a comment about fancy cars and big homes. How did he keep so grounded throughout life and not let money ruin him?

Walter: I think it's important for people not to be driven just by the toys you can buy. I see that in Elon Musk now compared to some other billionaires. He's not defining himself by the number of houses. I think he's divesting himself of his houses. Steve Jobs never had the fanciest mansions and he took quite a long time before he even got furniture for them because he didn't define himself by material objects.

Near the end of his life, I asked him about the meaning of all this. He said that he'd learned from his guru in India that life is like a river. At first, you think that if you're successful, you get to take many things out of the river, products people have made or ideas they've come up with. But he said, "Eventually in life, you realize that it's not what you get to take out of the river, it's what you get to put into the river." He was a very spiritual person guided by his Buddhist training and I think that helped keep him grounded.

Shane: Not only was he spiritual, but he also had a reputation for being hard on people. I think at one point he said, "I don't think I run rough shot over people, but if something sucks, I tell them to their face. It's my job to be honest." Have we lost that today?

Walter: Intellectual honesty is something that can push people, make people a great leader, it's something that's... I've been a manager, I've run companies, I know that being really brutal and intellectually honest is important.

First of all, you motivate them, you drive them, you let them know where they're not performing and how they can and you make sure that you don't have a team, as Steve Jobs said, that's filled with B players, you've only got A players on the team. I think we all have to look into ourselves as managers.

I had many failings as a manager when I ran Time Magazine or CNN. And one of my failings was that I wasn't as comfortable being brutally honest or telling people they sucked as perhaps a stronger manager would've been. But after a while, I realized, "All right, I got to play to the strengths I have." I look at somebody like Jeff Bezos or Bill Gates, people who have run great companies, I look at how Jennifer Doudna forms a lab and a consortium to do experiments on gene editing and I say, "How do you form teams?"

Jennifer Doudna will tell me, "I like to make sure everybody meets each other before they join our team and that they all feel that they fit in and everybody feels they fit in."

I said, "Well, that's a little different than a Steve Jobs who likes creative tension, likes to make sure that people are going to sometimes push back and not just go with the flow." She said, "Yeah, everybody's got their style but my style is I like collegiality and collaboration."

You can look at Ben Franklin. He was good at forging collaboration and cooperation, pushing compromise, smoothing over differences. He was definitely not known for intellectual honesty. In fact, sometimes he was considered being too diplomatic, which is a euphemism for not being all that intellectually honest. But in building a team like our founders, you needed passionate people like John and Sam Adams, you needed people of high rectitude like Washington and smart people like Jefferson and Madison. But you also needed somebody who could be the glue and who held people together.

So sometimes pushing people through intellectual honesty and brutality is important if you're going to create the most insanely great phone or iPod. But also sometimes being the person who glues people together and gets them to work in harmony—that's a talent you need.

I write about those different talents, whether it's Ben Franklin pulling together the founders, Jennifer Doudna pulling together a consortium of scientists to fight COVID, or Steve Jobs creating the awesome team he created at Apple.

Shane: Steve believed that even though we live in a virtual world, physical spaces are the secret hiding in plain sight for creativity. I believe you wrote creativity comes from spontaneous meetings from random discussions. You run into someone, you ask what they're doing and you say, "Wow," and soon you're cooking up all sorts of ideas. What do you think would be his take on remote work today?

Walter: I think that if you look at the Coronavirus lockdowns and the way we were all sent to our room for a while, we can understand what works well virtually—as many things do, including a lot of unnecessary meetings work better virtually. But we also know the importance of face-to-face interactions, actually seeing people, especially when it's teamwork. You can do teamwork, like in my book *The Code Breaker*, they're able to work on three continents in different countries and help figure out CRISPR, a gene-editing tool.

But when they started the project, it helped to be there physically, to be there in person, to be kicking around ideas in a lab over dinner. Likewise, whether it was Steve Jobs who designed the Pixar headquarters to make sure everybody had to walk through the atrium and bump into people and exchange ideas to the Apple headquarters, physical places tend to have serendipity to them. They tend to be unscheduled encounters. They tend to be things where you can gauge somebody's interests and emotions perhaps better.

When we look at places throughout history that have been cradles of creativity—and that's sometimes what my books are about. Why was it that in the 1470s when Leonardo DaVinci went to Florence, it was a mix of people from all over the trading world, from the Arab world? With the fall of the Ottoman Empire from all over Europe because of the strength of the Florence currency, they're all there in Florence. That becomes a cradle of creativity. Likewise, Silicon Valley becomes a cradle of creativity in the 1970s and for that matter, Philadelphia in the 1770s.

This happens because certain people get attracted to places where there are diverse ideas and energy to them and doing it on Zoom can sometimes recreate 60% of that. As a professor at Tulane here in New Orleans, I did a lot of my teaching on Zoom.

But I love the fact that the kids were actually on campus and that I could meet with them some, and now I'm back seeing them and we're just kicking around things and discussing things.

I think Tulane was right to do in-person campus even during some of the pandemic and it showed me how important these in-person encounters are. And if you ask the students and you ask them to compare their experiences to people who went to other universities that were shut down, they'll just tell you how important it was to be able to hang around other people.

Shane: I like the idea of these pockets of innovation that crop up, whether it's Britain or Florence, or Silicon Valley. What are your hypotheses on why they tend to burn out?

Walter: Well, they tend to burn out sometimes when the tolerance and the diversity that distinguish say Florence in the 1470s get hit by a Savonarola or somebody who's going to ban and burn books of bonfires of the vanities. And we see the backlash against creativity, innovation, and diversity happening, had happened in this country over the past four or five years. It's happened in Europe, some and Hungary. You see a backlash against modernity.

You also see what's happening in the United States, which I think is good, which is a dispersal of creativity and cradles of creativity. It used to be very concentrated in Silicon Valley when it was all engineer-driven. But now that it's driven by people with creativity in various realms, whether it be music or art or literature, or for that matter, figuring out truck driving routes or figuring out manufacturing logistics, or boxing materials and also where the creativity and the technology is not just digital engineering, but tends to have to be connected to the humanities or for that matter to the life sciences.

Now in the United States, you're seeing places like Austin, Texas or Nashville or New Orleans, Boston, of course, with the huge boom in biotech. Even in small places like Chattanooga or Cleveland, Mississippi, places with good colleges or universities where there's creativity. You don't have to have it all concentrated in Silicon Valley the way it was for the final quarter of the 20th century.

Shane: Do you think we need it to come together for a revolution and then disperse, and then another a hundred years from now come together again and then disperse with whatever the new technology is, or is it something that can always be dispersed?

Walter: I think that it's almost like we found during the pandemic, which is if you want some bursts of creativity, it helps to have a lot of people interacting in real-time, face to face, intimately. And then you can disperse that creativity, whether it's a group that gets together and starts figuring out how to do gene-editing technology, and then they all go to their labs around the world and do it on Dropbox and Zoom and other ways of social media.

I think that's a metaphor for how we as a society sometimes have big bangs that start in a singularity, a particular place, and then the energy gets dispersed. People during the pandemic moved to places like my hometown of New Orleans because they could work anywhere and they decided they wanted to work in a place that was more fun or edgier or had more music or would have more food, whatever they liked. And so that dispersal happened because of the pandemic.

I think they also found that in places like that where there are great research universities like Tulane or great medical centers, there are ways of having creativity. But once again, as we see with this new revolution I write about in *The Code Breakers*, which is biotech, it does help to have a certain center of the explosion. At the moment that's Kendall Square in Cambridge with Harvard and MIT and then the Boston area, which has more research hospitals infringed than any other place in the world.

So you're right. It's sort of big bangs coming out of intense places like Kendall Square Cambridge or the Berkeley area now in California where Jennifer Doudna is, but then dispersing where we're watching in Memphis just recently, they're using CRISPR to cure people of sickle cell. Well, Memphis is a new center of creativity.

Shane: I want to switch gears here and come back to DaVinci for a second. I mean, I think it seems natural to explore DaVinci after Jobs because like Jobs, he was at the intersection of technology and arts, only in a very different era.

I think you said Leonardo had the ability not just to connect art and science, but to make no distinction between the beauty of art and science.

Walter: I remember all of Steve Jobs's product presentations end with that street sign showing an intersection of two streets called the arts and technology or the liberal arts and engineering. I think people who stand at that intersection tend to be more creative.

Obviously in history, the person who both symbolizes it, but practices it is Leonardo DaVinci. His Vitruvian Man, that naked guy doing jumping jacks in the circle in the square, that is an icon and a symbol and an intentional drawing of Leonardo's to show the intersection of us, humans, with the humanities, with the sciences, and with spirituality, how we're standing in the cosmos and on the earth.

Leonardo DaVinci was the person in history who did the most to understand all that was understandable about all things that you could know of, from art to anatomy, from math to music to zoology, he tried to understand everything. I think that that was a key not only to his creativity but what he represented, which was known as the Renaissance man. And that's what the Renaissance was all about, the rediscovery of classical knowledge, but also the connection of the humanities to the sciences.

Before then, most wisdom including scientific wisdom was handed down by people who interpreted the teachings of the church. Suddenly with Leonardo, you're, as he put it, following people like himself. He called himself a disciple of experiments of experience. He really cared to have a fact-based empirical approach to knowledge and that connected it to the humanities, and that's what the Renaissance was about.

Shane: He was a bit of a misfit and getting back to that observation of reality or experiential learning, was a byproduct of him being an illegitimate child. Was it not?

Walter: Well, Leonardo did not fit in. He was born out of wedlock, he was gay, he was lefthanded, he was distracted, he had flamboyant ways of dressing. And as a young teenager, he arrives in Florence not fitting in, and yet Florence, and this is why it's a cradle of creativity, embraces him. The Medici family gives him work. There you have Leonardo who both fits in and doesn't fit in.

He has a deep curiosity about the cosmos. What is our role in the cosmos? How do we find ourselves in this strange world? How are we supposed to fit in? So throughout his life, he's driven by a passion and by a curiosity about what is this world in which we find ourselves and how do we fit in?

Shane: One thing I like about DaVinci at least, or I took away from your work, is it doesn't appear he has a mind like Newton that just has so much more horsepower than we have and could do things that we could never do. It seems like the stuff that he did was within our reach and it was driven by almost just pure curiosity. How did he go about pursuing so many interests and so many subjects and get so much mental horsepower out of his mind?

Walter: It's a good point because I wrote about Albert Einstein. None of us can really, truly aspire to be Einstein. He had more mental processing power. He was able to do the equations that described general relativity, things that most of us mortals would not be able to accomplish. But Leonardo DaVinci and Ben Franklin for that matter were not necessarily the highest-powered intellectual firepower people of their time.

Leonardo was probably not as great of an intellectual as Luca Pacioli, his friend who was a mathematician. But what Leonardo DaVinci had, just like Benjamin Franklin, just like Steve Jobs, was an insatiable curiosity and a willingness to be curious about those things that you and I quit noticing after a while. I looked in Leonardo's notebooks. I was reading through his notebooks and there's a section on "why is the sky blue?" I can look right out of my window here right now, it's a deep blue sky, but I've spent all day not puzzling, "Why is the sky blue?"

What amazed me when I saw that in Leonardo's notebooks was boom, it's in Einstein's notebooks. He writes why is the sky blue? They both do experiments. Leonardo sprays water in the air and shines light through it. Einstein is using Lord Rayleigh's formula for the defraction of the spectrum of light, all trying to figure out why the sky is blue.

Now you and I are not necessarily into all these science experiments, but every day we can push ourselves to be a little bit more curious, to see the water rippling as Ben Franklin did on a pond and say, "Why do the ripples go a different way from the wind? Or why does the duck have webbed feet?"

Which causes Franklin to invent swimming flippers and causes Leonardo to try to understand flying.

We see it as a kid. We're all curious as kids, until grownups say, "Quit asking so many dumb questions." And then we get the curiosity kicked out of us. But Leonardo teaches us that to be creative, all we have to do is nurture that natural curiosity we all have inside of us.

Shane: One of the things that struck me that you wrote about a little bit was why fish are faster in water than birds are in the air. Can you explain that?

Walter: These are the type of things that Leonardo was curious about. Leonard says, "Wait, water is heavier. It's harder to go through. Why can't fish go faster than birds?" And he looks at how birds flap their wings. He notices which species flap them up faster, flap them down faster. When they take off, he notices how the webbed feet of ductwork. He does experiments with flowing water so does Ben Franklin when he gets to London.

Franklin has a little machine shows flowing water and he's looking for how things resist the flow of water and how they can use water, use a flipper in water to go faster because there's more to push against than there is with the air. Now these are simple things, you and I can figure out. Hey, you can push against water, you can push against air, what will work, what won't. But the thing about Ben Franklin and Leonardo DaVinci is that they're both doing that, they're even making little experiments, desktop experiments to figure it out.

Shane: What was DaVinci's relationship with Michelangelo?

Walter: Not good. They're both in Florence, both gay. Leonardo was proudly and openly gay, had a boyfriend, Salaì, who he draws and writes about and brings with him wherever he goes. But Michelangelo, it was known as the agony and the ecstasy. He feared the wrath of the Lord, he was much more religious than Leonardo DaVinci was, agonized about his sexual orientation and many other things. So they're not destined to be the best friends.

Michelangelo is a little bit younger but they're both the superstars in the art world in Florence in the late 1400s.

And they have a few encounters on the street that turn a bit nasty. But partly, I just think it was a difference in personality. Leonardo loved people, he was very gregarious. He always had scientists and artists and apprentices and students and musicians and historians and writers around him.

Michelangelo was very much of a loner and I guess that's why I was attracted a bit more to Leonardo DaVinci. I tend to think, as we talked about earlier in the podcast, that having people around you stimulate your creativity.

Shane: And so they pushed each other to go beyond where they would've gone on their own. I think at one point they both quit the same commission, didn't they? They were both hired as rivals and...

Walter: Right. They were great competitors and the elders of Florence made use of that by commissioning them to do works on opposite sides of the big hall, the big room in the town hall building and Leonardo was going to do a Battle of Anghiari painting and Michelangelo was doing another battle painting and there they were almost as if it were a Shark Tank or some bake-off and they each become somewhat unnerved.

Leonardo's drawings are just spectacular with horses having their faces contorted in rage and everything else. Michelangelo has a lot of nude people bathing. I mean, they're both very intense drawings, but they both quit before they finish. It's almost as if the competition drove them forward but after a while, the competition became too intense. Michelangelo leaves to go to Rome and ends up painting the ceiling of the Sistine Chapel. Leonardo ends up going to Milan and among other things painting The Last Supper. So they each remain rather productive, but they forego that commission in Florence.

Shane: That's a really interesting point. One of the things that struck me about DaVinci and painting was that he only finished 12 paintings. To what extent was perfect the enemy of good with him?

Walter: Totally. I mean, he was very much a perfectionist, something that he shared with Steve Jobs who would hold up shipping the original Macintosh because the circuit board inside was not beautiful enough. That perfection really hurt him.

But Steve Jobs finally realized they had a sign made for him when he came back to Apple after his exile and he had talked about what real artists do. They put up a sign saying “Real artists ship”, which means you get the product out the door.

Leonardo never had that sign on his studio door. All of his great paintings took a long time. Even when he finished them, he never really delivered them.

The Mona Lisa was a commission of a merchant in Florence for a picture of his wife. Leonardo keeps that painting as he goes to Milan, keeps the painting as he goes to Rome, keeps the painting indoors by his deathbed when he’s in France. He keeps thinking, “There are more and more brush strokes I can put on it to make it more perfect, to make the eyes follow you, to make the smile more mysterious.”

So even though that is pretty much a finished painting, it still wasn’t shipped to the original person with the commission. Many times whether it’s the Adoration of the Magi or Jerome in the Wilderness or for that matter, the Battle of Anghiari in the Florence town hall, we have half of what Leonardo intended. We have the drawings, we have the sketches, we have an unfinished painting. But sometimes the conception was more important to him than the execution. And when the execution became hard or became something he didn’t feel that he hit out of the park, he just left it at the conceptual stage.

Shane: That’s really interesting. And it’s my understanding the Mona Lisa wasn’t famous during his day, it became famous when it was stolen from The Louvre, is that correct?

Walter: No. First of all, it was a grand painting even in his time. Even by its bed in a château in France where the king has brought him to France and become his patron, a cardinal comes by from Italy and admires the painting and writes about it. So it was known by the of Leonardo’s life that it was going to be a masterpiece. It doesn’t become the most famous painting in the world though. It remains part of the collections of the king of France.

It’s hung in their châteaux and eventually in their castles. So it doesn’t reach the stature that it now is. I think you could say it’s the most famous painting ever done. And that grows over time, including when it was once stolen. But throughout history, that painting has mesmerized art critics more and more. And it is interactive, it really does speak to you.

When you first see the Mona Lisa, you might be disappointed, it's rather small. But as you spend time with it, it continues to delight and surprise you, even as you move your head and watch the lips and the eyes change, it's a masterpiece of both science and art.

Shane: That was through the painstaking addition of microscopic brushstrokes over years and years and years to create that effect. Is that correct?

Walter: Absolutely. The more layers, sheer, thin layers of his painting, his brushstrokes because he understands how light refracts, how it hits our eye, that if it hits the center of the eye, you see more detail, if it hits the corner of our eye, you see shadows and colors better. So if you look at the very detail directly at the corner of the lips of the Mona Lisa, they aren't turned up. But as you move your head a little bit and you catch the shadow and the collars better, the lips seem to turn up. So it becomes an interactive smile, all because of the scientific brilliance of Leonardo DaVinci as well as his passion for perfecting the Mona Lisa.

Shane: That's so cool. What was the thing that surprised you the most about DaVinci through your study of him?

Walter: I think that he wanted to know everything and that he starts off wanting to understand things, including science in furtherance of his art, like he's dissecting neck muscles to do Saint Jerome in the Wilderness or he's studying the math of perspective to get the Adoration of the Magi correct. But then after a while, he's dissecting cadavers to study the muscles and the skeleton. But he's going down, he's studying the heart, he's studying the heart valves. This is not what you need to know for your paintings. He's doing it not because it's useful, but because he's curious. I think what surprised me was that Leonardo DaVinci's curiosity was driven not because there was some utility to it, but because it delighted him.

Shane: I want to come next to Ada Lovelace. You considered writing a biography on her. In fact, she's the first and last figure in your book, The Innovators. What makes her such a special historical figure?

Walter: She was the first person to understand what the general-purpose computer could do and she writes the first algorithm. So in many ways, she has the conceptual birth of the computer. And what struck me is something we've talked about in this podcast, was people who stand at the intersection of the arts and the sciences. Her father was Lord Byron, the great romantic poet, but her mother wasn't particularly fond of Lord Byron when Ada was growing up.

If you know anything about Lord Byron, he wasn't the perfect husband. And so Ada's mother had Ada tutored only in mathematics, hoping it would prevent her from being poetical. Instead, Ada invents what she calls poetical science. Not invents, but she embraces poetical science, loving both the humanities and the science, loving math as well as poetry. And so when she sees the looms in England that are weaving these great patterns using punch cards, she realizes that the use of punch cards to determine how a beautiful pattern could be woven, that those punch cards could be used on a machine that one of her friends, Charles Babbage was doing called the analytical engine, which was a numerical calculator and you could use punch cards.

What Ada wrote in her notes to the analytical engine was that with this type of device, the machine could do not only numbers but anything that could be notated in symbols. It could do words, it could do music, it could do patterns, it could do art. And what does that remind you of? That's what a general-purpose computer can do. It can manipulate the information of anything that can be notated in symbols. And so this was a great intellectual leap underappreciated by history, except for those who are fans of Ada Lovelace and their legion.

Shane: And this wasn't appreciated until later with Alan Turing, right? Or was she appreciated in her time or was it her... Ada Lovelace is...

Walter: Well, she was a very complex figure in her time and probably a good full-length biography, but it's somewhat tragic. She became addicted to drugs, addicted to gambling, gambled away the family jewels, had a painful life with opium trying to kill the pain. She did lay down the idea that machines could do everything except think on their own, that machines could not be creative, that it took the humans to be the creative ones, to come up with new ideas, to think different.

Whereas the machines could process based on instructions we gave them. Alan Turing, a century after Ada Lovelace writes her notes on the analytical engine, writes his paper called Can Machines Think? And he writes about what he calls Ada Lovelace's objection, Lady Lovelace's objection, he calls it, which is that machines can't think, that they'll be able to process any symbols we give them, but they won't be able to be creative thought.

Turing pushes the opposite approach, which is yes, machines will be able to think. We will have machine learning, we'll eventually have artificial intelligence. That's still a debate going on today, whether it's Elon Musk or Bill Gates, or many other people, they debate whether machines will ever be able to think creatively as the human mind will.

I don't have an answer, but I do love in my book, The Innovators is about exploring the Ada Lovelace school, which includes Ada Lovelace, with Doug Engelbart and Alan Kay and J. C. R. Licklider and culminates with Steve Jobs, the people who believe that advances will come from human-computer connections, human-computer interfaces like the graphical interfaces on our computer that make us closer to our machines. And then the other school is the Alan Turing school that goes all the way through people including Bill Gates who think that machines will be able to acquire an artificial intelligence that will surpass humans and perhaps leave humans behind.

Shane: So if we zoom out a little bit, what are some of the lessons that we can observe that are common across these subjects that are innovators that we can apply at work or in our day-to-day life?

Walter: Have a broad vision. Be curious about everything. I had the great, good fortune of growing up at Time Magazine, which was one of the last of the general-interest magazines. And it meant that one week I'd be writing the medical section, the next week I'd be writing the music section. I'd be writing foreign affairs one week and business the next week and politics the following week. I got to be interested in many things and to me that helped me see patterns that happen across creation. Those are the lessons of my great innovators.

Nowadays, we tend to be more siloed, whether you are at a university and you specialize in a silo or for that matter, you're a media thing and you're not a general interest magazine, there's not a market that much for general interest magazines.

So you become a podcast with a particular focus. I think my lesson is to be curious about everything, don't specialize too soon. Be able to go deep on a few subjects, but make sure you can also go wide.

Shane: I think that's a really good lesson. I just want to challenge a little bit about what you said about writing about multiple different subjects. How does that affect your ability to write about them and understand them? If you're just like switching context week to week to week, how do you develop a deep fluency in the subject you're writing about?

Walter: Sal Khan who does Khan Academy has a great phrase which is, "you can learn anything." The hardest for me was learning the math of general relativity. I had to study intensive calculus, I'm still no great expert at it. But if you put your mind to it, you can learn anything. After learning the mathematical equations of general relativity from my Einstein bio. And by the way, I didn't put them in the book, I just felt I had to know it to simplify it in the book.

I figured, "Okay, I can easily learn what RNA does as a messenger inside a human cell when it comes to a Coronavirus vaccine." That wasn't quite as hard as the math of general relativity. I do think if you put your mind to it, you can pretty much be familiar with many different fields. Secondly, I do think that there's value to the person who's not the expert. Especially when it comes to science and technology, most scientists, and I love them, aren't great at popularizing and explaining what they do.

Some are, Brian Greene is, Carl Sagan was, Neil deGrasse Tyson is. But generally scientists, they're part of a priesthood and they talk in the type of jargon and it's hard for them to explain the beauty of what they're working on. I think there's room for people like myself who are just passionately curious and will take the time sometimes a year or so to drill deep into a subject but then will try to write about it for the layperson, for the person who's not an expert, for the person whose last biology course was in high school.

Shane: How important is it? You're a writer, you're a professor, how important is it that we go to the source when we can, and don't get it through the secondary, third, fourth-order sources?

Walter: That's why when I did Leonard DaVinci, we're so blessed, we have more than 7,000 pages of his notebooks. I mean, paper is a great technology for the storage and retrieval of information. It has an almost infinite battery life, its operating system never goes out. I can go around the world and look at Leonardo's notebooks and not only read in a secondhand way what information he had in it but see the doodles in the margins, the way he drew little design to see how his mind leaped on the page from sketching out possible faces for The Last Supper to figuring out how to square the circle using triangles and circles and rectangles. I like seeing his mind leap around on the page.

Same with Ben Franklin, I went up to Yale and the box after boxes of papers. Einstein's papers, in the end, I read most of them in bound volumes, which you can see behind my shoulder that are on my bookshelf. I went to Hebrew university where the original papers are and to Caltech where the papers project is I wanted to see those last pages of his notebooks because I think there's something inspiring too about seeing the original physical product.

Shane: I like the inspiration and the doodles and the added context. I also think that there's something to seeing their own words and seeing what they thought was important and maybe the variables they thought were important or how they intersected and played out over time versus the interpretations of other people, which are simplifying or necessarily simplifying, I guess. I think something's lost in that.

Walter: I also find that when it's possible, when it's about a contemporary figure, you can read all of the secondary sources, and then you can read original documents. But then you have to do the third part of the triangulation, you have to talk to people. So if I read the books about Steve Jobs, that'd be fine, and if I read some of the memos he wrote. But then I have to say, "Why did he write that email?" Or, "What was that memo really designed to do?" And then you get the interviews.

I'm not as a historian the best at archival diving. Bob Caro, David McCullough, they're wizards when they come to archiving. As a journalist, I may not be the best interview. Bob Woodward could probably outrun me on any day of the week, but I think I'm pretty good at the intersection of being able to do a whole lot of interviews and getting people to talk to me but also going deep into the archives and studying the written record.

And so I like to combine the two, and that's part of my journalist training.

Shane: Let's explain that a little bit about the interviews. How do you extract information from other people? Is there a tip or trick or process or anything you've learned that's effective at getting the best information from other people?

Walter: My first day as a journalist when the Times began in New Orleans when I was about 17 and we had a summer job, I went and somebody had... a young woman, a young girl had been killed. I went out and I was supposed to find out about it. When I called the story back in, it was the days before email, I had to go to a payphone, if you remember what that was and phone it back to the office. My editor said, "What happened when you interviewed the parents?" I said, "Well, I didn't go bother the parents." He said, "Go knock on the door and interview the parents."

I took a deep breath and I did it and I learned my first lesson, which is people like to talk and they like to talk about themselves and what happened. And they especially like to talk if you like to listen, if you're not trying to guide the talk, you're not trying to explain things to them.

I just said, "Tell me about it," and they did. Ever since then, I realized I can call up anybody and they usually want to talk especially about themselves because they usually find themselves very interesting. If I just listen, they'll keep talking. And if sometimes they don't answer my question, I just stay there and listen and I'm silent. They got to feel the silence and they talk.

Shane: Let's come to CRISPR and gene editing. What is CRISPR and what is gene editing?

Walter: CRISPR is a pretty simple tool that we can reprogram to cut our DNA. If we decide that there's a sequence in our DNA we don't like a sequence that causes sickle cell in our blood, CRISPR is a tool where you can edit them out. It's a tool that Jennifer Doudna and her colleagues won the Nobel Prize for this past year inventing. And what they did was they adapted something that bacteria have been using for a billion years.

Bacteria have these clustered, repeated, interspersed sequences known as CRISPRs in their genetic code. And that comes from having to fight off viruses. They take a mugshot of the virus that attacks them and then if the virus attacks again, they use scissors known as an enzyme to cut it up. That's pretty useful in this year when we've had to learn how to fight viruses. It's also useful because you can repurpose that tool to cut our DNA, to edit our genes.

Shane: I mean, the promise of this on one hand is sort of like making our lives better, fighting cancer, fighting COVID, we're taller, we're faster, we're smarter, we're stronger, and yet on the other hand we have things like bioweapons, designer babies. Are we messing with things we don't understand?

Walter: Yes. And that's why Jennifer Doudna, after she invented this technology, was shaken because she had a nightmare that somebody wanted to understand the technology she invented, she goes into the room and it's Adolf Hitler. She realizes that in the wrong hands or with the wrong sets of social guidance on what we're going to use this tool for, it could be both something of great promise, but also terror.

My book is about her not only inventing these tools with her colleague but also then gathering scientists as well as ethicists and politicians and ordinary people to say, "What are the rules of the road? Are we going to use this tool?" Should we allow this tool to be used to fight sickle cell anemia? Well yeah, that makes sense. And what about using it in people to make us more immune to viruses? Well, maybe that makes sense. What about increasing our memory? Well, do we want to do that?

What about allowing rich people to buy better memory for their kids? But since this technology's not going to be free, it'll encode the inequalities of our society into our species. Well we know we don't want to go there.

My book not only is about understanding what the technology is, but I want people to understand it because we're all going to have to be part of this discussion. We can't cede it to the scientists to be in charge of this. Part of the last half of the book is by going step by step saying, "When should we use it and when should we not?" We all have to be part of this discussion.

Shane: One thing that's interesting about this discussion is unlike weapons of mass destruction where they're hard to accumulate, they're in relatively few hands, it seems to be like, biohackers have or could develop this in their basement.

Walter: I edited genes in Jennifer Doudna's lab. The motto of my old school I went to in New Orleans was "we learn to do by doing" and so I did it. That kind of frightened me because I was able to edit human cells. Now don't worry, we flushed them down the drain with chlorine and the cells I edited are not now part of our planet, but yeah, they're biohackers.

One really funny, interesting, delightful and slightly controversial guy in my book, Josiah Zayner runs a store called The ODIN and you can go online and get CRISPR and use CRISPR to regulate the myostatin so you'll have bigger muscles, things like that. So yes, this is not like an atom bomb that can't be built in a basement so we're going to have to learn the social rules of the road in doing this.

Shane: But how do we enforce those rules?

Walter: I think they only get to be enforced if we all agreed to them. And that's why I wrote this book. I'm hoping we'll talk about this enough and we'll have a social consensus. People say, "Well, that's hard to have," but yeah, we do that all the time. We have social consensus now against elephant tusks or trafficking or slavery, child trafficking, but we have social rules against everything from shoplifting to drug trafficking, to whatever.

That's how society tends to regulate these things. Now with CRISPR, it's not like you have to stop it totally. I mean one atom bomb and you can be toast. But if we can prevent CRISPR from becoming a regular commonplace thing, I think we'll be able as a society to decide, "No, this is where you don't go and this says where you do go."

Shane: Jennifer had her own Michelangelo through this. There was a bit of competition I understand in terms of coming up with this. Can you explain that story to us?

Walter: Yeah. The book is partly about the great race between Jennifer Doudna and her team, which includes Emmanuelle Charpentier, the French, biologist who won the Nobel Prize with her and they're competing against many labs around the world, but especially a great and charming young scientist named Feng Zhang who is at the Broad Institute of MIT and Harvard. After Jennifer and Emmanuelle discover how CRISPR can be engineered to be a tool to cut DNA, a race ensues to say, "Who can make it work and show how it works in human cells first?"

It takes them both six months along with some other labs. It's a race that Jennifer Doudna's team loses actually by two weeks and Feng Zhang's team gets the original, the first patents on it. They've been involved in both this race and this competition and now a patent battle over it. Competition helps spur science, it's a good thing. Competition can be for patents, it can be for Nobel Prizes, it can be for publication priority.

In this case, it's a race just like when Jennifer was a young child, she read *The Double Helix*, the book that Jim Watson wrote about the discovery of the structure of DNA and the race that he and Francis Crick were in against Rosalind Franklin and Maurice Wilkins at another university and Linus Pauling. Competition can make you do bad things. Crick and Watson purloin the imagery done by Rosalind Franklin without her permission, but competition also causes you to work nights and weekends. So my book is about the good sides and the bad sides of competition and the good sides and the bad sides of collaboration.

Shane: Are there any areas where you disagree with them?

Walter: My thinking evolves. Every time I get an email, my thinking evolves. I'll tell you the story, not about me, but about a wonderful ethicist in my book. He's only 17. His name is David Sanchez, you'll see the picture of him looking at the little tube of blood. Because he's a 17-year-old who loves playing basketball, except for when he dabbles over in pain in the middle of the court because he has sickle cell. And so they're treating him for sickle cell at Stanford.

At one point Matthew Porteus who's a great genetic engineer there says, "We may be able someday to edit your sperm or reproductive cells so your children won't have sickle cell." And David Sanchez says, "That would be great."

But then a little later he says, “But maybe that should be up to my kids after they’re born for them to get to decide, do they want to be edited?” And you think, “What’s that all about?” He says, “Well, sickle cell forged my character. It made me persistent. It gave me empathy. It taught me how to get up off the floor. So maybe it’s useful for my kids to have that. Maybe they should decide.”

And I thought that’s pretty profound. But then I asked him a few months later, I said, “What do you think?” And he said, “I think I would edit my kids. I don’t want them to have sickle.” So I said, “What about persistence and empathy?” He said, “I’d try to teach them that, but I don’t want them to feel the pain.” Now, the reason I tell this story is not because there’s a right answer, but because David in his wisdom had first thoughts, second thoughts, third thoughts. So to answer your question, I have first thoughts, I have second thoughts, I’m now on my third thoughts and someday will be onto my fourth thoughts.

My book is not about giving the answers. I’m going to hurt the sales of the book by telling you, there’s no last chapter with the answers, but there are first, second, third, and fourth thoughts in the book about different types of where we should go. Maybe we should use it here. What about depression? What about psychology? What about schizophrenia? What about sickle cell? What about better athletic abilities? And I want the reader to be like me, to go hand in hand with me and Jennifer Doudna and David Sanchez, having first thoughts, second thoughts, third thoughts. Because it’s a slippery slope. But slippery slopes are a little bit safer if you do it hand in hand, step by step, and that’s what this book is about.

Shane: That’s really interesting. And final question, thank you so much for your time, how do you want your work to be remembered?

Walter: There are people in the arena. I started early on with a friend called The Wise Men about the people who created American foreign policy right after World War II. And there are people like Einstein and DaVinci and Steve Jobs and now Jennifer Doudna. Those are the people who do things. They see the world differently, they push the human race forward. I know that I’m not one of those people, but I have a small role to play, which is I tell their stories.

I think being able to inspire people with their stories, it may not make me, certainly doesn't make me a Leonardo DaVinci or a Steve Jobs or a Ben Franklin but there's a role for some of us, as I said, growing up in Louisiana, being told, "Don't be a preacher, be a storyteller." And then if we can tell the stories, we can inspire the next generation. When she was in middle school, Jennifer Doudna came home one day and found on her bed, the book, *The Double Helix* by James Watson, and she read it.

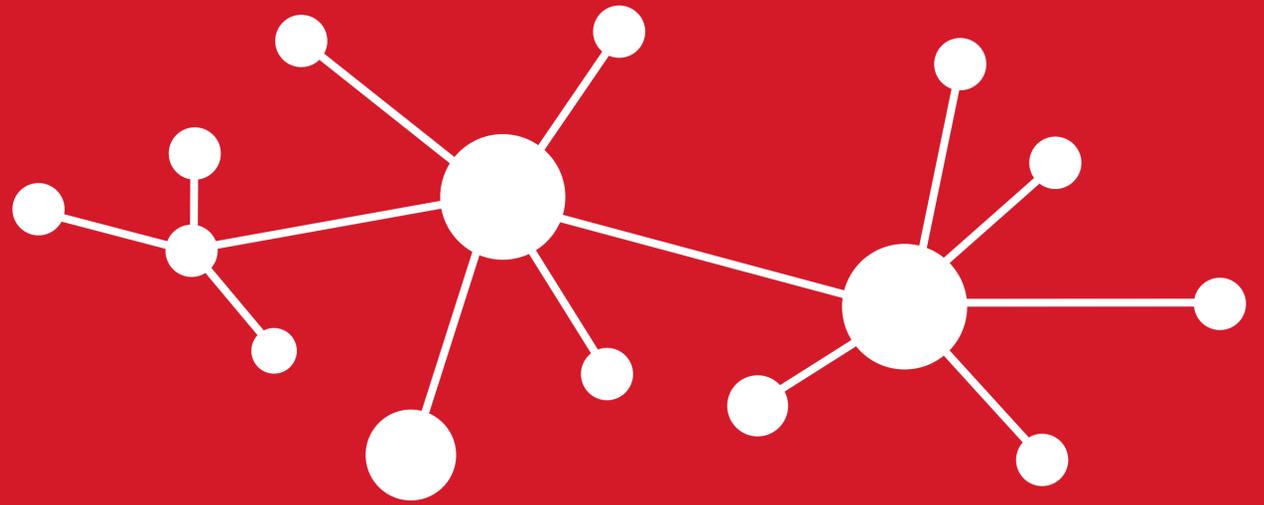
And she saw Rosalind Franklin, this biochemist in it and she said, "Oh, I didn't know women could become scientists." And she was inspired by Rosalind Franklin, but also by Watson and Crick and others to say, "I want to become a scientist." And so she had been thinking, "I'm going to study French," but no, she decides she's going to become a chemist. She got inspired.

I hope that someday my books are left on the bed of people's daughters and sons and nieces and nephews and maybe they're inspired to be a Steve Jobs, to be a Jennifer Doudna, to be a Ben Franklin, even to be a Leonardo DaVinci and we can help people understand how innovation happens, how creativity happens, how building great teams happen if we can be inspired by the people who are successful in doing it.

Shane: That's beautiful.

Walter: Thanks for having me.

Shane: Thank you.



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