



My Story in Computing with Dr. Rachel Dzombak

featuring [Rachel Dzombak](#) as Interviewed by Suzanne Miller

Welcome to the SEI Podcast Series, a production of the Carnegie Mellon University Software Engineering Institute. The SEI is a federally funded research and development center sponsored by the U.S. Department of Defense. A transcript of today's podcast is posted on the SEI website at sei.cmu.edu/podcasts.

Suzanne Miller: Hi, my name is Suzanne Miller. I am a principal researcher here at the Software Engineering Institute, Software Solutions Division. I am joined today by [Dr. Rachel Dzombak](#), a digital transformation lead in the SEI's [Emerging Technology Center](#). Welcome to our latest series of podcasts where our guests tell us the unique stories of how they ended up working in the fields of software engineering and cybersecurity, and in this particular instance, artificial intelligence. Welcome Dr. Dzombak.

Rachel Dzombak: Thanks so much, and please call me Rachel.

Suzanne: Absolutely. All right. We are going to be talking about all kinds of things today because you have had a very interesting life and in my world, that is part of what we are trying to get at with this series of podcasts is, you don't have to start off thinking you're going to be an [artificial-intelligence](#) guru to become an artificial-intelligence guru. So, that is a big part of it. Why don't you tell us a little bit about yourself and the artificial-intelligence work that you do here at the SEI? What is the coolest thing about your job?

Rachel: Thanks so much for having me. I am really excited to be here today and engage in this conversation. So, my background is in engineering. I kind of jumped around between biomedical, mechanical, civil engineering, but all of my work has surrounded being able to innovate in complex systems, being able to think about how do you see an entire system and try to drive change in it? And in my role here at the SEI, my title is lead of digital transformation, which often people say, What? What does that mean? I help our customers think about how they can adopt digital tools but also recognize that that involves making sure that those digital tools are applied towards stakeholder-driven outcomes. Because a lot of us with an engineering background, we see a new technology and we think, Ah, let's grab that, let's implement it, and it will solve all of our problems, but if we don't think about the underlying processes and people and all of those dynamics...



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Suzanne: Oh, no. That's perfect.

Rachel: Yes.

Suzanne: That is exactly the kind of thing that people miss. We call that the better-mousetrap syndrome. I just found a better mousetrap. Oh, there aren't any mice here. Oh, darn. Now what am I going to do?

Rachel: That is something that I think a lot about is, how do we design these systems that accommodate both technology and people, making sure that there is symbiosis? The coolest part of my job right now is that I am helping to lead the development of this field of [AI engineering](#), which is a field focused on how do we do AI the best it can be done. How can we start putting process and rigor around the implementation of AI systems, which doesn't mean just building the best algorithm, it means thinking about all of the entire lifecycle of AI, all the way from framing that initial problem space through test and evaluation and how do those different components interface with each other.

I think a lot of people aren't comfortable with ambiguity. I am very comfortable with it, and so I love being able to take a step and lead my team into thinking about what does it mean to define a field? How do we start doing more of those action steps?

Suzanne: In our prework, you mentioned that the board that people see behind you is actually part of that getting clarity in the ambiguity. Why don't you tell us a little bit about that board?

Rachel: Sure. One, I am super visual. I think I am always a person who needs to see the patterns that can emerge. When I started this role in December, I was charged with trying to think about, How do we define AI engineering? And right now, there are many definitions. There is not a single definition. In my listening role, I just started taking note of each definition that people shared or what perspectives they added to it, and then just started to arrange them up behind me and playing with them over time, so I could both, one, for myself, start to grasp what this field even entailed, but also so that I could start playing with language to see what resonated with people. When you are trying to do something new, it is all about establishing that connection and making sure people understand what you are talking about, and it is trying to prototype different definitions to see what matches the authenticity of the field but also what resonates with this community we are trying to build.

Suzanne: Cool. So, we have things to look forward to in future podcasts as we get that farther along. For today, we actually want to know more about you as an individual. I know that prior to your arrival at the SEI, you worked at UC Berkeley [University of California, Berkeley] as a researcher and lecturer across both the business and engineering schools, so the multidisciplinary thing is right there. What about that teaching and research that you did at Berkeley brought you here and what other forces brought you to Pittsburgh and the Software Engineering Institute? Why did you choose us?

Rachel: Sure. So, when I was at Berkeley, I was deep in the fields of innovation and also helping people learn how to problem solve on complex problems and do that in [diverse teams](#). A lot of times we assume that people know how to work in diverse teams. You learn that in grade school sports, right? But often times what we found is that that is not true at all, and people actually haven't learned the mechanics of



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how to set a shared goal, how to give and receive feedback, how to leverage the diversity that is present on a team. What does that even look like? So, a lot of my research was about both integrating those two things. How do you step through a complex problem, but how do you also do that in a way that brings your team along with you to achieve the outcomes that you want? I was doing that work, doing research, teaching interdisciplinary classes across business engineering, but also art, theater, and performance studies, because I strongly believe that you need that mix of skills to solve the problems that we are solving today. You need people who see the world a little bit differently. That is what brought me to start my work with the Department of Defense.

The center I was based at was focused on innovating within resource-constrained environments, particularly in the [international development sector](#). There was a meeting between the leadership of that center and some folks from the DoD who said, You know in national security, we are also problem solving under constraints. We don't have as much data as we want. The problems are really dynamic. They are constantly changing. How do we learn these same mindsets and skill sets that you are teaching your undergraduate students to solve wicked, complex problems? So, we started a partnership with the [National Security Innovation Network](#) and started teaching [innovation bootcamps](#), teaching the problem-framing-and-solving process as well as how to work with these diverse teams and bring those together towards problems that the DoD was facing. At Hanscom Air Force Base, that was taking on the challenge of how do we promote a culture of risk. At Seymour Johnson Air Force Base, that was how do you reduce pharmacy wait times following Hurricane Florence? I worked at about 20 different bases around the country teaching those skills and working with innovators to say, how do they start to have agency to tackle some of these really hard problems that nobody owns and make progress on them over time? So, I met an SEI researcher at [NeurIPS](#) two Decembers ago and found that they were doing really related work but also were in Pittsburgh, which is where I am originally from. That started a long conversation about how I could bring these skills to the SEI and start to serve the customers that the SEI has with these mindsets, skill sets, and innovation processes.

Suzanne: So, welcome home.

Rachel: Thank you.

Suzanne: All right, for our local viewers, which neighborhood—because we are very neighborhood centric—which neighborhood did you grow up in?

Rachel: I grew up in Point Breeze, right down the street from Frick Park, so...

Suzanne: Oh, okay. All right, excellent.

Rachel: It was great to have a fantastic park to run in as I grew up.

Suzanne: And not very far from work either, so you actually could probably cycle to work if you wanted, so that's always nice. All right. So let's actually talk about the social enterprise, the nonprofit that you're involved with in Kenya. It is called [Mashavu](#) from what I understand, and it was focused on establishing



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preventive medicine in rural Kenya. Why don't you tell us a little bit about your experiences with that, and how did you get from civil engineering to preventive medicine in Kenya?

Rachel: Sure. I did my undergrad actually in biomedical engineering at Penn State. I was a part of a really forward-thinking program at the time that still is forward thinking, but there weren't that many around then, called [Humanitarian Engineering and Social Entrepreneurship](#). We had a professor who has become a lifelong friend and mentor of mine who strongly believed in the notion of dreaming big and setting the bar really high and then seeing what you could raise and meet it. My first day of class in my sophomore year of college he said, OK, we are going to start a preventive healthcare company in Kenya, so that is your challenge over the semester, and you will work on that and then go to Kenya and implement it.

Suzanne: Wow.

Rachel: And I thought, This is crazy, but it really taught me the notion that it is about, I think, not knowing enough, not knowing that that wasn't possible. I hadn't been to the West Coast at that point. I hadn't been out of the country. I didn't know better to know how difficult that was and started working...that program was freshmen through PhD students from all the colleges at Penn State, starting to work together to say, What are the legal implications? What are the policy implications? What are the healthcare implications? I ended up getting hooked, and I spent all of my summers in undergrad in Kenya as well as did a fellowship in Kenya after I graduated and worked to establish this company that was aimed at introducing preventive medicine and also recognizing that technology wasn't the centerpiece of that company. We started with a telemedicine system using laptops to connect patients with physicians, but over time, simplified the technology and moved to a paper-based system with an [OCR recognition system](#) to read the text on it once the patient brought their forms in. And I think it really taught me this notion that technology is a tool to be applied alongside many other tools, many different supply-chain methods, operations methods, the management side. Also being in Kenya, one, just a beautiful place to live and work, but I hadn't traveled broadly at that point. I had really just spent a lot of time in central Kenya. And spending so much time in a place also taught me how important it is to just unpack the assumptions that you have over time.

Each time I returned, I learned new things about the context. I had my notions challenged. I thought more critically about the ethics of what we were doing and got to know my partners on a deeper level. Eventually we transitioned that business over to our Kenyan partners and then served in a mentorship role and continue to today, so...

Suzanne: I resonate with that travel challenging your assumptions, and I think many of us that have traveled, that is probably one of the things that we bring back with us is that until you travel, you don't realize how different things are in different places from what we experience. We have differences between west coast and east coast. My family is west coast, Bay area. I can kind of relate to that, but I also lived here for 25 years, so it's not the same.

Rachel: I saw that a lot in my graduate education as well. I didn't intend to end up in a climate-science program, it just kind of happened. I really knew nothing about it, and it was super interesting for me to be in a classroom. Coming from Western Pennsylvania, I had a really different notion of environmentalism



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than my peers who were born and raised in the Bay area versus my peers who were born and raised in Dallas, Texas. Just seeing how those perspectives, your background really shapes the problems: how you see them, how you approach them. I found that to be incredibly valuable as part of my education at Berkeley, just learning from others and making sure you challenge your...It's easy to say, Ah, we're all in the same class, we all see this the same way. But challenging that notion and being willing to ask the question, Well, why do you think that? It is getting behind the whats that people are presenting to ask the whys of what are the forces that are shaping your thinking in that way?

Suzanne: Let's talk a little bit more about that. What are some of the forces that shaped you early on as a Pittsburgher growing up in this region and in the setting that you were in?

Rachel: Sure. I am going to give a probably a very Pittsburgh answer, but a lot of it came from my family. Pittsburgh is a very interdependent culture. There is a reason that everyone introduces themselves with where they went to high school. You learn about people's family within the first five minutes of meeting someone. I love that notion, and it is super true for me as well. Two of the big forces were my grandparents. My grandfather was on the faculty at St. Vincent College. He was a chemistry professor. There are all sorts of great stories about him. He was referred to as "Doctor Death," but he had a strong balance of mixing science with the liberal arts and being a strong believer of how those two complement each other. He also had a strong notion of curiosity, so one of his famous quotes is, All knowledge is retrievable if we know how to read a book or ask a question. He was a big believer that systems are learnable, and it is about persistence, not about, "You are a genius so must naturally know something." And that curiosity was shared by my grandmother, who in addition to being a high school English teacher, she was one of the foremost thought leaders on Abraham Lincoln and his life and was tracking Lincoln. I think it taught me to be curious, be passionate and go after things that are meaningful to you, whether or not it's what everybody...I don't know how many people in Latrobe were going that in depth into Abraham Lincoln's life. My immediate family as well. My brothers are both very entrepreneurial. We are all super different but all pursuing things passionately, and that comes from both of our parents. My mom is a force and just always encouraged us to go after things we wanted and not stop, and my dad too. He was always just encouraging of what is possible. I think he got that from my grandpa. I remember when I was in high school, I was deciding between journalism and engineering. My dad said, Ah, why don't you just try the engineering thing and showed me the possibility of being able to write and speak about, you know, that journalism side about engineering.

I give my parents a lot of credit. They never pushed us towards any direction. They really just recognized what were we caring about in that moment and tried to amplify that. I think having a family surrounding you that does that is incredibly powerful.

Suzanne: OK. Before we move on, you cannot say that your grandpa had a nickname of "Doctor Death" without explaining that, so...

Rachel: Yes. He taught P Chem [Physical Chemistry] at St. Vincent's. It was one of the last classes that chemistry majors would take at St. Vincent, and he had impeccably high standards, but also both in terms of chemistry knowledge but I think character as well. He was the original polymath. He was constantly



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curious about everything, and he expected the same from his students as well, so it earned him a bit of a reputation there at St. Vincent.

Suzanne: Death by curiosity.

Rachel: Yes, I am sure. Yes.

Suzanne: Fair enough. Let's connect back to journalism a little bit because among many of the things you've done, you helped envision, edit, and publish a career book, which I am now going to have to go read, called [Solving Problems That Matter and Getting Paid For It](#), so tell us a little bit more about this, the book, and what led you to write it.

Rachel: When I was at Penn State and I was very involved both in running that business that I described earlier but also in growing the Humanitarian Engineering and Social Entrepreneurship program. I think we became home to many students who felt like they didn't have a traditional fit in engineering and that they wanted to do something different with their engineering program. They wanted to really connect it to impact. That is much more in our vernacular of engineering today than it was 10 years ago when we were doing that work.

So many students would have these experiences of being able to use their engineering skills towards impact-related fields, be it sustainability, healthcare, gender inequality, whatever it is. Then, they would get to a point upon graduation when there was a lot of pressure saying, Well, you should go get a coop, get a good job, and ride that out. I think students were coming to myself and my colleague, who was helping to run that program, and saying, Well, I need to make a choice between making money or doing something I care about, and it set up this paradigm where you can't have overlap. They said, "If I want to find overlap, where do I go?" And we didn't have great answers at the time. We started just asking people—we interviewed 100 people that have careers that blend these two sides of both making money and determining what is enough financially, while also thinking about how do you check a box of caring about your work and finding meaning in your work? We interviewed them, outlined their career journeys so that students could recognize one—it's not an instant-gratification thing. There are journeys to it, and sometimes you'll be on one of those sides of the spectrum more than the other, but then also we wrote a series of briefs, kind of quick-start guides. I think that was our engineering side coming through, of things you should be thinking about. So, 10 jobs in government you have never heard of before. I wrote one on 10 things you should think about before entering a PhD program. So, guides to help people navigate these decisions and make them consider, OK, what do I really want to do? And get into that space of reflection. Overall, that has just been a huge resource to share with people so that they can make choices that feel authentic to them and make sure that they are moving in a direction that they want to go in, even if they don't have a super clear vision of that endpoint.

If I can add one more thing, we talked a lot about this notion of, another colleague of mine introduced me to this. Her name is [Barb Waugh](#), and she introduced me to this notion of [quilters versus questers](#), where often in life you hear the story of a quilter. So, one of my brothers, he is definitely a quilter. He wanted to get into the music business from a young age. He joined a band. He started a booking company, and he got a degree in music business, and he has marched along. He has always had that really clear vision.



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Whereas my other brother is much more of a quilter where he has kind of popped his head up and said, What is interesting and what is next? He worked in finance, then he became a writer, then he kind of jumped back into a whole other host of things finally, before bringing some of them together. And I think we so often talk about the quilter because it is an easier story to tell. But quilters, we wanted to also just show people through that book that there is validity to the quilting as well, and that's often what a lot of people's careers actually look like. It is just where they have come.

Suzanne: I think I'm a quilter. One of the things, and I have not read it yet, I would assert that in today's world, this isn't just a book for students. At any time in your career when you are looking at, What do I want to do next? or I am bored or Why am I not enjoying what I'm doing? That is the kind of resource that I think people would appreciate and we'll make sure that the link to that is in our transcript.

Rachel: Fantastic.

Suzanne: ...because we always do that but I'm going to read that now. I'm 63 and you know, so I'm kind of...people say, you know, I'm on the glide path to retirement, but I look at that as just kind of what am I going to do next, so I think I need your book.

Rachel: The goal of it was really to show people the state of the possible because I think for many, the quote is true, You can't be it if you can't see it. If you don't know what those paths can look like, it becomes really hard to envision it. And so especially at a place like Penn State, you just didn't have as much access than if you had gone undergrad at Berkeley or Stanford to these less traditional models of career growth. But I agree, I think the pandemic forced everybody to reflect on, What am I doing, and why am I doing it? How am I spending my precious time, and what impact do I want to make? I think now it is a more relevant conversation than ever before.

Suzanne: I am on the same page with you there. I want to come back to some discussion about being a person of multiple fields: bioengineering, journalism, civil engineering, and oh, by the way, AI. Two things. One is, what does that contribute to you being able to do something very focused like AI, and secondly, how do you stay up to date when you have got all of these interests? I am a little bit like you. I am a multidisciplinary person. This is one of the questions I always ask is, How do you keep up with stuff? You just gave me another book to add to the list, and I hope it's on Audible because that makes it easier. How do you keep up with things, because it is a challenge even with just one field, and if you have interest as you do in multiple areas, how do you do that? But before we get into that, why is it beneficial to our listeners in terms of being OK with, I don't have to be deep in one single field? It is OK to not be quite as deep but to be part of multiple fields?

Rachel: I think one of the big things that forced me to reflect upon this was while I was in grad school, because so many people at the time were really pursuing a path that was getting deeper and more technical. Even during my PhD, I was constantly broadening, constantly looking to add new fields. I took classes all over campus. Many of my peers who were deep in mechanical engineering or computer science were saying, "Aren't you wasting time? You know, the purpose of a PhD is to be a single expert on the frontier of knowledge." I think that is totally valid for a lot of people. But I think in this day and age, fields are changing so quickly. They are evolving so fast that there is an impetus also to have a class



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of people who are experts at learning how to learn and who can get up to speed quickly on new subject areas. One, I just love it. It is how my brain works, and I really love that curiosity and the constant learning. I also think it allows me to draw connections for people who are in that space of a very deep focal area. An example is that from some of my work that I did in the energy sector, I started pulling in analogies from the healthcare side of things to frame and reframe the notion of an energy concept in new ways. From taking classes across multiple engineering disciplines, I recognize that, of course, there are nuanced differences, but in civil, you are talking about water moving through a pipe. In biomedical, you are talking about blood moving through a vessel. In industrial you are talking about fluids on a manufacturing line, and I think that that notion of being able to see across them, it gives you new leverage when you are trying to problem solve because you can pull in examples and really increase your design-exploration space.

And so how do I stay up to date? One, I have a lot of really amazing friends who are super-deep technical experts. Maybe this doesn't happen to you, but people try to force me into the generalist/specialist debate, and it's not one that I really love to talk about because I'm a believer of both, and it's about finding the synergies and respecting both and why each brings something different to the table. I have amazing friends, who are super deep on areas, that I have my list in my phone of when I have a question, I say, Ah, let me learn more about this issue. I know that I need to call person x. But then also, I follow a lot of thought leaders on Twitter, and I have kind of hyper-curated it to my flavors of the month or the year of what my interests are. Right now certainly going much deeper into the AI space than I had in previous years. Also, I read really broadly, and I think that also helps too, of any book. I am a voracious reader, and so any book that people suggest to me, whether it be on either side of that spectrum, I'm definitely a consumer of them.

Suzanne: And you are a consumer of Post-its, which is another thing that defines the multidisciplinary mind.

Rachel: Yes.

Suzanne: So you know, I am kind of known as the Post-it queen of the SEI. I always start my workshops by saying, I don't have any stock in 3M, I really don't, but we're going to use a lot of Post-its today, so...

Rachel: Yes, absolutely.

Suzanne: All right. There are going to be people listening to this and saying, She is like me. And what advice do you give to those people who are considering going into tech fields and especially ones that may not come from that field as their education or as where they thought they were going to go? What advice would you give them, somebody who wants to get into AI, but doesn't think they have the background for it?

Rachel: A couple of thoughts there. One, I definitely get a lot of these questions and meet these people. I think I'm a person that, because of my background, when someone feels like they don't fit in, I get a lot of those folks that, Oh, you are trying to do something different. You are on the edge of engineering. You should go talk to Rachel. I love it because I think I try to push people to embrace their narrative. For a



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while during undergrad school and even grad school, I would describe what I do as engineering and people would say, Well, that is not real engineering. At first I would flinch at that and say, No, it is, and let me tell you all of the technical details to prove myself in that way. Over time, I have gotten way more comfortable. I know how important it is to have engineers with these skill sets, and I think to the extent you can say that you are pushing forward a different level, type of engineer, it is incredibly valuable.

The National Academy put out a publication I think in the year 2000 called [The Engineer of 2020](#) that speaks to all of these skill sets. We have so glorified deep technical knowledge, and not that it is not fantastic, but you have to be able to glorify these other skill sets of communication, writing, integration across disciplines as well and hold them to the same level. Towards that end, I find a lot of people who are skilled at the creative-brain side and are less familiar on the technical side. They get nervous and they think well, You must be a genius to be able to play in that space. And I love dispelling that myth. My least favorite phrase is, It's not rocket science, because rocket science isn't rocket science. It is a matter of persistence and a matter of engaging in the content and working on it over time. If you adopt that these are skills to be developed, not traits that someone has or not, then it really shifts what is possible for you. And especially in AI right now, people, one, I think having worked in many fields, computer science uses language that is opaque...I find myself unpacking language and then realizing what we are actually talking about and thinking, why are we using such isolating language in our terms? There is a reason that that exists, and it is not a good one. I think it is something that the field, as they confront diversity challenges, is working to pay more attention to all the time. But I also think it is something to just know from the onset if you are trying to learn. Those roadblocks, they are there, but it is a matter of just continuing to persist and dive into them so that you can move past them and really get involved in the skill.

I have a great friend who, he was an artist. He graduated with a sculpture major, I believe. He started teaching himself programming on the side, and now he is on the research team at Apple. And I think that his growth and trajectory, there are many stories like that that deviate from, Oh, I got my PhD in computer science from XYZ school, right? And I think if you look for those, humans have a lot of confirmation bias. If you keep looking for people on that one trajectory, you'll certainly find them, but if you start to pay attention to where the other trajectories exist, you'll find those as well.

Suzanne: You and I can be friends.

Rachel: I am so glad.

Suzanne: We have many of the same perspectives. And as somebody who is kind of on the other end of my career, boy am I happy to see people that think like this coming up. Life is good. All right. One final question, all of us are more than the sum of our resumes. We have delved into a little bit of that, but tell us about a hobby or a passion that you pursue when you are not working with us at the SEI.

Rachel: Sure. One is on learning new areas. My husband is in regenerative agriculture. I feel like just by being married to him, hanging out with him and seeing his work, I have gotten to learn so much about farming and food systems and livestock management, plant management. It is like an endless complex system that is super fascinating to watch and is something that we have been reflecting on. Much like I



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said on the pandemic forces people to reflect, of just how do you engage in nature in new ways, now that we're able to be out and about in the world in new ways? What does that look like? And it is something that I really love thinking about, also because it is a completely different side of my brain. Being in the farm world and the land-management world, it forces me to think about different things.

And the other one that I will say connects to the book previously, at Berkeley I started teaching life design and just giving people space and facilitating those conversations for people to do reflective work on, What is important to me? What are my values? Because I think it is one thing to say that, Oh, you should do meaningful work, but magically sourcing from yourself what is meaningful, I don't find that it's an instantaneous process. It takes reflection, time, conversation, community to start to do that surfacing. It is a piece that I am continuing to think about how to do and bring it to the Pittsburgh community as well as other places, because I think that so many of us are having that conversation in our heads. I know I certainly am. I think the more we can make it shared, make it be in the air between us, it helps everybody achieve, one, recognize they are not alone in those thoughts but also kind of gets them closer to their goals. That side of personal development outside of my technical work here at the SEI is definitely something I have thought a lot about and am really passionate about continuing.

Suzanne: Excellent. Wow. This has been a great conversation. As I said, I am so glad to see somebody that...you and I share a lot of values. That makes me happy that more people are coming into the SEI because for a long time I felt a little bit like a lone wolf. My way of framing it was, I am doing the socio part of sociotechnical work, and so I don't feel quite so alone, so this is good. Thank you for sharing your experiences. Thank you to our viewers for joining us today. As I said earlier, we will include all the links to things we have talked about: to the book. We will include links on the work that you did in Kenya—I imagine that is still going on—and other aspects of your work so that you can learn more about Rachel. Maybe you will even get to be part of one of her life-design workshops if you are in the Pittsburgh area, although I will bet you do them virtually now because we're doing everything virtually now. So I do want to thank all of you for joining us, and especially Rachel for sharing your work and your life with us today.

Rachel: Thank you so much for having me. I really appreciate it.

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