Episode 66: John Nychka

**KL:** Katie Linder

**JN:** John Nychka

**KL:** You’re listening to Research in Action: episode sixty-six.

[intro music]

# Segment 1:

**KL:** Welcome to Research in Action, a weekly podcast where you can hear about topics and issues related to research in higher education from experts across a range of disciplines. I’m your host, Dr. Katie Linder, director of research at Oregon State University Ecampus. Along with every episode, we post show notes with links to resources mentioned in the episode, a full transcript, and an instructor guide for incorporating the episode into your courses. Check out the show’s website at [ecampus.oregonstate.edu/podcast](http://ecampus.oregonstate.edu/podcast) to find all of these resources.

On this episode, I’m joined by Dr. John Nychka, Associate Professor, Chemical and Materials Engineering, Associate Dean of Teaching and Learning, Faculty of Graduate Studies and Research, Vargo Teaching Chair, and Adjunct Associate Professor in the School of Dentistry at the University of Alberta. John graduated from the University of Alberta in 1997 with a Bachelor’s of Science in Metallurgical Engineering, then went on to earn his Master’s in Engineering from McMaster University in 1999 and his PhD from the University of California Santa Barbara in 2004. He stayed on at Santa Barbara as a postdoc, and then moved to become an assistant professor in Chemical and Materials Engineering at the University of Kentucky from 2005 to 2007. In 2007 he returned home to Edmonton to join the University of Alberta. He teaches introductory materials engineering, communication, and capstone design courses, and his research is primarily about structural materials.

Thanks so much for joining me on the podcast, John.

**JN:** Yeah, thanks so much for having me. It’s a great pleasure.

**KL:** So, um, when I look at your research, I have to say, I’m a little bit, um, not sure where to go with my questions, because you do research on materials, which just seems like this big category. I’m not entirely sure what all it in entails, so let’s dig in there first. What are the kinds of research questions you’re asking about materials? How might you describe and kind of frame your research, for people like me who maybe just don’t even know where to start with that?

**JN:** Fair enough. Yeah, *materials* is a pretty generic term, isn’t it, and it ranges from fabrics to metallic alloys to dental ceramics, implants, you name it. Everything’s made out of something.

**KL:** That’s a lot. [laughs]

**JN:** And then materials— Yeah, yeah, it’s a lot. And it’s a way I figured, hey, great career. Everything’s made out of something. If I know something about something, hey, I might have a chance.

**KL:** Very good. Yes. Absolutely.

**JN:** Yeah. What’s so wonderful about it is, is that diversity of materials, is you basically get to choose what you’re interested in. So, it might help to give a little bit of an idea about what the paradigm is, or how we think about materials. And that might frame the context for the type of research questions I’m really interested in.

**KL:** Okay.

**JN:** Really, when we look at a materials paradigm, you know, or way of thinking about this subject, how do you think about a material? Well, we typically look at—and I’m looking at engineering materials in general, so something that has some use for society. If we look back into ancient times, it could be a wooden spear. It could be a clay pot. It could be trying to make a stone axe. People, over time, realized that hey, if I process this material or do something to it, it changes its performance. It does something different than it did in its original state. And that’s really what we want to do with materials engineering, is take something from a raw state and make it useful for us.

How we do that? Well, there’re a lot of interrelationships, so it’s a big systems thinking setup. You have process, which could be heating something in a flame. It will change the internal structure of a materials, [inaudible] then in turn causes its properties to be different. And then when we put all the properties we want together, we get what’s called performance. So it’s this process, structure, properties, performance paradigm. And what we do in materials is everything is linked to everything else, and there’s a path dependency, so we have to understand how something is made, down to the atomic structure—the microstructure, we call it—it’s a very fine-scale structure. Crystals, where the crystals join each other, grain boundaries, and all kinds of properties: physical, optical, mechanical, magnetic, you name it. There’s a long, long list. And performance could be what do you want it to actually do?

So when I think about all of that interaction of how materials work, my, really, interest is focused mostly on how things fail. So, why don’t materials do what we want them to do? And so how can we design the material to be better for what we want it to do? And that entails trying to understand how to categorize a material, so, what kind of words would we use? What are the structures we’re wanting to get? How do we get those structures? And so it kind of boils down, for me, to three M’s, kind of questions that I’m really curious about, or I like to call my three M’s: The mysteries in materials, what the mechanism is in the material, and what is the meaning of this? How does it actually help us? So that’s the broad, kind of large-scale picture.

In terms of the questions I’m really curious about with materials, what drives me is my passion for actually learning about a bunch of new stuff. I’m a really curious person, so I want to learn about all kinds of new materials. So I look for collaborations in different fields to try to figure out, hey, how can this materials paradigm fit into all kinds of other materials? So, I work with dental ceramics. How can we make them better for prosthetics so that we don’t get chipping of the porcelain veneers off of these ceramic implant materials? How can we make bio composite materials? So, we take crop waste and we mix it with plastics, and we can make such composites for all kinds of applications, but make them biodegradable so that they can return back into soil, for example, long-term. I work with people in human ecology, where we look at textiles and how water moves, even thru simple fabrics—everybody knows about socks—how does water move through socks? How can we design better socks by understanding the physics at a very small scale, and materials?

So that’s a big-picture idea of what the questions are, and I’m really curious about, you know, what are new ways we can use materials, and how do we actually understand the mechanisms going on at the atomic scale, to give us the meaning we want and get the value, for society, from an engineering standpoint.

**KL:** Okay, that is super helpful. [laughs] I feel like I have a much better understanding of your work. But this is such a broad area, and as you’ve given these examples of the things you’re looking at, they feel different from each other. Clearly they’re connected in terms of the questions you’re asking and the framework, the paradigm that you discussed. I’m wondering if you can talk a little bit about how your research has changed over time, what factors have influenced the direction, because it seems like you could go in just about any direction with this, you know, how are you making those decisions and prioritizing what to do next?

**JN:** Yah, fair enough. It can be very open ended, and almost seem like there is no direction at times. And so what I’ve been, uh, and I actually like that— I like learning about new materials and new things. But the, I think the value that I’ve found, or the questions that I really like, or “how can I get a really simple process in a material to change its performance?” So examples of that, are a lot, uh, I do a lot of work with coding, or surface engineering, so I have to change the behavior of the material at the surface, but I don’t necessarily want to make an entire material out of the material that’s at the surface.

So an example would be, um, metal oxide coating on an alloy. Typically we would use, they exist naturally; metals don’t really actually want to be metals, they want to turn back into the ores from which we turn them into metals in the first place. So we can actually use it on purpose, and say, “hmm, can I come up with a simple process, like heating something in air, that could all of a sudden change how it would behave, uh, in different applications?” So we’ve done some work trying to actually looking at plant leaf surfaces. Understand the structure of the waxes on the surface that cause the water resistance, and then going into the lab and saying, “hmm, how could I do this with a metal, um, so that I could access this type of interaction with water at high temperatures in different applications.

Plants can help us out at high temperatures in a boiler, or something like that, where we are trying to generate electricity, we would need a different material. But how can I learn from nature about what the structure is and interaction, and then grow it in the lab by heating something in air. So it’s really these, you know trying to have these neat processes that are simple, yet effective, that get to the core of “what is that structure that I need to have, and the material to get it to behave the way I want it.” And that’s, that is the thread that carries through all of my research projects is, ‘what about that process step? How can I process that in a really simple, sustainable way to get the structure I want?”

**KL:** So, I think that, it seems like that guiding question for you would be what would allow you to see when a particular research project has come to completion because it seems like this kind of research around materials and how they interact with different things, it could just go on and on and on, just with one material. But because you go in with such a specific idea of what you are looking for, in terms of that process, you kind of know when you’ve found it?

**JN:** Exactly. So when you get the performance or behavior you are trying to design for, you stop monkeying around. Say, “okay, that sounds good, moving on,” and so I like finding those questions that enable and empower both types of solutions, in other disciplines too, not just in my own materials [inaudible] but you know, because everything is made out of something, most people, at least in some of the scientific research that I’m involved with, are dealing with some kind of material in some form. Now it might not be from a material engineering standpoint, but in order to get more performance out of it, they need to know something about materials, so that’s where I kind of fit in is, “okay, well let’s try to inject some knowledge about materials into your bigger projects, to allow, to enable it and go to that next step.”

**KL:** So given that, and I feel like you’ve touched on this a little bit, can you talk a little bit about the tangible or the real world implications of your research. What are some of the things that are really kind of the takeaways that maybe a lay person would see as a, you know, a really tangible result?

**JN:** Yah. Precisely. Exactly the point of engineering [inaudible], it shouldn’t just be research in a lab, how do we benefit. One of the things that I think are really exciting, is in the dental ceramics realm, we’ve been looking at interfacial coatings and interlayers to try to understand and reduce the amount of incidence of failure of prosthetic devices in the mouth, for example. Other coatings that go on implants, to try to get them to, you know, be integrated into the body faster. There, there are other things with regards to some of these oxide coatings that I was talking about before where we’ve applied them in all different types of technologies to [filters?] to be able to separate oil and water.

So there’re all kinds of applications in that sense. From general processing of, you know, foods or chemicals to clean ups. You know, how do you clean up a spill with simple soap to paper that’s been coated in a simple process. To reduce that, the cost of some of these devices.

**KL:** Well, it’s, I feel like we’re just scratching the surface, John, [laugh] on your work. We’re going to take a brief break, when we come back we’ll hear a little bit about how John is taking the frame work for his research and engaging it with other parts of his professional life. Back in a moment.

[*music]*

# Segment 2:

**KL:** So John, as part of your work in research with materials, you’ve also created a frame work as your professional philosophy called, *Materials at the Interphase*, and I’m wondering if you can define this. You know, what does this mean to you when you incorporate it into things like your CD, your website, you know, what are you hoping people will take away? So what do you mean first of all, by ‘materials at the interphase?’

**JN:** Uh, great question. That philosophy is really, um, it goes into a bunch of different categories, but as I was talking earlier about how we have these materials and their [inaudible] skill structure is different. If you go down and down and down in length scale from the size of a mountain down to the size of a grain of sand, if you interrogate materials at a high enough level you notice that they’re actually physical interphases of that material. So we have regions in a lot of materials that have a different structures than the other one, that’s how [we’ll?] define, one way to define an interphase. And so materials at the interphase, really is all about, you know, a lot of the engineering we do about materials, is actually interphasial. So between these small regions and subsets of materials, or between materials, it’s that interaction where different materials, or even different structures in the same material, that’s where all the business happens.

So if you look at the strength of metals, it all comes down to very, very small defects interacting with zones within the material that are basically a few atoms width across, [grain boundaries?] So when I look at this philosophy, it’s a systems level approach to show that dedication to materials, you know research, being at the interphase of the materials themselves, but it extends then, if you [inaudible] it goes to different dimensions. There are those literal definitions of, well we have what we’d call amorphous or a glassy regions of a material, compared to a crystalline material. We’ve got interactions of an environment with a material, that all happens at the interphase. We have then, interactions that are more metaphorically, which are well materials are at the interphase of human cultural development.

If you look back and you see, you know, what is, uh, the Stone Age named after, well stone, what about the Bronze Age named after, well bronze. Materials are at that interphase at the highest level of technology to allow that development, and you know, looking forward, I would even say teaching and learning materials are at the interphase of that too, in terms of the concepts or learning and knowledge. Heck, we’re even made out of materials ourselves, if you want to take that more physicists type of standpoint. You know, all that there is in the universe is physics. You can have that standpoint too. But the idea of this, you know, our development as people is also linked to materials. So that’s the idea of is there a separation between matter and mind. So this field called Stone Age Neuroscience that looks at – did we develop materials, or did materials also develop us? So did our brains actually evolve because of our use of materials? Did language develop because of materials? So materials at the interface is – it runs many lengths, scales, and time scales, and dimensions and I just thought of all the things that I’m interested in that captured where I feel that my dedication to studying materials was actually at the core, was to be able to look at all of these interfaces.

**KL:** So, as you were kind of thinking about this interwoven philosophy for your teaching, research, and service. Is this something that you kind of went in – I’m curious about the origins of this; did you go in thinking, “I need to find a meta way, a systems way of kind of thinking about all these things together.” Or did you just kind of stumble into it and say, “You know, this makes sense. And I’m going to kind of shape some things around it to help communicate what I’m doing to other people.” You know, like how did that come to be?

**JN:** A lot of it was the communication aspect, you know, and over time trying to integrate all these different things that I had been learning about and that were starting to guide my own approaches to things; how I was making decisions, how I was thinking about problems. A lot of it is this systems thinking approach. And trying to have some kind of anchor that says, “Oh yeah, this is what it all actually boils down to.” Is, yeah, this is what I care about most. This is the thing that’s gonna drive me at all times. And why develop the tagline, “In the Logo”? That’s more of a communication piece. To, to really try to get sticky ideas and they came from reading Chip and Dan Heath’s book – I don’t know if you’re familiar with that or not – How do you make ideas sticky? Well, there are all kinds of different ways, but one way is to have them be memorable. And something that has different meanings to different people to get them all curious. And with that curiosity, you effect the affective mind rather than just the cognitive mind and domain and get people more emotionally involved with something.

**KL:** So you’ve mentioned the tagline “In the Logo” – I’m curious if you can share some of the different ways that you have communicated out this philosophy and how it’s helping to shape your career. I have seen it, you know, in a couple different places as I was researching for this interview, I saw it on your website, I saw it on your CV, are those kind of the main places that you’re sharing this out, or are there other places online or in your face-to-face interactions with people that you’re also sharing this out?

**JN:** Yeah, there are a few other places. I have a YouTube channel – Materials at the Interface, our flickr page group, which is Materials at the Interface; we embed the logo into videos that I make for education. The students want the logo for their email signatures, so students in my research team, for example. We’ve even gone so far as to make stationery so they have Materials at the Interface pads at their desks, which they love. I’ve shown it at conferences, it’s appeared in different sorts of venues at conferences, and the team, it’s really about the research team is, you know, getting them contributing to one big kind of group or team, feeling that they’re part of something.

**KL:** So in some ways, it sound like this is acting a little bit as a brand for you and for your research, which I think is a little bit unusual that researchers would sort of think about creating this around themselves. Can you talk a little bit about, you know, how has it shaped your career, how are you hoping it will continue to shape it in the future? Do you have ideas around that or are you just kind of seeing where it goes?

**JN:** I’m kind of seeing where it goes, but with a little bit of motivation to do more social change rather than just technical, scientific, or engineering research. That’s really why I think the branding is important. And to have a multidimensional definition. You know, I like that you can take it as a literal, metaphorical, or even a pedagogical direction. And so it’s allowed me to go and think a lot more beyond technical work. So asking different questions and getting more philosophical. I’ve been doing – it’s a wonderful collaboration with my friend Glen Hebert at the University of Toronto – about this materials paradigm and how did it evolve and where is it going? And thinking about these problems, you know, in this way, more philosophical way, we really came back to that kind of, you know, instance in time where I was thinking, “How am I going to think about the rest of my career?” And so this Materials at the Interface – it seems like a system – it really is my professional philosophy, and I’m not just a teacher or researcher; it’s really what I want to accomplish is more social change and having people understand how we can better utilize materials in those efforts.

**KL:** So for researchers who are listening to this, and maybe they’re kind of intrigued by having this kind of professional philosophy – can you talk a little about some of the benefits that you’ve found from it?

**JN:** Absolutely I can. I think I went into it earlier, but it’s really about decision-making; it makes decision-making easier. I can elaborate on that; it’s – when you know what your vision or your anchor is, all you really – the one question you have to ask is, “Does this align with my vision or not?” “Do I do this or not?” “Does this allow me to grow, grow my own little movement?” If the answer is “no” then it’s pretty simple to say, “No, I don’t think I’m going to be involved with that.” If it’s “yes” then the next question is, “Okay, how does this help, help advance or deepen the philosophy and our ties to it?” And also it allows for some grounding so you kind of know what you stand for. The team has a feeling of belonging too. Those have been great benefits is to get that clarity on what direction you want to go with things.

**KL:** Well, thank you, this has certainly gotten me thinking about my professional philosophy as well. We’re going to take a brief break, when we come back we’re going to hear a little bit more from John about failure and the research enterprise. Back in a moment.

*[Music]*

# Segment 3:

**KL:** John, one of the areas I know you’ve thought a lot about, particularly within your research on materials, is this concept of failure – the failure of materials – but I know that you’ve also thought in a more broad way about failure and the research enterprise and how this is something that’s just kind of baked in to what we do as researchers. I’m wondering if you can talk a little bit about that. You know, what kind of really led you to focus in on this area, what has it meant for you as a researcher?

**JN:** Yeah, it’s a great topic, and it’s dear to my heart. I’m a huge failure, right, that’s one of the ways I look at myself is failure is not really a bad thing. And so I think, when we look at failure and a research enterprise, what really gets me curious about failure is how do we reduce the necessary or the negative connotations we have with failure? So, failure sounds like a bad thing. Failure is not a bad thing. I’m reminded of a former CEO of Proctor and Gamble who said, “Two things: first, is that we don’t know anything. And secondly, nothing works the first time.” So when you have that attitude as a researcher, heck, whatever you do you learn something; that’s positive, that’s great.

**KL:** It takes some of the pressure off, that’s for sure.

**JN:** It sure does, and you know what’s interesting about research is there can be a lot of pressure, especially if there is a, as a new graduate student. You tried really hard, you got into grad school, and now you think maybe that you have to have all of your experiments work because it’s all about getting that good data for your research question. And so there can be a real challenge in training people to let go of that hope that everything is going to work and switch to actually, no, what we actually want to do is learn. You are not a failure; a failure is just an event. So when I say I’m a huge failure, really it’s just I am who I am because of all of the failure events that have gotten me to learn what I know to get me to where I am today.

**KL:** Mm-hmm, mm-hmm. This is one of those areas that I always think it’s so interesting, because most of what we publish in our academic journals are successes. And we’re really encouraged to, like you said, to gather that good data and make sure that, you know, we can say something of substance. But I do think it’s so important, especially when we have kind of a process perspective, to share the failures as well and to say we tried this methodology and it didn’t work and you know we tried to figure out why and here’s what we’ve realized. And you know, like I think when we’re recruiting for different research experiments and things, you know, if the recruitment doesn’t go well, why didn’t it go well? What can we learn from that? We don’t always focus on those things in terms of kind of tracking and making records of our own failures and then sharing them out into the larger research community.

**JN:** Yeah, that’s a great point, and as you were talking, I started thinking about how we’re basically showing this outwardly false sense of who we are inwardly. So we’re trying to show that, “Oh, look at all these great experiments I did and what the great data was and I wrote the paper so it sounds like a great story.” Not the order in which I did things, so it sounds like I have this great cogent argument supported by this great evidence. And I’ve got counter-arguments, and I’ve validated everything. But you’re right; that’s actually not how it works. So when you read the papers, as an earlier researcher, you think, “Oh, okay, this is what I have to do; I have to have this great story and everything has to work.” And, as you said, when we’re not publishing all the things that didn’t work, how do we actually get people to realize that to do the research is not the same as writing up the research; they’re different processes.

**KL:** But I do wonder, too, how much more efficient would our research be if we weren’t all failing at the same things because we knew that failure had already happened, so when we’re testing it out in those ways – and I’m sure there are certain researcher communities that are sharing out those failures effectively – but I don’t know that we have journals that are, you know, really actively talking about failure in the ways that you are describing.

**JN:** Yeah, it is a good point. How do we get that communication? And it’s a tricky one. I think it actually can even boil down to mindset. I don’t know if you’re familiar with Carol Breck’s work or not –

**KL:** I am and I really love it. Mm-hmm, mm-hmm.

**JN:** Uhm – and so the way I really look at it is it sounds to me like we’re looking at a fixed mindset versus growth mindset. You know, I think what we really try to do in literature is to grow basically human knowledge. That is really the main goal, I believe. The heart of sharing and disseminating all the knowledge we’ve built throughout our research, to grow what we know as people. But the challenge with that though is is that it seems like we’re doing it with a fixed mindset, which is, “Look at how smart I am; I figured this out.” Not “Hey, I learned all these other things that didn’t work. Don’t ever try these again. But this is also what I learned that worked well.” So it’s almost duplicitous or two-faced that we’re not really being honest to the process we’re actually following. There’s a little bit of dissonance there.

**KL:** It seems to me too, from your work specifically on looking at materials and failure that a huge part of your work is causing things to fail on purpose so you can try to figure out why that’s happened. Can you talk a little bit about failing on purpose in your research? How is that shaping what you’re doing?

**JN:** It’s getting a lot more – I wouldn’t say prescriptive – but as I bring newer people onto the team and we have discussions in the team, it’s – we try to get the mentality of, well, let’s just try it and see. Let’s go and see. And I remember being a co-op student as an undergrad working at a ceramics research lab, and I would go to my supervisor, Pressad Aptae, and I would say, “Pressad, I don’t know what to do about this.” He’s like, “Well, let’s just go try.” And so learning that attitude from somebody who models it, that doesn’t have to know the answers all the time, but says, “Well, let’s go and see, and if it doesn’t work, well we learned something that doesn’t work; we won’t try that again.” And so it gets more into, uhm, I guess the process of making sure people are exploring and asking questions. But how do you know if it’s the right question? Well, do an experiment, right? Try it; you’re never going to think about how to do it all in a perfect way, and then you’re going to fail. So fail on purpose, not because you’re trying to fail, but fail with the intent of trying to learn something so that when you learn something you can determine why and build that knowledge so that when you repeat it and iterate it, you can actually modify what you’re doing, modify your questions and get to the right question to learn something valuable… And then you just loop, right – it’s explore, experiment, fail, learn, repeat. And you just keep going in this loop. And so the goal is the learning, not the result. And I think that’s the shift I’m trying to do with my team.

**KL:** I’m so glad you brought up this idea of modeling for students and that you were modeled too as a student, because it seems like, you know, this is one of those areas where students need to see that their ideas have credibility, and one of the ways that they can see that is just by saying, “Let’s try this out. We’re not sure, so let’s go and see what we can find out.” But also I think grad school in particular is such a time where you’re not getting a lot of affirmation typically and it can feel very scary and vulnerable and everyone kind of postures to see that they can do this and there’s a lot of bluffing that we’re all just trying to get through it. And it seems to me that the failing on purpose mentality could be really helpful, particularly in that area of one’s career, where you’re really trying to build up your initial research and you’re really a junior scholar.

**JN:** Yeah, I really – it reminds me of that saying, “Fake it til you make it.” Do just enough to make it look like you’re being productive, but don’t go out too far and stretch your neck out because of the high risk. And this perceived high risk, I think, is really at the heart of the matter. And a lot of it, it has to do with the relationship, yeah, and so when I look at, you know, the graduate student- supervisor relationship, that’s a big power differential. And like you said, that tentativeness of people, you know, wondering “Can I really do this; I’m not really sure how to do this.” It boils down to not really knowing what’s supposed to happen in grad school. Like, is it my own personal growth, or so I have to publish a bunch of papers? And how do we shift that conversation to allowing people to develop as people, rather than producing research results.

**KL:** Mm-hmm, and it is typically both -

**JN:** Research results are going to happen anyway.

**KL:** Yeah, and it’s actually, you know, always both at the same time.

**JN:** Sure, what – it has to be. Yeah, yeah. And so that’s one of the shifts that we’re looking at here is how can we develop soft skills in addition to technical skills? So that we get the growth of a person, rather than the creation of a researcher. And clearly they’re going to be a researcher, but that’s not all they are. That’s not their own definition of themselves. Yes, they’re going to have academic training, but at the end of the day, if you can’t communicate it and you can’t share it and you don’t know how to work with other people, how does it help you? That’s one of the questions that’s really curious to me. And then, another aspect would be, well, what does the relationship look like? How do we switch to more of a mentoring relationship rather than a supervisory relationship? And that’s what some of my colleagues here at the U of A are trying to do. Is have mentorship Mondays, try to train the faculty members how to be a mentor more than just a supervisor.

**KL:** I think you’re right; that there are absolutely very practical things that we can do to make this a better experience for our grad students who are learning how to fail, in some cases for the first time.

**JN:** Absolutely, and I would say in many cases for the first time. If we look at the academic requirements, which is mostly how we admit students into graduate school, they’re superlative, they’re excellently performing academicians. The question is what happens when they reach that first failure in life. Are they able to get up and keep going, do they give themselves permission to fail, or do they try to avoid it? Love to see is a shift in the culture and the mentality rather than to avoid failure to embrace it and say this is how research actually happens. We figure things out because we’re trying things and we’re learning and we’re not taking it personally.

**KL:** Absolutely. Well, John, I appreciate and have really enjoyed the thought that you’ve put into so many areas of your research and how you’re incorporating it into all these different components of your professional life. Thank you so much for taking the time to come on the show and share a little bit more about your work.

**JN:** And thank you; it’s been a great pleasure talking with you.

**KL:** Thanks so much also to our listeners for joining us for this week’s episode of Research in Action. I’m Katie Linder and we’ll be back next week with another episode.

*[Music]*

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# Bonus Clip:

**KL:** In this bonus clip for Episode 66 of the “Research in Action” podcast, Dr. John Nychka

shares about what would be listed on his CV of failures – take a listen.

**KL:** John, as we’re talking about failure, I keep thinking about a Chronicle article that came out a while back about the idea of having a CV of your failures. And we’ve linked to this in the show notes for people to check out, but the idea that all we see in a typical CV is successes – the jobs that you got, the articles that were published, the books that were put under contract, the grants that were received. But we don’t see all of the things that were rejected or the failures that kind of maybe backed up all of those things that eventually happened. And I’m wondering, given how much you’ve thought about failure and integrated into your professional life, have you thought about this idea of your CV of failures? What are some of the things that have really helped your career progress, even though they were things that maybe didn’t happen?

**JN:** Great question. As I’m thinking but I’m wondering if my CV of failures – how much longer it would be than my current CV.

**KL:** Mmm. Mm-hmm.

**JN:** It makes me wonder now, of those, how long would it be? You know, and I have a bunch of them on there too. I remember when I first started in engineering student as an undergraduate, my first semester, I took a course – Engineering Physics, and it was not for me. I guess you might say that I didn’t quite get it, and being new to university, not knowing really what it was all about, taking that midterm – I think the class average when I took it was about 32% - and that was well below class average at, I call it my 007 midterm at 7%. And I really seriously questioned, should I really even be here. This is clearly not something I’m good at, I don’t know if I can do this. Should I just drop out? But, but I persisted and said, “Well, all I can do is try and do my best.” You know, with an average of 32 and being at 7, I wasn’t that far below class average. Sounds ridiculous, but I just had to buck up and work hard and realize that if I wanted to change, I had to do it myself. And so it allowed me to do that internal reflecting, and I think that’s one of the great benefits of failure. You can react different ways to failure; you can blame other people or you can look inward and say, “Hmm, what’s my role here, how can I change?” That was one of those key instances in my career as a researcher and student that I started to think inwardly and say, “Hmm, I’ve got to change something, it’s something in me.”

**KL:** You’re reminding me about my own early math days when I failed geometry and had to take it twice when I was in high school and junior high. And what you’re making me think is that part of what failure can sometimes trigger for us is what do we really care about? And what do we really prioritize? Because sometimes I think the things we fail at, we don’t care bout. I am not a mathematician, as our listeners are well aware, and so I think that that is one of those – it can be a signal in a really important way, but only if you’re looking for that signal.

**JN:** Yeah, if you have that, I guess, reflective intelligence to look to the past and look to the transitions to the future. But I think also part of that is that behavioral flexibility to say, “Oh yeah, I can accept that and I know that I don’t have to be good at that.” That’s why I’m not a mechanical engineer, as it turns out, that course is all – people who love that course and do well in it typically end up in mechanical engineering. I am not a mechanical engineer. Even though when I was in high school, I thought that was what I was going to go to university to become. So you never know. And you know, as you were saying, you’re repeating things I’ve had… [inaudible] four or five times.

**KL:** Mm-hmm, mm-hmm

**JN:** But believe in that idea, because I know there’s something to be learned there. And learning how to not take that personally, just learn how to become better at communicating or finding that fault or finding a different way to review getting other people involved, it allows you to grow in other ways I think is important. And this particular grant that you know wouldn’t get funded, wouldn’t get funded, wouldn’t get funded, I just kept going and eventually it led to a whole new line of research that I wasn’t even expecting out of that. So it was a grant to do one thing and the students also experienced in air quotes “a failure” which was they were trying to get a process to work in the lab – it wouldn’t work. They told me about it, and I said, “Oh, this is fantastic. This is not behavior we expected.” And he was kind of tentative and said, “What do you mean?” And I said, “Well, now we get to find out why it doesn’t work. This is exciting.” And it turned us on to a whole new area of research. A link to biomimetic and plant surfaces and trying to understand them and doing this differently. So it was fantastic. And if I would have given up on the first try at getting that grant, would any of that other stuff ever have happened?

**KL:** Mm-hmm, mm-hmm.

**JN:** So I think it also is that resilience piece. If you don’t allow yourself to fail and learn how to fail, then it’s harder to build up that resilience.

**KL:** Mm-hmm. I think a lot about revise and resubmits for publications and when I work with early career scholars and they think of that as failure, and I think you know feedback and revision, it doesn’t have to be framed as failure. I think it can actually be really impactful to make a piece a lot stronger, but it is about resilience in terms of bouncing back and knowing how to take that feedback and shape it into something really valuable for your work and for your audience.

**JN:** Yeah, and there are plenty of cases of people heavily invested in failure. If you look at patent literature, for example, Thomas Edison has the most patents of anybody. 1093 US patents. But he had inventions where he would do 50,000 failed experiments to come up with one invention. Now that’s a dedication to failure if I’ve ever seen one.

**KL:** Mm-hmm, mm-hmm

**JN:** Yeah, are you willing to spend what it takes to learn what you need to learn? You have to be invested in and treat it as that feed back – Oh – as you’re talking about the papers, “I guess I didn’t communicate that as well as I needed to for someone outside of the research to understand it as well as I know that I can communicate it.” And I have this opportunity, right, so it’s opportunity now to make something better.

**KL:** Well, thank you John for sharing some of the things that would be on your CV of failures.

**KL:** You’ve just heard a bonus clip from episode 66 of the “Research in Action” podcast with Dr. John Nychka sharing about what would be listed on his CV of failures – thanks for listening!