**Paul:** Friends. Lend me your engineers. Welcome back, everyone. My name is Paul. I'm here with Kamryn.

**Kamryn:** Hello, Paul.

**Paul:** Hello, Kamryn. Should probably get to the podcast. Let's get to the podcast. Helen Huang from the Brain Lab. So you are director of the Brain Lab here at UCF. What is what is the Brain Lab? That sounds like something that you walk into, and it's like a scene out of Frankenstein where there are brains and glasses. Is that an accurate portrayal of the Brain Lab?

**Helen Huang:** No, not at all. The Brain Lab. Brain in this case stands for biomechanics, rehabilitation and interdisciplinary neuroscience. And it abbreviates to brain.

**Paul:** Yeah, that would be probably hard to fit on the business card.

**Helen Huang:** It is. It is also hard to fit into an email. And then since then, I have sort of regretted having such a long actual lab name.

**Paul:** But the Brain Lab is great because you tell somebody that you're going to the Brain Lab, and they're like, ‘Oh, what is this Brain Lab? So what do you actually do at the Brain Lab?

**Helen Huang:** So we study neuromechanics. That's the interaction of neuroscience and biomechanics. For neuroscience, we're looking primarily at brain activity and muscle activity, and we're interested in understanding how people walk with an interest in gait rehabilitation and interventions.

**Paul:** What is gait? What does that word mean?

**Helen Huang:** Walking? It's locomotion. So walking, running, skipping, crawling.

**Paul:** Crawling. Really crawling?

**Helen Huang:** It's a form of locomotion.

**Paul:** Yeah. Okay, so I have actually been to the Brain Lab before. I was kidding about the brains and jars thing. And when you walk in, you have this tremendous treadmill in the center of your lab. Is this something that you could just go to the sports authority and pick up this treadmill, or was this a custom job?

**Helen Huang:** This is a commercially available treadmill that I purchased from a company that's based in the Netherlands. It's an instrumented treadmill, meaning it can measure forces that your foot applies to the ground when you're walking. And this particular treadmill is mounted on a mobile platform, which means that I can move the treadmill in real time as people are walking. So I can have the treadmill essentially shift side to side when your foot hits the ground. We can increase this belt speed so that we can also sort of create these losses of balance as well. There's two belts. There's one for each leg, so you can do things like have one belt go faster than the other. You can also have one belt go backwards and the other one goes forwards. And people are really remarkably able to adapt to these different situations.

**Paul:** So you're trying to trick people, you're trying to trip them?

**Helen Huang:** I am, yes. Applying perturbations to disrupt their movements, because I want to see how people adapt, I think is really quite fascinating to sort of probe to what extent people are able to adapt. And in my case, what are the brain areas and when are these brain areas active in learning to adapt to these different perturbations?

**Paul:** So the similarity between the professors here at UCF is everybody likes to trip someone. You had Andrew Dickerson who is researching how to trip mosquitoes. That's true. And Helen Huang who is learning how to trip people or really learning how to overcome.

**Helen Huang:** Well, I'm not really trying to make anybody slip or trip. I'm using very small perturbations on the treadmill. Something I'm doing that is new that I don't think other groups do is I'm actually applying this small perturbation on every stride to see how people adapt to it over time. Whereas in most cases people using slip or trip paradigms for looking at how people adapt during walking or for gait rehabilitation, it actually is used for older adults to help improve their fall recovery. They tend to use a larger perturbation so that people actually do potentially slip and they trip. And then they've seen that people are able to improve their sort of balanced recovery to these slips and trips and sort of reduce their fall risk. So in that case they have one perturbation as they're walking, let's say across a hallway or down the lab. And you're wearing a safety harness so you don't really fall or trip. So in my lab we also have a safety harness that our subjects will wear.

**Paul:** Is it optional though?

**Helen Huang:** It is not optional.

**Paul:** Well, I don't know if we want to talk about this right now, but there is a chance that we will be strapping Kamryn into this device and I was just wondering if he wanted to do it without the harness.

**Kamryn:** It doesn't sound like I have much of a choice. It sounds like the harness is not optional for safety.

**Paul:** I understand.

**Helen Huang:** The IRB institutional review board. We put that in there. There's a safety harness that we use particularly well. I'm talking about creating these losses of balance. I'm trying to understand what are the brain areas and when are they active as people have these losses of balance and how do they recover it from it, obviously. And I'm testing older adults.

**Paul:** Sure.

**Helen Huang:** So my parents were kind enough to come down and be among my first participants. And yes, I put them in the safety harness. And of course even then you're still sort of worried that they may do something funny. But they all said it was actually not as hard as they thought. And I was like, what? It's not as hard? I should make it harder? Yeah.

**Paul:** Can you turn it up to eleven? Is there like extreme testing?

**Helen Huang:** We're going to play around with different parameters that we can change, including the magnitude. So how big it is, the direction that the perturbations occur or when they occur. There might be different phases of the gait cycle where you're more unstable. So we're going to play around with that on healthy young adults first and try to find out on Kamryn find out where a happy medium is. We want to challenge them, but you don't want to challenge them too much because if you make the task too hard for people, then motivation like students will just sort of like deteriorates. Yes, they'll deteriorate, but you also don't want to make it too easy because then you also won't see anything. Right. So we have to find this sort of balance between the two.

**Paul:** So once you collect all your data, what are you hoping to use that data to either learn or what is the end goal of this project?

**Helen Huang:** Well, the long-term goal in my lab is to try to develop gait rehabilitation therapies or robotic devices or fall intervention therapies that are based on brain dynamics. So the idea is basically, what I hope is, that what's important for rehabilitation is actually activating certain brain areas at certain times. And maybe if you can't actually practice walking because you can't support your body weight or you have a hard time walking, you're very unstable or something. Maybe if we can activate those brain areas with other types of exercise, maybe that will actually help you walk later on. So I'm trying to identify the areas in the brain that are involved in recovering from these losses of balance and when you are adapting to these perturbations. And I want to know when they're active in what way, and then trying to use these perturbations and maybe other approaches to essentially elicit that sort of brain activity without you necessarily having to walk and hoping that that will help with balance, recovery and walking ability, things like that.

**Paul:** Is this something that you've always been interested in?

**Helen Huang:** Honestly, no.

**Paul:** Okay. What led you to this field?

**Helen Huang:** What led me to this field? I'm not the sort of person who had a set idea of what I was going to be, and I made a plan and I was going to follow it through. I've always sort of just followed whatever opportunities arose for me that I thought were interesting. So if you asked me when I was in high school or college or as a graduate student if I would be doing this, the answer would be no. In fact, when I was a graduate student in Michigan, I worked with Professor Dan Ferris. And when I was finishing up my Ph.D., he started to do this brain activity stuff during walking using electroencephalography that's or commonly known as EEG. That's where you place these recording electrodes on the scalp surface and you can measure the electrical activity. So he started to do this high density EEG studies during walking when I was finishing up. And I just remember thinking, I will never do this. And so I was like, I'm glad I'm leaving the lab now while he's transitioning to this other area of research. And I just think it's funny where I've learned that I should never say never. I'm never going to do something because it always comes back where I end up doing whatever it was that I said I never wanted to do, such as high-density EEG.

**Paul:** I think if there's one lesson to be taken away from this show, is that you're going to end up doing what you said you would never do. Because Dr. Dickerson was in the exact same boat. He's like, ‘I'm done with academia.’ Well, I'm a professor now, so maybe being a professor was not always something that you were considering.

**Helen Huang:** Oh, no.When I was in high school, I applied to colleges with the intention of being a different type of doctor, a medical doctor. And then I went to this camp in Boston for high school students interested in medicine, and they started talking about ethics related to medicine. And I was like, ‘I don't know if I want to deal with this.’ And so I told my dad, I don't want to be a medical doctor anymore. And they just looked at me like, ‘You applied to all these schools for purpose of going to medical school.’ And I did apply to MIT. And he pretty much was like, ‘Well, if you want to be an engineer now, and you've gone to the best engineering school in the world, then I and his money, we're going to go to MIT’. And that's the way I phrase it, and I'm sure he thinks of it differently, but, I mean, he has my best interest at heart, right? But they didn't have biomedical engineering back then, which is something I was interested in. There was a minor, but not a major. So something I think is interesting as I'm now in the mechanical and aerospace engineering department, right? And when I was a freshman at MIT, I remember trying to decide what major I wanted to be, and I was like, ‘Oh, maybe mechanical engineering sounds cool.’ I like to build stuff and things like that. So I signed up for one of the core classes there. It's called 2001, and I forget what it stands for. So MIT, all the majors are actually numbers. So mechanical engineering is course two, materials science and engineering is course three, et cetera. So I signed up for a mechanical engineering class, and I signed up for polymer chemistry, which is a material science class. And I really enjoyed and did well in polymer chemistry, so I dropped the mechanical engineering class. So I think it's kind of interesting that I had the choice of going to mechanical as an undergrad, and at that time, I wasn't all that interested, and yet now I'm an assistant professor in mechanical and aerospace engineering.

**Paul:** Look at that. You never know. You never know. So coming out of college, where did you go into industry?

**Helen Huang:** I did. So when I graduated from MIT, I got a job at Michelin.

**Paul:** The tire company?

**Helen Huang:** Yeah, tire company. Their North American headquarters is in Greenville, South Carolina, which is where I grew up, and I had an opportunity for a position there. I actually was what they called a process engineer, and my job was actually really fun. So there was a rubber manufacturing plant, and I was one of the engineers responsible for managing a line of equipment, essentially, that produces the rubber. So essentially, you can imagine there's all these different lines of equipment in the plant that produces tons of rubber. And so I was in charge of making sure all the parameters were set to try to maximize the output, because obviously, it's a business, so they want you to make as much rubber as you can during the shifts and also maintain certain quality. I didn't have to dress up or anything. I mean, it was a manufacturing plant, so I showed up. There's a locker room. There was, like, a jumpsuit. So we each had three of them. It has your name on it. Like, I have this little yellow patch…

**Paul:** Like The Ghostbusters?

**Helen Huang:** I guess, kind of something like that. So you put this on and have your work day. It was kind of fun. I got to interact with the actual workers who are actually running all the equipment and talk to them. And one of the reasons I was interested in pursuing this, because some people would be like, ‘Why would you work in a manufacturing plant?’ And it's because ultimately, whatever research and development devises, it has to get produced, and it has to get produced at a scaled up version. And so R and D would usually send us over formulations, and we had to try to figure out how to run it and make a ton of rubber. Whereas in their little lab space, they have this little miniaturized thing, and they're making a very small amount, and usually it doesn't transfer that well. What you create that's very small in scale doesn't necessarily translate to this very large-scale operation. So I thought it was important to see what really goes on on the manufacturing side. So ultimately, later, if I were to continue there and transfer to R and D, I'd have a better idea know what are the constraints, what are the parameters? What are things that are important to consider that people who go directly to R and D would never know?

**Paul:** Did you meet the Michelin man?

**Helen Huang:** I believe he has a name. Think Mr. Bib.

**Paul:** Mr. Bib? I think I've Michelin Bib.

**Kamryn:** Heard that before, but I can't verify.

**Helen Huang:** I never met him. But they have a store in downtown Greenville, South Carolina, that has all Michelin sort of like gear.

**Paul:** So what led you to UCF? Was it straight from Michelin here, or were there some stops along the way?

**Helen Huang:** There are a lot of stops along the way. So when I worked at Michelin, that was right after undergrad, right? So I was actually only there for about four months before I was like, ‘I don't know if I really want a career here at Michelin.’ They're a good company. They treat their employees well. I just didn't know if corporate life was something I was interested in and all the sort of different layers of paperwork and bureaucracy that's involved. So I applied late to a couple of schools for biomedical engineering because that's what I wanted to do from the beginning. And I applied to Georgia Tech and University of Michigan. And I remember I was like, I'm going to submit my application, like, December 31. And I did, but I didn't like my essay, so I actually wrote another one and sent it and said, ‘Hey, is there any way I can swap out my essay?’

**Paul:** So after you already submitted your application?

**Helen Huang:** Yeah, after I already submitted it, and they accepted it. And I was fortunate enough to be among, like, 40 students that they bring up for recruitment. So they fly us out and put us up and take us out and have us meet with a bunch of different professors and visit a lot of different labs, essentially trying to recruit us. And at the end of the trip there, you meet with the chair of the department. And I remember when I met with him, I had applied for a master's degree, not a Ph.D. And when I met, he had said that he wanted me to switch from master's to Ph.D. And that I was being awarded a first-year fellowship. And he said that he thought I was a risk, but he thought I was a risk worth taking, and he told me I got the last one.

**Paul:** It was that essay.

**Helen Huang:** I don’t know.But I do know when I was going and talking to different professors, I did see that they had both, so I thought that was interesting. But Michigan, what I heard from my advisor Dan Ferris, was that one of my recommendation letters was really outstanding. And surprisingly, that was from my Shakespeare at the Opera professor. Obviously, I took Shakespeare at the Opera at MIT, and I ended up making a really good impression on the professors. And she wrote, apparently, a really fantastic recommendation letter for me or reference letter for me. And it's just kind of crazy, right, to think that I even got into graduate school for biomedical engineering, and I was able to start off right away getting a first-year fellowship, which obviously helps you right away get into, like, a research lab and do your coursework and things like that. So that was pretty – I often think that I'm kind of meant to be here because of different things that happen along the way in terms of transitions, in terms of how I got here. So that was one of them. And it took me a while, but I did end up getting my Ph.D. And then after that, I'm not a person who really plans very far ahead. I'm not the sort of person who makes a plan to say this is what I'm going to do. I'm a procrastinator. I think everybody who knows me knows that. And I just sort of get things done when they need to be done. And when I was getting ready to graduate, I really hadn't thought about what I was going to do next at all. All I knew was that I got another fellowship from NIH to finish funding my last few years at Michigan. All I knew is my funding was running up, running out, and I needed to finish up, and I had no idea what was going to happen next, but didn't matter. I just needed to finish up. And I was really fortunate where I was contacted or someone made aware to me that my postdoc advisor at Colorado, Alayhiyah Ahmed, was looking for a postdoc and suggested that maybe I apply. And that's what happened. So I applied, and we were able to help me come out to Colorado, and I did my postdoc out there with her. And that was a really great experience. Got to do some really fun research related to motor adaptation and metabolic cost, which is essentially how much energy you use when you're making a movement. And that was also interesting in the sense that I was funded off of – they have an NIH T32 grant at the University of Colorado on aging, and I applied for one of their postdoc positions because there was going to be an opening, and I did well, but they thought they had an opening, but then they didn't. So the letter I got back was like, it was a rejection, but not a rejection.

**Paul:** Okay?

**Helen Huang:** So it pretty much was like, ‘Oh, they don't have a spot right now.’ But when there was a spot, if a spot opened up in that year, if I remember correctly, they were going to offer me the position, and it happened. So I have all these little things that happen along the way that I'm just like these things. Do they really happen? Maybe they do happen and people just don't talk about, but like, this is part of my story here. And that's only kind of halfway because after my postdoc, I went back to Michigan and again worked with now Dan Ferris, where I said, like, I'm never going to do EEG, and then I went back to learn about and so I was there for a little bit, and he actually played football here. He did his undergrad here, and he got, I think it was in mathematics, and he played on the football team. And there was a lot of positions that MAE had. And he said, ‘Hey, did you apply to UCF?’ I was like, no. And one reason I didn't apply is because my family, we live in South Carolina, right? And my dad, he wanted to go to Key West. We went to Key West, and as we were driving through, I just remember thinking, ‘I will never live in Florida, never.’

**Paul:** Seems to be recurring. Yeah, too flat. Why?

**Helen Huang:** I don't know. There's just something about Florida I didn't really like. And then the other aspect of that was I was never if I was going to stay in academia, I was like, I will never be at a large university.

**Paul:** Right.

**Helen Huang:** And UCF is what, second largest? Second largest or something? So these are two nevers. And I was like, no, I don't want to apply there. But I ended up applying because as many of us know, it's very difficult to get a tenure track position. And I believe I was like, one of the last people to apply for this particular position for UCF. And guys brought me out here. I somehow had like a three-day interview, which I have not seen any other candidate come in for three days. But I was here for three days and I was terrified because I don't think I do well in interviews. And then everybody's like, ‘Oh, when you interview, you know, when you find the right spot.’ And for me, I was like, I realized at the end of the three days it really didn't feel like an interview. So because it didn't feel like an interview, I was like, ‘Oh, this may be a good spot for me to be at.” So fortunately, UCF and MAE felt positively about me. And then now I'm here. So yes, nevers, always come back to get you -- never going to do EEG. I was never going to be in Florida and I was never going to be at a large university.

**Paul:** All three happened.

**Helen Huang:** All three happened.

**Paul:** What else are you never going to do so that we can look out for you doing that very soon?

**Helen Huang:** I can't recall anything that I've said recently where I'm like, ‘I'm never going to do this.’

**Kamryn:** I think she's learned at some point you're like, ‘I might as well not say that because I know I'm going to go back.’

**Helen Huang:** Yeah. So it's been a really interesting sort of path for me to get here, and I'm really thankful for all the people along the way that have been my mentors. And I think Dr. Dickerson had said something about his advisor at Georgia Tech, something that he really appreciated was he just did things that he was interested in. And I feel like I've been surrounded by people who are also in that mold. I've always been very fortunate that my peers are very curious and interested. In fact, most of the people I know from Michigan, we are graduate students together. Most of us are in academia as assistant professors or associate professors. And I'm not sure how many other people can say that. Like the majority of my peers, we are all still in academia. So it's just that group of people are just really interested in what we're doing. And we enjoyed it and we like it, so we're still doing it, and we're trying to pass it on to the next generation, trying to get them interested as well. So I think I've just been really fortunate for who I worked with, funding that helped me get through it all these little really weird little things I feel like came through that I just would have not expected.

**Paul:** I want to go back because you mentioned Shakespeare at the Opera.

**Helen Huang:** Okay.

**Paul:** Does this mean that you sing opera? I'm not familiar with this program, what this means.

**Helen Huang:** I do not sing opera. I do come from a musical background. I played piano when I was younger. Interesting. There's a lot of Helen Huangs, by the way. In fact, there's another Helen Huang who's, like, in a similar area. She's at Carolina State University slash UNC. She works with prosthetics. She decodes signals to control upper limb and lower limb prostheses. People get us confused. And a lot of students here, they're interested in prosthetics, and I have to tell them, like, ‘Just so you know, there's another Helen Huang. So you may or may not have read my paper. You may think you read my paper, but it actually might be the other Helen Huang.’ But we know about each other, and it's kind of funny. So if we get emails intended for the other, we just send them along. But we're hoping to work on a project and get published together.

**Paul:** Well, that would be confusing.

**Helen Huang:** I'm the, I'm the junior one. She's more established. But back to music. There was a Helen Huang who is a pianist, and she was coming through Greenville, South Carolina, and gave, like, a concert, I think, at the Peace Center is what's called there. And my neighbor snipped out the article in the newspaper and put it in my family's mailbox, thinking it was me. And then I was like, we were like, ‘Oh, no. Helen’s pretty good, but she's not that good’. So I have a musical background, I guess. At MIT, you have to have a humanities concentration, I think, is what they call it. And I chose to do mine in music. Interesting. Like, think all the humanities, the number is, like, 21. So it's like 21 M is music. 21 H is history or something. 21 L, I think, is literature. And my memory could be off. That may not be correct, but I ended up taking three music classes, and I prepped for Shakespeare at the Opera. By taking Shakespeare the previous semester. Not that I think it really helped, but it was kind of fun to take a class that wasn't engineering based. And, yeah, we listened to a lot of involved, a lot of listening to, a lot of opera writing essays, discussing it, things like that. So a very completely different set of skills. And I guess you can say I kind of put myself in that position because I thought it would be interesting, and it would put me outside of my comfort zone a little bit. Kind of surprises me that I did that at that age. But that is something I think is important now, is realizing that you can only grow as a person or as an engineer or as a professor, lecturer or as a speaker or whatever, if you make yourself a little bit uncomfortable, like doing this podcast.

**Paul:** But did you know that there is a great big, beautiful tomorrow shining at the end of every day and tomorrow is just a dream away? Close.