

- Speaker 1: Welcome to Featured Faculty, a podcast series about Anderson University professors and their lives both in and out of the classroom.
- Amalia Arms: My name is Amalia Arms. Joining me in the studio today is Dr. Caroline Baker, Assistant Professor of Mechanical Engineering. Dr. Baker began working at Anderson University in January of 2019. Could you tell me a little bit about yourself, and about how you came to AU?
- Caroline Baker: I just recently graduated... well finishing up still, actually, my PhD at Purdue University. I got my Bachelors at Pensacola Christian back farther, a little longer ago, than I care to mention right now. Got my Masters at N.C. State. And all through my undergrad, I'd sworn that I was never, ever going to teach; and then changed my mind right at the very end, and decided that if I was going to teach, I'd get the PhD.
- Caroline Baker: And the opportunity at Anderson actually came, I don't know, some time through my third year of my PhD. And they were like, "Well, you're not ready yet. But keep us in mind, please." And then a year and a half later, they contacted me. They're like, "Hey. You haven't happened to take another job, have you?" And I was like, "No, actually I'm still looking." And they're like, "Well, come back for an interview, please." And I was like, "By all means."
- Caroline Baker: So it was really just kind of a fortuitous. I needed a job, they needed a person. And it's been really exciting, because the engineering program here is so new. And just being able to get on the ground floor of something this new, and with everybody so excited about it, is really fun.
- Amalia Arms: So you earned your PhD at... well you're still earning it...
- Caroline Baker: Yeah.
- Amalia Arms: ... at Purdue University, in Mechanical Engineering?
- Caroline Baker: Yep.
- Amalia Arms: As part of your work there, you developed a time integrator by using angular orientation to analyze diametrical compression of compressed granular tablets. I have no idea what that means, so I was wondering-
- Caroline Baker: Some days I don't either.
- Amalia Arms: Yeah. Could you explain it a little bit to me?
- Caroline Baker: We analyze materials that are made up of granules, so basically powders. So think of really small particles. And we pretend they're all spheres, even though they're not. And we say, "Well, this sphere pushes on this sphere this much..."

and I don't if you're familiar with Newton's Second Law of Motion, but force equals mass times acceleration. So you push something, it will move as long as you give it enough force.

Caroline Baker: So we look at it and we say, "Well, if the particles are this much pushing on each other, there's this much force, so they'll move this much when they're done. And then they'll bump into these other particles." And there's a lot of math involved. A lot, a lot of math. Computers do this, we'll deal with 100,000 particles at a time. And the computer will calculate all the forces, and calculate all the motions, and then go back and like, "Well if it's in this new position, now it's pushing this particle. So, how much is it pushing that particle?", and then just repeat the process over and over.

Caroline Baker: So the time integrator specifically is: How do we do those calculations, from acceleration to where the particle goes. And a lot of time integrators use some really basic equations to be like, "Oh, the particle moves here, and it moves here." But not all of them take into account the fact that the particles don't just scoot along in their same position, they rotate as they do. They can roll, they can turn. If you have two spheres and they don't hit each other head-on, they brush obliquely... like if you think of billiard balls of something... if one hits one at an angle, you can send the other one off spinning, where it wasn't spinning before.

Caroline Baker: So our integrator takes care of some of those rotations, in a little bit simpler mathematical way than a lot of the other ones do. The math for the rotations gets very complex, very, very quickly. So being able to reduce the number of calculations we do, for one calculation, when you have to do that calculation 100,000 times, 1,000 times over, really helps with the speed. And that's one of the things we were trying to achieve.

Caroline Baker: I'm not sure if that was any clearer than mud. But I hope it was a little clearer than the mud we started with.

Amalia Arms: You're also a member of the American Chemical Society?

Caroline Baker: Yes.

Amalia Arms: I'd like to hear more about that. How did you get involved?

Caroline Baker: I have an undergraduate degree in chemistry, actually. I graduated with my degree in chemistry, and then a year later finished up my mechanical engineering degree. The reason I have a degree in chemistry is actually because I went into school going, "I love chemistry." And I still enjoy chemistry. But it's like, "I love chemistry, but the only things you can do with chemistry are research and teaching." That's not necessarily true, but that was my mindset. And I was terrified of the idea of research. And I didn't want to teach, ever, ever.

Caroline Baker: I had a professor who told me my sophomore year, "Have you ever considered getting your PhD in teaching?" And I was like, "No." And then I laughed at him. And now he's laughing at me, because I got my PhD and I'm teaching now. And I love it. So I started with a chemistry degree but I did the engineering degree alongside it. Because I was like, "Well I love the chemistry, but I can get a job with engineering that doesn't involve research and teaching."

Caroline Baker: And then I wound up going the engineering route anyway. I get to pull some of the chemistry in for some of my classes and stuff, and that's always fun.

Amalia Arms: This is kind of interesting to go from not wanting to teach at all to now being a teacher. How did that happen?

Caroline Baker: After my sophomore year, I was a lab assistant in the chemistry labs. They let anybody, sophomores on up. So we do grading, we help the students, we do whatever the instructor wants you to do, basically. And at the end of my chemistry degree, when I had finished, they were going to be short a couple chemistry teachers the next semester. And I knew this because I was assisting in the labs.

Caroline Baker: And I was like, "Hey, I have a chemistry degree." One of my classmates was going to be working on his MBA and teaching in the chem labs. I'm like, "I have exactly the same qualifications. Can I teach in the chem labs while I'm finishing my engineering degree?" They're like, "I don't know about this, but we really need somebody." So I wound up teaching four chemistry labs the following year, the following fall.

Caroline Baker: And then in the spring, they had me doing something else other than the labs. And I went back in the lab to go ask someone a question and I was like, "Dang, I miss this. I really, really miss this. This is really weird, but I miss this." And through a few other circumstances, they wound up losing an engineering teacher, and I actually started teaching... I graduated in May, and I started teaching college classes in September. Not a path I would recommend for... I was going to say most people, but not anybody, really. Including myself.

Caroline Baker: I would never recommend that to myself if I were going to go through and do it again. It was a path, and it was the path I took. And after I started teaching I was like, "I really do enjoy this, but if I'm going to do this for the rest of my life, then I can't do it with just a bachelor's degree."

Amalia Arms: Not a lot of women go into hard sciences, like chemistry and mechanical engineering. What has it been like for you to be a woman in the sciences?

Caroline Baker: I have run into... you run into those people. It's more the older generations that have issues with it or whatever. But I had a classmate [inaudible] and he's like, "I don't even know why they let women in engineering," or whatever. And I

ignored him, because he was a jerk. He didn't really bother me anyway, because he was just like that.

Caroline Baker: So for the most part, I felt a little bit like a unicorn in some cases. There were two women in my graduating class of engineers. We're still friends. She's from Houston. She wound up actually getting a job up here in Noblesville, so now we're a half hour from each other, which is nice. We see a lot of each other. And so you wind up being really collegial with the women close to you. But I haven't really run into a lot of the issues that people talk about.

Caroline Baker: I think the biggest problem that I've had, being a woman, is balancing my own expectations of what I should be doing at home. Like, "I should be doing the cooking, and I should be doing the cleaning," and all of that stuff. And my husband's been very supportive of like, "So, you're the one working two jobs right now. Don't worry about it." And he's a better cook than I am anyway.

Caroline Baker: So just, I've had a pretty good experience. All of my colleagues have been very supportive. Here, I've had a lot of colleagues... not in engineering, because I'm the first female engineering professor that they've had... but my computer science colleagues, others in the School of Science and Engineering are like, "I'm so glad to see a woman in engineering finally!"

Caroline Baker: All of my students are male, right now. But I don't run into, haven't run into, any real issues with that.

Amalia Arms: So, one thing you enjoy learning is new languages. And I was wondering which ones you've studied and what draws you to language?

Caroline Baker: Yeah, I can be a little bit of a... I don't want to say nerd because that comes across wrong sometimes. My mother lived in Germany for nine years, before I was born. So she spoke a little bit of German to me, started teaching me a little bit of German, when I was very small. So I've always loved German. I studied it in high school, but you know how studying high school languages goes, right? I'm working on it some right now in what I call my "spare time," which winds up being my commute. So listening, and that kind of thing.

Caroline Baker: I have a bunch of German books now that I want to read. I collect them, from Half Price Books, when my husband is not with me to stop me. And I've started learning with Duolingo, or some of those language-learning apps. Irish. What apparently we would call Irish, Gaelic. They get upset if you call it Gaelic, but [inaudible 00:10:20]. Started learning a little bit of that.

Caroline Baker: Recently, taught myself a little bit of the Cyrillic alphabet, as a preparation for Russian. So, getting used to Hs being Ns, and Cs being Ss; and like, every letter you know being something else. Which is different than, like, a lot of the German sounds are very similar to the English sounds. You swap up like two letters and that's it. So, that's been a different experience. But I have this list of

languages I want to dabble in, trying to be realistic that at this point that's probably all I'll ever do with most of them.

Caroline Baker: But I really would like to be conversational in German, at some date in the future. It's just fun to sit there and make different noises with your mouth, and to be able... in the case of German for me anyway... to be able to read something from another country, from another time period, that was written by somebody who doesn't even speak the same native language as you do and be able to understand it. I read German news sometimes. And it's always really exciting when I can make out a headline that I didn't need to go back to like, "What was the English word for that again?"

Caroline Baker: It's just exciting. And I don't know that I've ever really analyzed why.

Amalia Arms: You also have some more creative hobbies, like crocheting and playing the piano, which makes me curious about what kinds of things you like to create.

Caroline Baker: Right now, I have far too many projects in my pipeline, far more than I should. I don't crochet a lot right now. People are going to think I'm a heathen for this, but I crochet during church to stay awake. Because otherwise I will fall asleep. So I try to make sure it's something like boring enough that I don't have to count, or something else that's going to take mental energy.

Caroline Baker: But right now I'm working on a couple Afghans. I have cousins getting married this summer, so I'm trying to make something for them. I've made an Afghan for each of my siblings, have them choose the pattern and the colors, and put it together. They're just something soothing about the repetitive work that actually doesn't use a lot of mental power.

Caroline Baker: You have to count, you have to keep track, but it doesn't involve calculations... well, a little bit of calculations. But those can be done with a calculator. It doesn't involve a lot of heavy math, or a lot of intense thinking. It's just nice to be able to sit there and watch something kind of grow in your hands.

Amalia Arms: You earned both of your undergraduate degrees from a Christian college, and now you've come to teach at a Christian university. How has your faith influenced your career path?

Caroline Baker: I would say that my faith has led my career path. Just the ability to step out and do something that I literally was terrified of doing, that for me was an act of faith. Faith in the Lord to keep me from completely botching it and screwing up my students' lives. Faith in the people around me who had strong relationships with the Lord who were like, "Yes, you can do this. And yes, I will support you."

Caroline Baker: My church, right now, is one of the reasons that I even have gotten close to finishing my degree at Purdue. Because there have been days when I'm like, "I'm done. I'm just done. Not doing this anymore." I've had a lot of support

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there from my pastor and other people. Just knowing that I have an aptitude for the mathematics, for the engineering. Those things make sense to me. And knowing where that came from, knowing that that is a gift from God, and being able to use it for the development of other people, is a tremendous blessing.

Amalia Arms: Well those were my last questions, so I just wanted to thank you for joining me.

Caroline Baker: You're welcome. Thank you.

Speaker 1: This podcast is a production of The Andersonian, the student newspaper of Anderson University. For more in this series of faculty interviews, please visit Andersonian.com.