Sloan Career Cornerstone Center

Profiles in Aerospace Engineering/Technology

Susan M. Bowley

Aerospace Technologist - Biomechanics
NASA Ames Research Center
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Education:
Ph.D. Candidate, University of Virginia
MS, Mechanical Engineering, Stanford University
BS, Mechanical Engineering, University of Connecticut

Job Description:
Aerospace Technologist focusing on biomedical research in the Musculoskeletal Biomechanics Lab; analysis of heat, human factors, and load for space shuttle.

Advice to Students:
"What's most valuable really -- in anything -- is persistence and accomplishing your goals."

Comments:
Sue began her NASA career ten years before this interview as a facility engineer for wind tunnels. For several years she developed support equipment for transonic and later hypersonic wind tunnels. She then took advantage of NASA professional development program through which employees can move to different areas of interest which brought her to life sciences to actually build a human powered centrifuge. It's powered by bicycles and they're going to be using it for research. She's been in biomechanics research ever since.

Video Transcript 1:
"What I think basically got me the job here was lab experience that I had. When I was an undergrad, I worked in the food mechanics lab. And there was a lot of experimental stuff that I did, all four years during the summertime and part-time during the school year. So I didn't do a coop but I had that lab experience. That's what really what got me the job here."

Interview:

Q: Tell us who you are.

Bowley: I'm Sue Bowley. I work at NASA Ames Research Center, doing biomedical projects right now.

Q: How did you get started in that field?

Bowley: Well, I was interested in medical applications of mechanical engineering. And actually, when I was doing my Masters, I started doing a project with premature infants and sudden infant death syndrome. They had sort of an instrumentation problem there. That's what made me want to do more biomedical engineering. There was an instrument that you actually place on the skin of the infants to measure sweating rate. And the idea was that the infants cannot regulate their body temperature, so they're overheating, and then they stop breathing. And so it's kind of a long story but my part of it was to make sure that the instrument that they were using on the skin was more accurate than what they were getting before.

Q: How did you get started in mechanical engineering first?

Bowley: Well, my dad was a Mechanical Engineering professor at UConn and when I was in high school, I originally wanted to go into physics. But he's the one who sort of convinced me that engineering would be more application-based instead of theoretical-based. I always liked physics because I thought it was really great that you didn't have to, like, go do something. You could figure it out on paper, you know, and then you could check it by doing whatever.

Q: Is that true? Is that the way it's actually worked out?

Bowley: Yeah. I mean, to me, the value is of engineering is that you can experiment forever but you could get to a much quicker answer if you could analyze something first and then experimentally determine something afterwards.

Q: When you were a student, what were you interested in?

Bowley: Actually, when I was in high school, I was considering being a French major because I like foreign languages. But I didn't think it was challenging enough for me. It was very easy and I'd rather do something more challenging. I was interested in nature, and studying nature and science weren't so easy.

Q: Did you have any idea that you would be doing what you're doing now?

Bowley: No, I didn't expect to be. You mean this? Working for NASA?

Q: Talk about what you expected, what you were thinking about as an undergraduate.

Bowley: Actually when I was an undergraduate, my dad was doing a lot of biomedical type problems like hip implants and protheses for your mouth and your teeth. And since I was a kid, he was doing these projects so I got some exposure when I was a senior at UConn to some of those projects.

Q: How did you get to NASA?

Bowley: (Laughing.) Me and a friend of mine, Julie, we just took off in the car from Connecticut without any jobs. And just sort of drove across the country for like a month, and

when we got here, we took the public tour and it was so exciting. I mean, to see these wind tunnels and stuff that were so huge. The ones at school were only like the size of a room and to see this stuff, it was just really exciting. And you know, it wasn't easy to get a job here either. It took a lot of persistence to keep calling, but that's how I ended up here.

Q: How long have you been working for NASA?

Bowley: I've been working for NASA for almost eight years. I came here in November of 1988 and what I think basically got me the job here was the lab experience that I had. When I was an undergrad, I worked in the food mechanics lab. And there was a lot of experimental stuff that I did all four years during the summertime and part-time during the school year. So I didn't do a co-op but I did have that lab experience. And that's really what got me the job here.

Q: What is your title here?

Bowley: I'm called an AST -- Aerospace Technologist -- but I'm a mechanical engineer and I work for NASA Ames Research Center.

Q: How has this job changed with NASA over the time that you've been here?

Bowley: Well, originally I was a facility engineer for a wind tunnel. And I worked there for about three years. That was fun because it was a lot of fieldwork. You could be outside crawling around in the wind tunnel. These things are huge, like submarines. There were always problems and it was exciting to always have a problem to work on, to think on your feet, you know. And most of it wasn't analyzing really huge problems, at your desk or anything. But, from there, I worked in a transonic tunnel for two years. And then I worked in a hypertunnel-blowdown wind tunnel, which has different support systems. It was a different type of facility, so, again, it was the whole "learning-new-stuff-over-again" thing. That's when I did the baby project for my graduate work -- not related to NASA. And then I did a professional-development program that they have here in the center, where you can move to different areas that are interesting to you for career development. And then I came over to Life Sciences to build a human-powered centrifuge. And so for a year I worked and got that thing built. It's powered by bicycles and they're going to be using it for research soon. But then after that, I applied for full-time graduate study, and I went to the University of Virginia for biomedical-engineering Ph.D. course work. Then I came back after that year and I'm trying to finish my research project now. I just recently started working in a biomechanics lab with Rob Whelan and Greg Wright.

Q: Talk about the biomechanics lab.

Bowley: I just started there about two weeks ago, so a lot of it is coming up to speed on research papers that the people in the lab have done in the past and other people are doing in the field. Most of their research is around remodeling of your body under loading from gravity, different loadings from walking or running. And basically the long-term goal is to see how that relates to space flight and weightlessness or micro-gravity. And the project that I'm going to be working on is called a “ground-reaction force sensor.” There's this sensor that you wear in your shoe and it's basically a capacitor that is input to this data-acquisition system that you wear on your belt. You wear it around during your daily activities and this thing is basically

monitoring your loading history throughout your normal daily activities. There's a little memory card on it that can take two megabytes of memory throughout weeks or days of activity. And so the idea is to have an objective way of measuring people's activity levels over a long period of time. Currently there's no accepted method of measuring people's daily activities. There are just things like logbooks and subjective ways of doing it.

Q: What's the benefit of having the data?

Bowley: Once you have the data you can use it. They have a theoretical model related to the loading on your body and how your bones and your body are actually changing all the time related to your activities --your "loadings" So, the plan is to be able to have this information as an input to the mathematical model and also do bone scans on people that will give you mineral content of the bone, like a distribution. And they have other work related to bone-structural properties. So it's all related to inputs to this mathematical model.

Q: Talk about what it's like to work in this lab.

Bowley: Actually, I like it, I like it a lot. I like working with people who are doing biomedical research, who also happen to be engineers. It's nice to work with other people who you can bounce ideas off of and who are really interested in research and aren't so interested in non-scientific things. There is a lot of background information to learn, so it's hard to come "up to speed" quickly in order to contribute to the lab. There's a lot of reading.

Q: If you had to do it over again, would you pick mechanical or would you go for something else?

Bowley: For undergraduate, I would definitely pick mechanical. The thing I liked about mechanical is we had classes in all the other different engineering disciplines. We had electrical engineering, computer science, chemical engineering and related things. It really prepares you well for anything. But I would only do biomedical engineering as an advanced degree because it's so specialized. And I think that you need the pure engineering discipline to be able to go into that in the future. I don't think it would be useful doing that as an undergrad.

Q: What's your lifestyle like as a NASA engineer? What is your day like? What do you do?

Bowley: Well, I work a lot of hours and there's a lot of hours that are kind of frustrating at work that I didn't sort of expect. Things related to running to the copy machine or, you know, having to do things that are so frustrating because you don't feel like you're really accomplishing something scientific. That was kind of, kind of an eye opener to me. But I've been going to school basically since I came here part-time. And so I'm continuously busy. You know, now I'm involved with the ASME section here and I was also involved with other things at the Center. There's this rescue team at the Center. I'm interested in medical stuff so I was interested in being an EMT -- emergency medical technician. And so they have this rescue team at work that does heavy rescue stuff. And that was kind of a fun break from the other stuff at work. But I don't think I do many "fun" things. I don't know. I'm trying to think of some.

Q: Are you having a good time?

Bowley: Yeah, I like it here. I think NASA was a good choice. I like working at a research center. I wouldn't like working someplace where you're just cranking out something that somebody else has worked on forever and you're just sort of doing a little bit of a tweak to it. That would be really boring to me. I like to have a lot of challenges. What's so motivating about being at a research center is that things aren't well-defined and I like that aspect of it.

Q: Do you travel a lot?

Bowley: Me personally? No. But there are a lot of research scientists that come from around the world. There are people from France and Austria that I've met. And Japan and Ukraine, I think. So there's a lot of visiting people that come here for research.

Q: Any particular advice to students?

Bowley: What's most valuable really, in anything, is persistence and accomplishing your goals. It's so hard to get through and I can remember not being able to have free weekends. Everybody else was going to parties and stuff. If you can just keep being persistent, I mean, in anything. That's what got me the job here. People would say, “Oh, we don't have any openings.” Well, you know, I didn't take “no” for an answer. I just continued. So, I guess that's the biggest advice.

Q: That's good, thanks.

Bowley: OK