



Profile: Carol Woodward

Project Leader, Center for Applied Scientific Computing,
Lawrence Livermore National Laboratory, Livermore, California



BS, Mathematics, Louisiana State University; PhD and Masters, Computational and Applied Mathematics (emphasis in Computational Science), Rice University

EARLY INFLUENCES

What sparked your interest in mathematics? When did you know that you would use math as a path to your career?

My interest in math was first sparked by my Dad. He was always showing me tricks or things that were a month or two ahead of what we would do in school. He made it fun and interesting. In high school, when I started taking more sciences, I realized I really liked science. I had a hard time deciding what to major in for college and eventually ended up in math because I was drawn to the fun and challenge of it. However, I wanted to do science too, so I took computational science in graduate school.

CAREER/CAREER PATH

Describe your current position and briefly, the path you took to get there.

My job is to work with scientists who want to simulate some sort of physical phenomena to help them conduct those simulations efficiently and accurately on state-of-the-art supercomputers; as such, I work at the intersection of math, science, and computer science. When I start working on a project, I try to get as much information as possible about the physical problem and the mathematical model they are using. I then either help them myself to build an efficient solution strategy or I connect them with another applied mathematician from our division whose expertise is more in line with what they need.

What is a typical day at work for you? Please list your job responsibilities. What are you responsible for?

I work on a number of projects at any one time. As a result my days vary considerably. They all almost always involve a mix of proposal writing, meeting with scientists or other mathematicians, writing or giving presentations, or writing final reports on project work. As a project leader, my job is to write proposals for projects, recruit team members for funded projects, coordinate work on the projects, and represent the projects to funding sponsors through presentations and reports.

What do you like best and least about your profession? What is the stress level associated with this type of position?

What I like best: I get to work on really interesting problems and with some truly amazing and intelligent people. I also like the variety of my job. I have worked in many different scientific areas including subsurface flow, defense applications, supernova simulations, magnetic fusion, power grid, and materials science. As a result, I constantly meet new people and new subject matter. Also, the job constantly evolves resulting in new challenges.

How many hours per day or week do you typically work? Do you have flexibility that allows a good life/work balance?

I typically work about 50 hours a week, sometimes more and sometimes less depending on deadlines. Because my job is very interactive I tend to need to be onsite for meetings much of the day.

CAREER EXPECTATIONS FOR YOUR FIELD/POSITION

How/why are applied mathematics and/or computational science important to your industry? How is it/are they used?

Without simulation much of the science that we work on at the DOE would be very slow. Due to the high complexity of the problems being addressed, physical experiments are expensive (as in materials science or magnetic fusion) or impossible (as in supernova). Simulation is critical in gaining insight into the behavior of physical systems so that experiments can be more productive.

Where do you see the future of math in industry or in your particular career?

I see math becoming even more critical. More and more engineering and industrial science-based companies are relying on modeling and simulation. Many of the big oil and gas companies now own their own high performance computers. As a result, numerical analysis and data analysis will be in increasing demand over the coming decade.

ADVICE

If you could advise someone currently pursuing the same degree or profession, what would you say? What are some steps you would recommend to students, or to those in their early careers, that perhaps you wish you had taken earlier? Are there things you would have done differently?

I would definitely suggest taking a summer internship LATE in your graduate career. I suggest later in the career since many students only do internships early, before they have been exposed to research or advanced coursework. By doing an internship

later in their studies, they can get a feel for where research and their acquired knowledge fit into the company or industry. I think it's critical for applied mathematicians in academia to have some understanding of how their work can be used on real problems.

Any specific supplementary skills or training you can name that a person pursuing this profession should acquire?

Applied mathematicians should build strong programming skills. Even if they will only formulate numerical schemes, it is critical that they understand the issues that arise when numerical methods are implemented in compiled languages.