ACM-W Interview with Denise Gürer

Dr. Denise Gürer is an experienced science teacher, computer scientist, and physicist who has taught at the K-12 and university levels. She is an Ocean Grove Charter School Vendor, teaches at Coyote Grange and A-TEAM, and is an adjunct instructor at Cabrillo Community College in physics. In her life before teaching, she co-founded TerraVert, an online service that provides hands-on environmentally focused science experiments. She also worked in the high-tech industry at LightCloud Software, 3Com Corporation, and SRI International in areas of education research, artificial intelligence, and data networking. Dr. Gürer received a Ph.D. and M.S. in computer science from Lehigh University and a M.S. in physics, also from Lehigh University. Denise is active locally as a Science Fair organizer and Santa Cruz County Science Fair judge. She was a leader of an energetic Girl Scout Troop in Scotts Valley for eight years and currently volunteers at the Santa Cruz Animal Shelter. Most importantly Denise believes in the joy of learning and is constantly exploring new horizons with her students.

You have seen many technologies come and go. One has to wonder whether it is possible to stay current on technology trends. How do you know which trends have staying power? What have you found to be the best methods to keep your skillset up to date?

Computer science is unique in that the technology changes almost on a daily basis (or so it seems). It's impossible to be an expert in everything, however, you can keep up with current trends. What you keep up with depends largely on what your job or research area is. Operating systems are constantly being upgraded, new applications abound, and there is a constant stream of new programming languages and updates to our old favorites.

The main thing to remember is to not panic! The basic computer science and programming concepts do not change much over the years. To learn a new programming language is not terribly difficult once you have mastered the ideas of looping, conditionals, event driven processes, graphics, object-oriented programming, and so on. There is always something new and exciting to learn, but you can always rely on the foundations you learned in college. Thus, learning a new language or method can be achieved through online educational sites and need not require you to attend college all over again.

For those of you who are in college or are younger, remember that learning one programming language really well will do you more good than learning the bare minimum in 3-4 languages. It

is the depth of knowledge and more importantly, the problem solving approaches that are going to give you the most reward when you get out into “the real world”.

Some trends that currently have staying power are approaches or languages that implement the Internet in exciting ways. We are moving towards a world where everyone is always connected and everyone expects to be able to use their technology with no real learning curve. Thus ease of use and the ability to understand what users need is crucial.

It’s apparent that you have a great love for computer science; what advice would you give to young people considering careers in computing?

Computer science is an exciting field to consider as a career. There are so many directions you can go. Most of the exciting work is happening in cross-disciplinary areas. For example, cognitive science and artificial intelligence strive to build cognitive models of how humans think and learn with the goal that these models be applied to help machines learn. Biology and database design work together to represent knowledge of the human body in ways that help push forward medical research. Statistical analysis and networking can be combined to come up with more efficient networking algorithms and make our Internet faster and more flexible. There are countless areas where computer science can make a difference in our society.

Pick a university that not only has a good undergraduate department in computer science but also has interesting graduate research in computer science. As an undergraduate you can pursue helping out in these endeavors and learn more about the field and perform some exciting work. As an undergraduate you will take a lot of math and learn some programming languages. Once you get your B.S. I would encourage you to consider moving on to graduate level work and earning a M.S. or Ph.D. The most exciting work in computer science is at the graduate level.

Many women choose not to pursue a career in computer science due to their perceptions of the field being a place for male “geeks”. How can we make computer science more appealing/welcoming to women?

Over the years we have seen the field of mathematics become over 50% women. Unfortunately, in computer science the numbers have stayed below 30%. Computer science is a math-rich field, so why is this happening? There have been many studies trying to understand this phenomena (including some that I have undertaken) and programs that attempt to encourage and retain more women in computer science. I believe that there are many things that contribute to the pipeline effect, where we steadily lose women as the education level and

prestige go up. Because there are many causes, it is hard to find the "silver bullet" that will help solve this problem.

As I see it, there are two main goals. We need to start very early (girls in elementary school) and get the numbers up for girls entering computer science before they enter college. Once we have girls taking classes and interested, we need to retain them. Both goals are connected. If we make computer science more tantalizing to women, we will attract more and will retain more women. One common factor that I have seen in my research on this topic and in my own personal experience as a teacher, is that girls and young women are interested in making a difference in the world and within society. Making faster machines or "cool shoot 'em up" computer games doesn't appeal as much as it does to boys. Thus one way to bring more girls into computer science is to have an angle of bettering society with the work.

You have extensively researched the significant contributions of women in computing science throughout history. Based on your work, who do you most admire and why?

There are many women scientists and computer scientists that I admire. Even though women are still greatly outnumbered in the field today, it is nothing like it was in the beginning days of the field, during World War II and later. One of my favorite women is Grace Murray Hopper, also known as "Amazing Grace". She is known for her groundbreaking work in developing the precursor to FORTRAN and working on the Univac. She was quite a character and never let the fact that she is a woman slow her down. She eventually became an admiral in the Navy and even had a huge battle ship named in her honor! She was always cognizant of her role as a mentor and used to carry around short wires that represented the length of wire that a nanosecond of light would travel. Since electrons would travel slower than light, she used these visual aids to illustrate the need for computers to be as small as possible (to increase their speed). Remember that during her time, computers were huge and often could fill up a room.

Grace Hopper is famous for her quotes. Some of them are:

> *"It is often easier to ask for forgiveness than to ask for permission."*
>
> *"A ship in port is safe, but that's not what ships are built for."*
>
> *"You don't manage people; you manage things. You lead people."*

Another famous anecdote is the coining of the term "bug" in programming. The story goes that one day while programming the Mark II, a moth was found in the relays which was causing the computer to not operate. Hopper removed the bug and taped it to their logbook, calling it the

"first bug". The term stuck and now we call programs that aren't running correctly as having a "bug".

The anecdotes for Hopper are fun, but my main reason for admiring her is her tenacity, self-confidence, and leadership. She forged her own path and encouraged others along the way.

Considering how successful your career has been, what suggestions can you make regarding the balancing of job and family responsibilities?

Balancing job and family is one of the top reasons that young girls (even as young as middle school) give for not wanting to pursue computer science. It's amazing to me that girls that young are already worried about these issues. However, this is an important quality of life concern and women still take on the bulk of child rearing in our society.

Fortunately, there has been some progress in this area since I was a young mother. Places of work are now providing lactation rooms so a nursing mother can pump in private and NOT in the bathroom. There is maternity leave which is allows a mother twelve weeks of unpaid leave. Some workplaces provide on-site childcare. In traditional marriages, society is seeing more "stay at home dads" and men are taking more of a role in child rearing.

Even so, having a child will greatly change a woman's life and change her work habits. There is definitely more work to be done and lots of juggling. It is not easy. This is what I think many young girls are focused on when they think about career and family. They see how hard a woman has to work to have career and children, either through their own mother, friends' mothers, or the media.

What isn't made clear are the benefits of having children. Your life changes, but it is for the better. You are not focused on yourself as much and a whole new world opens up to you. Children are an endless source of joy. It is hard to see this effect since it's internal. Mothers tend to joke about the hard work, but they wouldn't change a moment of it. Yes, it is hard work to have children and a career, but it is worth it.

The question then arises, what can I do to help myself when I have a child? First, take the twelve weeks of maternity leave that you are due. It is the law and your employer has to abide by it. Take more time if you are able. Second, if you have a partner, make sure that person is committed and takes on as much work as possible. Obviously he or she cannot nurse the baby, but they can change diapers, make dinner, help around the house, and so on. Third, if you have family or friends, don't hesitate to use them for support, whether this be babysitting or just an occasional homemade meal. Fourth, try to work from home whenever possible. Some employers and/or job requirements are very flexible about working from home.

Once your child is old enough to be going to school you'll need to figure out arrangements for your child after school. You may or may not be able to pick them up. This requires support

from friends, family, and your partner. Remember that your career is important as is your child's welfare. It is OK to ask for help.

Most importantly, even though you are crazy busy, remember to cherish the moments of your child growing up. They will be off to college before you know it!

With respect to your work in the computing field, what are you most proud of?

I am most proud of my work in education. While at SRI International I worked on creating computing structures that modeled a student's learning processes. This combined artificial intelligence techniques and cognitive modeling. By modeling a student's learning in real time, a tutoring system is able to adjust the material presented to the student. I employed a variety of approaches: rule-based, case-based reasoning, and fuzzy logic and leveraged some other research at SRI in speech recognition and intelligent distributed agents. One example of a prototype system that I developed was a reading tutor that used speech recognition, intelligent agents, and fuzzy logic. The speech recognition was used to "listen" to a student reading a passage out loud and the fuzzy logic kept track of reading skills that the student exhibited. The intelligent agents were used as a means to provide an interface to the user that coordinated the speech recognition, screen display, fuzzy logic and other key components.

After working at SRI and several other places, I ended up becoming an instructor. I am currently teaching at a charter school where I teach science in grades 1-12. I have a graduate physics degree (M.S.) and computer science degree (Ph.D.), which come in handy when teaching at all levels.

I strongly feel that we need more young scientists coming into the pipeline of our universities. It is dismaying to me how few students really want to pursue science (especially computer science). One of my goals is to instill a love of science and learning. Once this occurs, the rest will follow. To this end, I always have hands-on activities for the students that are challenging but fun. It has been a learning experience for me to adjust my approach, lecture, and lab for each grade level (elementary, middle school, high school). They are each so different, with unique needs, social skills, and cognitive abilities. However, this is what makes it fun.