



From math teacher to Turing winner

By Candace Lombardi

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On Wednesday, Frances Allen, an IBM Fellow Emeritus, became the first woman to win the A.M. Turing Award--the Nobel Prize-equivalent for computer science.

Allen started at IBM in 1957 as a teacher of the Fortran (Formula Translation) programming language, but went on to develop parallel computational computing. Her development of parallel processing--the ability for programs to run simultaneously on multiple microprocessors--enables today's high-speed computing. The Big Blue veteran recently shared her insights on the future of computer science and what work was like for a "Greatest Generation" woman of technology.

Q: The Association for Computing Machinery honored you with [the A.M. Turing Award](#) for your work on Ptran (Parallel Translation), but what do you see as your greatest achievement as a computer scientist?

Allen: Ptran was just one part of my work, which actually is about enabling users to have access to high-performance computing...being able to achieve high performance by the use of parallel computational computers.

What childhood experiences led you to become interested in computers and technology?

Allen: I was from a very remote farm. Well, not so much remote, but a dairy farm in upstate New York without electricity, without central heat, without running water, and it was before computers really came into existence. I do think that my experience on the farm probably gave me a lot of freedom to be very interested in solving problems.

By the way, this is a little off your question, but I have an impression, and it's a piece of work somebody should do sometime. I think there is something to that farm. Look at the men that joined, that entered computing or built rockets in that early era. When I meet someone of my generation and we start talking about our backgrounds, I will often find that that's where the men came from. Not all of them by any means, but a number of them. Many of them, I think, were Midwest farm boys.

Really?

Allen: Yes, somebody has to go look at that thesis.

If you didn't have exposure, as you say, when you were young, when did you realize this tech stuff was something you'd like to turn into a profession?

You know it was a wonderful time in those early days because computer science didn't exist yet. There weren't a lot of constraints on thinking, on

Allen: I just fell into it. I was trained as a high school mathematics teacher. I went to the University of Michigan for a master's degree in mathematics and was in debt, and IBM came on campus. I just signed up because it could pay off my debts. I had intended to go back to my first love: teaching mathematics.

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What was your first computer?

Allen: The 650, the [IBM 650](#).

You're a pioneer both for women and computer scientists. What advice do you give now that you wish you had taken when you started your career?

Allen: Not to get so frustrated sometimes when you can't get your way.

You know, it was a wonderful time in those early days because "computer science" didn't exist yet. There weren't a lot of constraints on thinking, on what you could try to do. So it was kind of free, a period of trying many different things. Now there's much more knowledge about what doesn't work, or presumed knowledge about what doesn't work, and you have to know more. And it was a time when one could (experiment broadly). It was like a fresh wall that you could paint.

You joined IBM to teach Ptran in 1957. How has the environment changed for women since you started your career?

Allen: At that time in the environment that I was in at IBM Research in Poughkeepsie, there were many women that were being hired. Actually, quite a few of them came from Vassar and in that neighborhood. IBM had put out, I've discovered years later, a brochure called "My Fair Ladies" and they were actively recruiting women. Of course, they were actively recruiting a lot of people. There weren't any set requirements that they had to meet. They were just looking for people that had interesting backgrounds.

As a female in a male-dominated profession, were there any "ouch" moments that you can recall over the course of your career?

Allen: Oh boy! Well, yeah! The thing is, you know, in the '60s things got pretty bleak for women.

Why is that?

Allen: Well, it became a profession in the '60s. Computer science became a science and it became much more structured to people that were being hired, and there were mostly men that met the requirements. It significantly changed the workplace.

Now, the "ouch" moment. Well, here's one that I haven't told any other reporter. I was working on a software program, on a very large machine which was being built in a huge warehouse on an IBM site. It was a mammoth machine! The first time I went to go and run my program on the machine that was being built, I went with a group of the guys, and as we walked into the building we were suddenly stopped. And they said, "Whoops, we don't know how to get to the machine without going through the men's room." The floor where the computer was had been built so that this kind of huge men's room was down the middle, because there were so many people involved with putting these things together.

Were you the only woman in that group?

Allen: No, at that time I was a manager. There was a group of four peer managers and three of us were women. So there were women getting in lots of roles at that time and getting promoted, and it was great. That wasn't true a few years later.

In the late '60s, I remember walking into an auditorium which had many managers in it at IBM and I counted four women among well over 100 people in the room.

So when did you start to see it swing back, or have you seen it swing back?

Allen: I see it swinging back now, but not everywhere.

I still, every time I walk into a room or the cafeteria or some other space in the workplace, look at the ratio. And I think most women do that. At the beginning, I wasn't sensitive to it whatsoever, but I am now. I have become more and more, so over the years as I realize that there aren't that many women around. I think the field is not doing well. And I *know* the field is not doing well in terms of the number of women.

Some critics and studies have said that women are not attracted to the sciences because of the hours required. What do you think of that claim?

Allen: I think, first of all, the idea that women aren't attracted to science is not true.

They are being attracted to medicine and the biological sciences. Even the gap, the percentage of many women in physics and chemistry and mathematics is closing. And in some of these other fields they're actually going to pass. You know, they say the number of women may pass the number of men at the undergraduate level.

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I think there is also the question of work-life balance. I think that's more about the culture of the workplace than it is about the way people work.

Can you explain to me what you mean by that?

Allen: Well, many people at IBM don't have an office and they work from home. The technology enables that and, in fact, it's very effective. But the culture in the workplace sometimes goes counter to that, and the expectation is that you're going to be physically in the office and that you'll be there long hours.

I should say, I'm at the IBM Research Laboratory and that's not our culture here. But we do need to come in, and it's because of the intellectual stimulation that one has and the ability to work with other peers on interesting problems.

Many people in your industry complain that the U.S. is suffering from a lack of qualified skilled workers. Some say it's a lack of incentives on the part of companies, others say it's a faulty U.S. education system. What's your take on that issue?

Allen: Well, I was involved with [ACM's Job Migration Task Force](#) and it wasn't clear that any of those was quite the right answer. But one of the things that is obvious is that so many of the women are not part of the IT workforce. If we're ignoring 50 percent of the potential workforce, then we have a problem in the IT workforce.

How do you think we get more young people interested in math, science and technology?

Allen: I don't really have an answer. I mean these are big, hard problems, actually compiler questions.

You are known for your lifetime work in mentoring people in the tech industry. IBM has even named a mentoring award after you. What about as a mentor: Your greatest achievement there?

Allen: Mentoring is sometimes just viewed as a way of giving advice, providing a place for someone to come and talk through various decisions they're trying to make or what they should do in certain situations. But I also became an advocate for people, actually being a spokesperson and an advocate for women.

Surveys have shown that [major software companies are increasing the amount of offshore work that they use](#). What do you tell your mentees who fear that their job may eventually be lost if this trend continues?

Allen: What I'd tell them is that the very interesting jobs are staying here. It really is the case. The kind of help desk work is going overseas.

It used to be that we had a lot of problems to solve down at the low level, near the machine, near the infrastructure, all of that. Now it's more solving the problems that require integration of the existing lower-level solutions and putting together information from mathematics, from finance and from business modeling.

It's the putting together of all of these parts and the building of the PCs so that they can be put together. This is just one example of something that doesn't go overseas.

Can you give me another example?

Allen: [In health care--managing records and integrating](#), doing data mining to find out what kind of drugs seem to be working, or [what are the symptoms people are getting](#). There are many possibilities here that require a lot of innovation and integration.

The Wal-Mart story is fascinating. That company is efficient because it has integrated into one package all of the things that used to be called stovepipes: personnel management, financial management, inventory management, [supply chain management](#), that kind of thing.

With the A.M. Turing Award comes a \$100,000 cash award. Do you have any particular plans for that money?

Allen: Yes, I'm going to put it in a fund--and I'll pretty directly manage it--for educating poor people, particularly young women but not exclusively, who wouldn't have the opportunity for an education otherwise. I've done a lot of traveling in the Far East and some particular areas where the possibility of a four-year college education is very inexpensive from our point of view, but just not attainable by many young people.

I was inspired by a visit to an orphanage in Mongolia, mostly nomadic kids who are orphans, and also in Bhutan where they have one university that teaches computing and not many students can go there.

You're also known as an avid climber and belong to the American Alpine Club and the Alpine Club of Canada. Do you think having a physical hobby is important to balancing an intellectual career like computer science?

Allen: I don't know that it helps everybody. But it just keeps me active. I like to explore things, so it's part

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of who I am. I like to explore new ideas and new spaces, and remote parts of the world. I've been in the nomadic areas of Tibet, and also gone to Bhutan and Mongolia. It's this wonder of the space that we have around us that I like to look into. I like challenges, but that's not for everybody.

So what's next for you?

Allen: I'm going to take a trip to India. I want to make use of the opportunities that this award has given me to make some changes, or at least to deliver some messages about the opportunities for women and wonderful opportunities for the technology that we have. Because I think we are certainly closer to the beginning of computing than where it's going to take us.

Such as what?

Allen: I would like to see the computer languages change to be a little bit more user-friendly.

I don't get into user interfaces per se; there are lots of experts in that. But we build very high-performance computing machines--and they're getting ever faster and ever bigger, not in size but in terms of their capabilities. We've got to find ways for them to be easier to use. I actually have some involvement in all of those things already, as well as quite a lot of activity with the [Anita Borg Institute](#). So, I will certainly continue that.

Is there anything else that you want to let people know as the first female winner of the A.M. Turing Award?

Allen: I will say one thing. One of the reasons I've been so successful is that I've had such wonderful colleagues. I mean, that's been an extraordinary experience. And I certainly would hope that everybody has the same kind of experience because it does really make a difference in the workplace and then in the results of the work. ■

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