



First Computer Programmers Inspire Documentary

Decline in Numbers of Women in Computer Science Threatens U.S. Competitiveness, Say Experts

By **SUSAN DONALDSON JAMES**

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At 83, Betty Jean Jennings Bartik -- a devoted bridge player and grandmother of five -- had a secret past that was invisible to many who knew her.

Her grandson Alex knew her story. He stormed out of school one day when his teacher refused to believe his gray-haired granny was a computer pioneer who had calculated firing tables and ballistic trajectories during World War II.

The boy's parents had to explain to the teacher that Bartik and five other women had, indeed, legally hacked the world's first programmable computer, converting it into a stored machine and eventually helping to usher in the digital age.

"She was dumbfounded," said Bartik.

So, too, were the historians, who for a half century never acknowledged the wartime contributions of the six women who programmed the Electronic Numerical Integrator and Computer (ENIAC) and made programming easier and more accessible to those who followed.

In 1945, Bartik was one of a handful of female math majors at what was then Northwest Missouri State Teachers College. The feisty 20-year-old farm girl knew only one thing: She didn't want to teach.

As the war came to a close, the Army had run out of male mathematicians. Bartik answered a recruitment ad for women "computers" in a classified project at the Aberdeen Proving Ground operations at the University of Pennsylvania.

"I wanted to do something exciting and adventuresome," she told ABCNEWS.com. "I wanted to get to the big city and see what life was like."

Ignored by History

Bartik went on to help program the BINAC for Northrop Aircraft Company in 1949 and design logic for UNIVAC I, the first commercial computer delivered to the U.S. Census Bureau in 1951. After that, she took time off to raise three children, but then returned in 1967 to help businesses understand the new microcomputers.

Her personal story -- a sort of Rosie the Riveter meets Bill Gates -- recalls the enormous talent women have brought to computer technology and illustrates the challenges today's women face in what's still a

male-dominated field.

Many say their story is especially timely, because the already low numbers of female computer scientists are dropping, posing a new threat to the nation's global competitiveness.

For decades, Bartik and her colleagues were ignored by computing history. At the 40th anniversary of the ENIAC project at the University of Pennsylvania in 1946, the women were initially not invited -- only one was on the list as a spouse.

But now, a documentary film -- "Invisible Computers: The Story of the ENIAC Programmers" -- will chronicle their groundbreaking stories.

"The documentary isn't just about the history," said executive producer and ENIAC Programmers historian Kathy Kleiman, an Internet lawyer from Northern Virginia, who is fundraising for the project, "but how these programmers provided role models to really inspire women to believe that computer careers were within their reach."

Susan Hadary, a Maryland documentary producer, will help Kleiman produce a multimedia film that explains not only how ENIAC worked, but to give long-awaited recognition to the ENIAC women.

Kleiman, a former Wall Street programmer, has spent years recording their oral histories. Three of the women -- all in their 80s -- are still alive.

"There were few women in my college classes," said Kleiman. "Few people had exposure before college and they didn't think they could do it. I saw a block that began to trouble me."

As student at Harvard University in 1985, Kleiman began research for a history paper on women in computing. "I didn't think I'd hit the 40-page word limit," she said. "I found nothing."

While reading a biography of an Army captain who found funding for ENIAC, Kleiman discovered a 1940s photo of women at a 9-foot tall computer. A computer historian told her those were "just refrigerator ladies" who had been posed in front of the machine "to make it look good."

'Tracked Them Down'

"They looked knowledgeable to me, and I made it my job to track them down," said Kleiman.

In fact, working on ENIAC required physical stamina, mental creativity and patience. The machine was enormous, with an estimated 18,000 vacuum tubes and 40 black 8-foot cables. The programmers used 3,000 switches and dozens of cables and digit trays to physically route the data and program pulses.

Bartik tells how she had great male mentors, like science giants J. Presper Eckert, Richard Clippinger and John Mauchly. But in the in the second half of her career, while working in business, she experienced subtle discrimination.

"I would go to a meeting with men where I was usually the only woman, and I would make a suggestion, and no one would say anything," said Bartik. "If a man said something, they would jump all over him."

That atmosphere still persists, according to Bartik. "There's still a glass ceiling."

Figures from the National Science Foundation show women earn more than half of all bachelor's degrees in science, yet fewer than 25 percent take computer science. By comparison, women represent 59 percent of all graduates in biology and agricultural sciences and 47 percent of math degrees.

Experts say that these numbers do not bode well for the burgeoning Internet technology industry, and could be catastrophic.

"Women are canaries in the coal mine," said Claudia Morell, director of the Women in Information Technology at the University of Maryland, Baltimore County, signaling a decline in the American IT work force overall.

"This is about getting the best and the brightest people," said Morrell. Seeking talented women "makes good economic sense," she said. "It's good for business and it's good for women."

Morrell and others say women have found careers in computing socially isolating and unwelcoming. Those who do stick with computing in college and enter the workplace find they are in a "masculine world," often patronized and uncomfortable.

Opening Doors

"We'd like to get the doorways open and let them push through," said Morrell.

The filmmakers hope the ENIAC story will dispel some of the "geeky" stereotypes that have dissuaded women from computing.

All young women see is "the nerdy kid with glasses," said David Leighton of Women in Technology International (WITI), which "helps companies understand the business value behind women."

WITI inducted the ENIAC women into its Hall of Fame in 1997 and sees them as role models for leadership in today's global economy.

"The way women lead is advantageous," said Leighton. "They have better interpersonal skills and build consensus and work horizontally across multiple organizations."

The challenge is how to recruit women, according to Shirley Malcom, director of education for American Association for the Advancement of Science.

"I want people who are smart and solve problems," she said. "You have to be able to nurture talent and be eager to point to opportunities."

"It's not all about the machine," Malcom tells young women, encouraging them to learn technology to address issues like global warming, voting and monitoring nuclear arsenals. "Women are drawn to social issues and impact rather than being interested in the machine as a puzzle."

Unlike men, women pay attention to detail and tend to get the job done, she said. "They are more willing to do whatever it takes," said Malcom. "Men want to delegate the nasty part of the job, like handing off the baby when it's number two."

'Do What You Love'

Those qualities were a key to ENIAC's success, according to Bartik. "We were given responsibility because we were good finishers. We looked at the whole job."

Today, Bartik lives in New Jersey and, after the incident with her grandson Alex's teacher, she visits schools to tell her story. Keeping up with technology, she plays bridge online and chats with other women in computing on listserves like Systers, which is run by the renowned Anita Borg Institute.

Bartik also stays involved her alma mater, now Northwest Missouri University, which named its computer museum in her honor.

"Do what you love, because it's not really work," Bartik advises girls intimidated by computing. "There are no stupid questions. Act as if you have permission to do things and don't let anyone intimidate you."

"What I did seemed like play because it was fun," she tells them. "Even though we were pushing back frontiers."

For more information on the documentary, visit [Invisible Computers: The Untold Story of the ENIAC Programmers](#).

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