Traveling Without Maps

If at first you don't succeed, try again—perhaps other people's perceptions of success will change along with your efforts. That's what happened to Arati Prabhakar, 34, the first woman to earn a Ph.D. in applied physics from the California Institute of Technology. By the time her degree was awarded in 1984, she wasn't feeling like a success. Prabhakar had struggled in the program and rather than following a career in research, she went to Washington as a Congressional fellow at the Office of Technology Assessment (OTA). Recalls Prabhakar: "One faculty member said he didn't understand why we wasted time educating women if they were going to do something like that."

But the reaction to her at Caltech is different now. The Congressional fellowship provided a springboard to a career at the interface of technology and policy, and Prabhakar is now director of the Microelectronics Technology Office at the Defense Advanced Research Projects Agency (DARPA—which is now dropping the D to become ARPA). Last year, she was invited to Caltech to talk about her work. The moment richest in irony, says Prabhakar, was when Caltech president Thomas Everhart shook her hand and said, "Caltech is really proud of you." Says Prabhakar: "I didn't know whether to laugh or cry."

Prabhakar's trajectory shows that for female scientists there are alternatives to the traditional career path in academic research, if they're willing to travel without maps. "No one I knew had traveled this path before," recalls Prabhakar. "It really was considered radical, and I didn't know where I'd end up."

Prabhakar says she gained the confidence to make bold moves from her mother, who had made a very bold one—uprooting the family from New Delhi to Chicago when Prabhakar was 3. But that confidence took a beating at Caltech. After a promising start as an undergrad at Texas Tech University and internships at AT&T Bell Labs and Lawrence Livermore National Laboratory, she arrived at Caltech "where I went from being the top of my class, like everyone else in the program, to being in the middle of my class—on a good day." She had a tough time in class and realized she was inadequately prepared in physics. In the lab, studying electronic defects in semiconductor materials, she was no happier. To make matters worse, her department didn't offer a friendly environment for women. When she joined one research group, a man in the group said, "Welcome to the group. Women don't last here very long."

Prabhakar says she might have quit without a degree had it not been for her advisor, applied physics professor Tom McGill. McGill convinced her that even if she didn't pursue a career in research, a Ph.D. would open doors. So she soldiered on to get her Ph.D.—and doors opened. One of them was at OTA, where she wrote a background paper on microelectronics R&D.

Though Caltech folks thought her career move was "crazy," she got noticed by the microelectronics researchers she was interviewing. "When you're female and Indian from Caltech," she says, "people remember you." And though she hadn't enjoyed research at Caltech, she did "delight" when she "could get an answer and feed it back to someone in industry who was having a problem with the materials. I found I appreciated science when it was useful, but I didn't enjoy the research for its own sake."

Work at OTA led to an offer from DARPA. In the 7 years she's been there, the total budget for electronics research (including Prabhakar's department) has jumped from $40 million to $650 million a year, and Prabhakar has had a hand in shaping U.S. microelectronics research. She says, "I love what I'm doing, and everything's fitting right into place." But for everything to fit, Arati Prabhakar had to go an unorthodox route—and wait for the definition of success to change with her.

–Ann Gibbons


RICK KOZAK

By dint of application. Arati Prabhakar, the first woman to receive a Ph.D. in applied physics from Caltech, is a key manager at ARPA.

example, if she was interested in a certain chemical process, she would offer her expertise to the group working on that process. Unfortunately for her, in the particular corporate culture where she worked, her action was considered an inappropriate intrusion on the turf of other units. She also made the mistake of sometimes correcting colleagues in public—quite politely, she says—and of failing to acknowledge a sponsor.

After 4 ½ years at Alcoa, Hershenhart's career had stalled. And so she left for a job as a quality-control manager at the Millipore Corp.'s manufacturing plant in Taunton, Massachusetts. Despite being the only woman manager there, she says she's thriving. And she credits her success in large part to the fact that the rules are clearer in her new setting. "It's a more bottom-line kind of success. We make outright money. It's clear if you made a mistake and cost the company a million dollars, or if you're improving the quality."

All workplaces have unspoken, deeply entrenched codes of conduct like the ones Hershenhart broke. But women scientists who go on in academics have years of training to familiarize themselves with the unwritten rules of university life. The industrial culture is different, however, and it may be harder for women to find someone to explain how to crack the code, says economist Myra Strober of Stanford University, who studies gender segregation in the workplace. "Most of the people who know the 'unwritten rules' do not transmit that information to women, either because they're hostile to women, or because they're just more comfortable with men," she says.

Strober's expert opinion is backed up by a couple of studies. One survey of Ph.D. scientists and engineers in R&D at 18 major companies, by Nancy DiTomaso of Rutgers University, found that women were less likely than men to discuss their work with someone in the company outside their own lab. And the Catalyst study found that women engineers tend to try to prove themselves by dint of hard work alone—instead of networking and building visibility. The same conclusion is echoed by Karel Czanderna, a Ph.D. materials scientist at Eastman Kodak Co. in Rochester, New York, who surveyed women's attitudes while building a new network of female researchers at Kodak: "I've read on hundreds of survey cards that women have a feeling of being isolated, especially in the technical community."

DU PONT

Women make up...

0 of 9
R&D VPs

3 of 40-50
lab/technology directors

915 of 7360
engineers, scientists, and managers in the research and technical community (12%)