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Manijeh Razeghi



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Manijeh Razeghi is showing me a box. It's a small box, fitting well within the palm of her hand and no more than a few inches in height. The transparent housing shows off the circuitry inside, including a row of AAA batteries which powers it. She points to a small node on the top of the box.

"That is a light," she told me. "When you are in the sun, on the beach, a part of the sun, that is UV, has very high energy and can create cancer." She moves her hand in front of the sensor and the light fades out. She moves her hand away and it lights up again. "If you have the sun, the special light with the energy coming that can create cancer, it can tell you immediately.

"That is the first in the world that we developed here: from the material to the design, physics, publication, everything is done here at Northwestern at [the Center for Quantum Devices]. With who? With all of the undergraduate students that started at 18, 19 years old."

It immediately becomes clear to me that Razeghi is very fond of undergraduates. Since the inception of the Center for Quantum Devices (CQD), she has mentored more than 80 of them who have published 70 papers in total. I know each of their names because she has prepared for me an 11-page document listing them and their publications.

She begins leafing through the pages, stopping every so often to point out specific students and recall their achievements. There's another document she's prepared which she cross-references with the names of undergraduates: the proceedings for the Quantum Sensing and Nano Electronics and Photonics XV, a conference which she will be leaving for in a few weeks. This year's event, put on by SPIE, a society for optics and photonics, will draw 23,000 attendees. The CQD is well-represented, and scattered throughout the sessions are current researchers (both PhD and undergraduates) and alumni of the center. After we finish looking at the proceedings, she comes back to the list of undergraduates.

"Eighty-two undergraduates I educated," Razeghi said. "Each of them without exception at this time are great scientists in industry or

at university, around not only the United States but around the world.”

The more that I talk to her, the more I come to understand that Manijeh Razeghi speaks in facts: that when she says something like how her students are able to do whatever and go wherever they like after leaving her lab, it is not because she wants you to believe it; it is because it is true.

It seems that the truth comes naturally to her, as it is often so flattering. Along with the list of undergraduates and the conference report, she has prepared a slew of other papers, documents which record her myriad accomplishments since her career at Northwestern began. There's a letter from the vice president of the physics department at École Polytechnique, one of the most prestigious universities in France, congratulating her on the success and reputation of her center. There's a similar email from the chief technologist at the Naval Undersea Warfare Center. Also included is a transcript of the acceptance speech she gave in 1995 when she was awarded the SWE Achievement Award by the Society of Women Engineers. But, again, these are just facts.

Razeghi should be used to such facts by now. After all, this is the woman whom Northwestern spent two years and \$6 million courting until they finally convinced her to join the university in 1991 to found the CQD, which she still directs today. When she tells me about the circumstances by which she came to Northwestern, she minces no words:

“The dean [of the McCormick School of Engineering and Applied Science] and the president at the time [Arnold R. Weber], they did everything in order to bring me at Northwestern to make this facility,” she said.

And it wasn't just the facility she developed. When Razeghi came, she also created both the undergraduate and graduate curricula for solid-state engineering and wrote a textbook, *Fundamentals of Solid State Engineering*. Her focus on pedagogy has been an essential part of her work at Northwestern since she arrived on campus.

Her love of learning can similarly be traced as far back as she can remember: when Razeghi was a child in Iran, her father was so devoted to her education that by the time she started attending school she had already learned the material her teachers were going over. She tells me

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that one day at school, when she was around five or six years old, her teacher had to step out of the classroom. A child-sized Manijeh then stepped up and started explaining the material to her classmates.

“I was always curious about learning,” Razeghi told me. “And it still is exactly the same thing. Because the best teacher is the best student, and the best student is the best teacher. At this time, I am a student because we are learning. The difference between the teacher and the student is only one thing: the teacher learns the day before, and the student after. And we are learning every day, why? Because more you know, that is the part the things that you know, and that is the things the you don’t know. More you know, there are more you don’t know.”

It comes as no surprise, then, that she sees education first and foremost as a family matter. Yet while she has inherited her father’s dedication, she views her role as a mother as being especially formative one in the education of her children.

“I was lucky, and from the first day it was to come to my mind, that is, that education is very important, especially for women,” she said. “Why especially for women? Because women are responsible to bring the child in this world. Women, they are responsible from the first day, for the formation of the child and education of the child.”

After our conversation, I start to realize why she had prepared all these documents for our meeting. To know Manijeh Razeghi is to know her achievements: the founding of CQD, the education and mentorship of so many students, the continued contributions to the study of semiconductors and nanotechnology. When she assumes her roles — as scientist, teacher, and mother — she does so simultaneously simply because to her they are the same, and none can be done without doing the other. She is the one who gives things form, who shapes things. She is no stranger to making something out of nothing. ■