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AAAS Lecture Series on Women in Science and Engineering Essay: Maribel Vazquez, Assistant Professor City College CUNY

I am applying for the Latin American Lecture Series on Women in Science and Engineering because I am eager to share my experiences with our Latin American colleagues. Although relatively young in my field, I have already encountered many challenges in pursuit of my engineering career. This pursuit has led me from an impoverished childhood in New York City, through graduate study at the Massachusetts Institute of Technology (MIT), to an appointment as a faculty member in the Department of Mechanical Engineering at the City College of New York (CCNY).

My initial interest in engineering began with mathematics. As a child, I loved solving word problems and brainteasers, and enjoyed the science programs shown on television. However, coming from a Dominican immigrant family with limited English, I was assigned to a New York City Bilingual Education Program that de-emphasized math and science in the early grades. Exposed to few science, advanced math, or laboratory classes, I longed for role models and colleagues. I attended a Bronx public high school whose resources were dedicated to reducing its 42% attrition rate, rather than encouraging scientific careers. Although I was privileged to have very dynamic and enthusiastic teachers, the school offered only one advanced placement course in science, and no funds from which to pay the examination fees. Interested students were encouraged to sell numerous boxes of state-subsidized candy to cover the cost. At the time we joked that we were, therefore, expected to gain weight for the love of science.

Despite the lack of females in math and science, my calculus teacher made a special effort to talk to me about engineering. He encouraged me to apply to schools with engineering programs, and was outraged when guidance counselors claimed such schools were reserved for "nerdy boys". Outside of school, many family members dismissed my desire for a technical career and insisted I not waste my long legs on engineering, but pursue modeling instead. Luckily, my mother always supported my career decisions, and disregarded the family's assertion that engineering would condemn me to a life of spinsterhood.

When I was awarded a scholarship to Cornell University, I naively believed that only difficult courses would challenge my pursuit of a scientific career from then on. However, much like in high school, the first challenge came from the administration. Engineering deans, though hired to encourage students into the program, repeatedly disheartened me with comments like, "Students of your background seldom survive our engineering program." Affirmative action offices blatantly shared the opinion that, "Engineering is a white man's world, slow to change." I was also affected by the profound lack of female role models. None of my courses was offered by a female professor, and women comprised less than 10% of the undergraduate population. Except for the positive female role models I met at various company open houses, I would have become convinced that women engineers did not exist. However, perhaps the most emotionally difficult challenge I faced was the unconcealed prejudice against female engineering students. Many male classmates, teaching assistants, and administrators told me that I had been accepted into the college simply because I was female. Worse yet, they maintained that my ethnicity would guarantee me future engineering positions that should rightly be offered to them instead. With such negative experiences, I looked forward to leaving academia, and to working in an industry where these attitudes would be absent.

I received my Bachelor of Science degree in Mechanical and Aerospace Engineering from Cornell University in 1992 and immediately accepted employment as a Mechanical Engineer with the Intel Corporation as part of the Clean Room Facilities and Equipment division. There, I learned how to design, build, and maintain semi-conductor clean rooms, as well as how to control the microfabrication processes performed within this environment. To say this field was male-dominated is an understatement. The group had over 30 engineers and I was the only person under the age of 40, the only female and the only Hispanic. I dealt with many construction crews (98% male) and interacted with other females primarily in the human resources department. However, it is a credit to Intel that I always felt colleagues perceived me as a young engineer anxious to learn about the real world. I was never "too dainty" for a job and was often one of the key players on clean room construction projects.

After 3 years I realized that I was much more interested in research projects than in engineering installations or modifications. Although my supervisor believed that research was for those who did not understand real engineering, I applied for a GEM fellowship via Intel nonetheless, and received funding to attend graduate school at MIT during the academic year, and return to my engineering position during the summers. At MIT, I performed research in an interdisciplinary laboratory where I was able to interact with many men and women from numerous technical and demographic backgrounds. I enjoyed experimental investigations and decided to remain in research rather than return to Intel upon completion of my Master's degree. In time, I decided to integrate my engineering knowledge with

more science applications and transferred into a research group where I could apply my microfabrication knowledge to biotechnology. I was excited to perform this new research and looked forward to working with scientists for my dissertation. But I was shocked at how quickly I was ostracized by a working group of older scientists who expressed antiquated views about working women, and about engineers in general. They casually mentioned that few women were qualified to complete a doctoral degree, and frequently whispered sexually charged jokes to one another in the laboratory. I found it ironic that I never once felt sexually harassed throughout the years of working with construction crews, but was reduced to tears by established scientists.

The group, thankfully, received new leadership the following year. They were able to hire several new people, including three female technicians, and leave the older scientists isolated. My doctoral research truly developed in this new environment, as I was able to incorporate my microdevice designs for high throughput DNA separations for the Human Genome Project. I received my Doctor of Science degree in Mechanical Engineering from MIT in 2001 and happily joined the faculty at CCNY the following September with a two-year Distinguished Junior Faculty Chair. In November of 2001 I was honored to receive a "Woman of Valor: Rising Star" award from Education Equity Concepts (EEC). This award is intended as a tribute to young women who have overcome large obstacles in scientific education and who remain committed to technical careers. In the past year, I have become a founding member for the new Department of Biomedical Engineering at CCNY, the faculty advisor for the Society of Women Engineers (SWE), and graduate advisor for Master's candidates. I have received over \$300K in funding to develop a microfabrication laboratory and have submitted external grants totaling over \$200K to develop new integrated experimental courses in biorheology and tissue engineering. I have published numerous research articles from my doctoral research and am venturing into a new area of biomedical research to study the growth of ligaments in vitro in collaboration with the Hospital for Special Surgery (HSS). Despite these successes, I feel that engineering women are still treated unequally in many respects. Engineering departments at leading universities still employ less than 10% female faculty, and many students refer to women faculty as "Miss" instead of "Professor" because they perceive all females as teaching assistants rather than as researchers and faculty members. Unbelievably, many people still insist some females are too "pretty" to be engineers and undervalue our technical contributions. Even at this stage in my career, I encounter well-intentioned professors who repeatedly warn of the particular hazards to women of the chemicals I have been working with for over a decade.

Although I am at times disappointed with the barriers I still face, I truly love my career and am committed to removing these obstacles for future generations of engineers. I have chosen to join the faculty at CCNY in order to train the very best engineers from the uniquely diverse background of CCNY undergraduates. I have also begun interdisciplinary research within the New York Center for Biomedical Engineering (NYCBE) because it specifically promotes collaborations with young scientists, doctors, and clinical workers from around the world. I believe such research will help eliminate some of the challenges faced by my generation for future engineers.

My interest in sharing my story with Latin American colleagues is obviously a personal one, but a professional one as well. My experiences make it clear that there are no better engineers than ones who can work with people from numerous backgrounds to develop the most innovative solution to a problem. I believe this requires camaraderie with scientific communities of all nations, including engineering collaborations and equal opportunity.

<http://ehrweb.aaas.org/womeninscience/essays/vazquez.htm>