US Professor's Essays on Gender Equality

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"Work and Life" for Ph.D. Polymer Scientists

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In the 1960s, life for the average family in the United States involved a husband working full time, earning a wage, and a wife at home taking care of the household chores and the children. I grew up in this era. This situation changed rather rapidly in the 1970s and corresponded with both the "Women's Liberation Movement" and the changing economic reality in which one salary could no longer support a family. I suspect that this change will be looked at, in retrospect (historically), as a sudden change that occurred over ~1 decade at the 3/4 point in the 20th century. It is now common in the U.S. for both parents to work full time. Families have fewer children and they are often reared in daycare centers and after school programs. This change has had a significant impact on life for people who plan careers in science. For married couples with two career ambitions, this "two body problem" puts stress on relationships, work life and home life.

I make several comments below that I don't mean to be advisory, but rather my perspectives on aspects of "Work and Life" for career scientists in the U.S. I acknowledge that these are narrow evaluations, but I make them so that comparisons can be drawn. My career has been entirely in academics, however I have witnessed other careers that my students have taken. I qualify my views further in that I work in a department that trains only Ph.D. and postdoctoral students and thus I interact with very few undergraduates. I emphasize the "choice" that these Ph.D. and postdoctoral students must make between academic and industrial careers because I have seen this important decision up close and think that this is what I can best provide in this Work and Life format.

The students who I mentor are 22–30 years old and have spent almost their entire life in school. They have generally had very little, if any, exposure to the "real world" of business/industry, although most of them end up working at a company. I've mentored 61 Ph.D. students and 18 postdoctoral/visiting scientists. Of these 79, only 17 have academic positions and almost all of the others work in industry (3 work in government agencies). Despite these statistics, most students begin their studies with the ambition of becoming a professor. It seems that in the sheltered world of academics (where students have spent most of their life), professors are viewed as successful role models, and students, having little exposure to "real world" role models aim in the direction of academics. Even when they realize that they will not be competitive in an academic job search, they look for industrial positions with opportunities to do "basic" research - that is more akin to the academic style - rather than "applied or product-oriented research."

As most of my former students work in industry, I have witnessed many successful and enjoyable industrial careers - in both large international companies and small start-up ventures. Something that I did not realize before witnessing it and that I want to emphasize here is that former students continue to learn science after joining companies. Learning does not stop after school! Many former students have surprised me with how smart they became after a few years in industry. People who enjoy learning new things can thrive in an industrial setting. Working on teams to develop new products, taking materials from the laboratory to the pilot plant, and interfacing with marketing, sales and service can all be rewarding. There are many different types of job opportunities for scientists in industry and there are choices that can be made depending on preferences.

Academic careers in the U.S. are stressful and they differ significantly from their counterparts in Japan (which are also stressful). Assistant Professors are hired from a pool of qualified Ph.D. and postdoctoral alumni and they immediately have to build an independent research group and support it in all respects. Assistant Professors have essentially all of the responsibilities that Full Professors have, but do not yet have tenure - they have to earn this by teaching quality courses, raising funds to support research, publishing papers and building a reputation in the scientific community. Research funding has become enormously competitive and difficult recently. In the U.S., funds for graduate student stipends and fees are the major expense of a research group. Funding trends have moved toward directed programs in which proposals are required to address "real" or politically perceived issues, so faculty, instead of proposing their best ideas (which was the case when I was an assistant professor), have to fit their science into overall goals of energy, medicine, sustainability or environmental problems, for examples. This trend has, of course, changed academic research to be more applied. So the difference between academic and industrial careers, from a scientific perspective, has decreased.

I close with the comments that of my 79 alumni, 47 are men and 32 are women, almost all of them have families, essentially all of them work full time, and there is no correlation between their success and their gender. One woman is an astronaut, 7 women are tenured faculty and several others have reached executive positions in companies. The men have done equally as well.

Thomas J. McCarthy is completing his 33rd year as a Professor of Polymer Science and Engineering at the University of Massachusetts, Amherst. He grew up in the U.S. in the 1960s and 1970s, graduating from High School in 1974, receiving a B.S. in Chemistry from UMass in 1978, and a Ph.D. in Organic Chemistry from the Massachusetts Institute of Technology in 1982.

Promoting the Success of Women in Science and Engineering

Wei Chen

Growing up in China during the cultural revolution, I knew nothing of life outside of my country and never considered that I might someday live and work elsewhere or speak a different language. I was taught, even as a little girl, to pursue my interests, follow my heart, and not give up easily. Implementing these lessons led me down what are, in retrospect, predictable paths, but also required me to have to work harder than whomever was next to me pursuing the same goal.

Since 1999 I have been a faculty member at Mount Holyoke College, one of the premier liberal arts colleges for women in the U.S. My career objective has been to provide the best education to young female students: to teach them, to inspire them, and to motivate them to pursue professions that they are passionate about. My own life experience has taught me that female students tend to be less confident than their male counterparts, even though they are often more mature and more talented in one way or another. Many societies and educational systems have led girls to believe that they are not as good as boys, especially in science. As a female scientist and educator, I feel an urgency to change this culture. After more than a decade teaching undergraduate women, I have encountered so many talented female students with aspirations that are compromised due to their lack of confidence and low self-esteem.

I have developed a three-step process to address this prevalent problem that includes background remediation, positive reinforcement, and setting high standards. Encouraging and helping them remediate the weaknesses in their educational background is the first step before creating an environment where positive reinforcement takes place regularly. Designing new biorelevant materials is my research interest. Because of the everyday relevance of the research, it is not difficult to infect undergraduate researchers with enthusiasm. The research is feasible for undergraduate chemistry and biochemistry majors because it draws knowledge that they acquire from general, organic, physical, analytical, and biological chemistry courses. It is enjoyable for them to apply what they have learned in the classroom to solve tangible, real-world problems. Reoccurring positive reinforcement helps build or rebuild students' self-confidence. Each individual requires a different schedule, but standards are raised with appropriate timing. The process of carrying out independent research offers multiple and excellent opportunities to build confidence and skills. Students learn how to identify a problem, to formulate strategies to solve the problem, to modify plans when needed, to be flexible yet to be persistent, and to be ambitious yet realistic. This helps to pave a path that will lead to their future success as independent and confident individuals in whatever professions they choose. I am proud of the many undergraduate female researchers who have worked with me in the last fifteen years. Those who have graduated have since taken on courageous journeys in becoming educators, medical doctors, dentists, industrial researchers, and Ph.D.-level scientists.

It is statistically obvious that the recipe for success in the U.S. is to be male, white, American, and tall. As a female, Asian, foreign, short person, I am fortunate to have gotten to a position where it is possible to pursue my passion. This motivates me to act as a role model for my students so that they can see firsthand that there are other recipes to make satisfying careers in science, that normal females like them and me can follow. Many of them have the tools, but too many of them lack the confidence to pursue their dreams. This is what I need to inspire as their mentor.

During my sabbatical stay at Kyushu University in 2010, I came to recognize the large disparity between females and males in Japanese society including the academic sector. Most women decide not to continue their career after getting married. There are few female students in Ph.D. programs and female faculty are alarmingly scarce. A Japanese colleague, who is an Associate Professor in polymer science, told me that when she made the decision to pursue a Ph.D. degree, she knew it would be unlikely for her to get married and have a family. I also witnessed increasing efforts in supporting female students and researchers at the individual, university and society-level and I applaud these, but the general stereotype of a woman in science and engineering still prevails in Japan. Promoting gender equity has different challenges in Japan than in the U.S. or China because of dissimilarities in culture and tradition. For the well being of the society and for the advancement of science and technology, it would be wise to take advantage of the collective talent from the other half of the population. The exposure to other cultures through international exchange programs and collaborations, involving undergraduate and graduate students, postdoctoral fellows, industrial scientists, and academicians, is an important vehicle to learn from others and remediate our own shortcomings whether it is science or gender disparity. All three countries, especially Japan, have programs sponsoring these efforts, but certainly more involvement from governments, institutions, private sectors, and individuals will safeguard the fruitions of such endeavors.

Wei Chen is the Marilyn Dawson Sarles, M.D. Professor of Chemistry and Chair of the Biochemistry Program at Mount Holyoke College, Massachusetts, USA. She became acquainted with the Japanese academic system as a visiting professor at the Institute of Materials Chemistry and Engineering, carrying out joint research in the laboratories of Professors Takahara and Kidoaki from September to December in 2010.

