

# Agency, advocacy, and attention: A tale of encouraging women into careers in the chemical sciences

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### Abstract:

The continued and persistent gender gap in the chemical sciences, in which more men than women choose to study chemistry, continue to advanced degrees in chemistry, and ultimately pursue careers in chemistry, is a deeply concerning phenomenon that has the potential to negatively impact scientific progress due to a lack of diversity among scientists. In this article, I summarize the talk that I gave at the national meeting of the American Chemical Society in March 2022 in honor of my receiving the Camille and Henry Dreyfus Award for Encouraging Women into Careers in the Chemical Sciences. This talk focuses briefly on the problem of the gender gap, and much more extensively on ways in which we can address that gender gap and continue to make progress in enhancing diversity.

## Introduction

*This article is adapted from a talk that I gave at the national meeting of the American Chemical Society, in a symposium celebrating my receiving the Camille and Henry Dreyfus Award for Encouraging Women into Careers in the Chemical Sciences.*

One thing that is clear when we talk about women in the chemical sciences, is the fact that despite a significant amount of effort and attention towards addressing issues of gender disparity in the chemical sciences, significant gaps in the percentage of men and women in the chemical sciences still

exist. A report published by Linda Wang in *Chemical and Engineering News* in 2016 indicated that although some gains had been made in the percentages of female faculty, particularly in top chemistry departments, the overall percentage of women at all levels of academia remained disappointingly low (percentage of women by rank: 26% of assistant professors; 30% of associate professors; 14% of full professors). At the current rate of improvement, researchers estimate that it will take an additional 136 years to close the gender gap in the chemical sciences.

Associate Professor **Mindy Levine** joined the Department of Chemical Sciences at Ariel University in the Fall of 2019. Prior to that, she was a faculty member at the University of Rhode Island from 2010–2019, first as an Assistant and then as an Associate Professor. Mindy's research focuses on the development of novel, practical chemical sensors, using fluorescence and/or colorimetric changes, with a particular focus on the use of supramolecular, cyclodextrin-based chemistry. Mindy is also a passionate advocate for the promotion of women and girls in science, and was the recipient of the American Chemical Society's National Award for the Encouragement of Women into Careers in the Chemical Sciences. She recently ran Chemistry Camp for Girls in Israel, for 33 girls in grades 5 and 6, and continues to run high-quality programming for girls and young women to support their continued interest in chemistry.



This situation of a lack of women in the chemical sciences tracks with my own experiences, where although I had a significant number of female colleagues at the high school and undergraduate levels (including attending an all-female high school), that number started to drop in graduate school at Columbia University, during my postdoctoral fellowship at MIT, and in my first faculty position as an assistant professor at the University of Rhode Island.

There are several questions we can have around this topic, including what factors cause or at least contribute to this gender gap, but I want to focus more on what we can do about that gap. This question can be broken into two parts, as we can ask both, “What can we do on an institutional level?” and “What can we do as individuals?” that will contribute to addressing this issue.

Before we move to answering those questions, though, I want to clarify that the lack of gender diversity in the chemical sciences is not a “feminist” or “women’s” niche issue. It is an issue that affects every person who is invested in successful scientific outcomes, which should be the entire population. This is true because having more diverse scientists means that more, better, and faster progress is highly likely; as the research has shown, increased diversity across all axes and in all disciplines leads to enhanced productivity and to a markedly improved work product. The issue of gender disparity in the chemical sciences is something that should interest all of us, even though my oldest son, who was 10 years old at the time, told me that, “Really you are the only one who cares about these kinds of women’s issues. That’s because you are a woman. This will not be of interest to anyone else.”

I want to also be clear that for as much as there is a significant issue of a persistent gender gap in the chemical sciences between men and women, that gap is even more pronounced for other gender minorities, and is also more acute for women who also identify as members of other minority groups, and that the challenges and opportunities for both of those populations are worthy of their own, dedicated talk.

## Agency

Coming back to the question of what we can do about the gender gap between men and women, let us focus on what we can do as individuals, using the guiding idea of “agency.” Using “agency,” defined as “the capacity, condition, or state of acting or of exerting power,” as the guiding principle means believing that I as an individual have the power to change a situation, and to exert control over a situation, rather than thinking that the situation exerts control over me.

Under this guiding principle, I have been privileged to be able to lead chemistry camp for middle school girls, initially funded by the Dreyfus Foundation through a Special Grant Program in the Chemical Sciences. Starting in 2013, I led a week-long, full-time, free program for girls in grades 6–8, which provided immersive science experiences, interactions with female scientists, and a positive, supportive environment for girls to experience, experiment, and enjoy science. This program had broad success, received significant media attention, and was able to impact approximately 280 girls (40 girls/year over 7 years). Key results of this program were published in the *Journal of Chemical Education*, and highlights include the moment when a previous participant of the camp returned to act as a mentor for the students. That previous student, who had participated in the program when she was in 7<sup>th</sup> grade, returned as an undergraduate student studying biology at the University of Rhode Island. When asked why she decided to study science as an undergraduate, she explained that her participation in chemistry camp was the first time she understood that science could be fun, and that the scientific community could be a home for her.

In July 2022, I was thrilled to be able to bring chemistry camp to Israel, again through funding provided by the Dreyfus Foundation, and ran Chemistry Camp for Girls in Israel for 33 girls who had finished grades 5 and 6. I am looking forward to continuing the tradition of Chemistry Camp for Girls, now in its new location.

Other examples of agency, or situations in which I was able to directly impact the situation of gender disparity in the chemical sciences, include Sugar Science Day. This program, built entirely around the chemistry of sugar, was run for high school girls as an integrated outreach component of my funded NSF CAREER grant. Moreover, I also facilitated paid internships for high school girls, in which the participants were selected from the population of those who participated in Sugar Science Day, as well as ACS Project SEED, which provided economically disadvantaged high school students, particularly females, with paid scientific internships. Many of these students co-authored scientific papers based on their work in the lab, attended conferences, and presented the results of their work. A significant fraction of these students went on to study science in college, and to focus on scientific or medical fields for their chosen careers.

This kind of outreach to students at the high school level occurred concurrently with a strong culture of female mentorship in the laboratory, focused particularly on two outstanding former PhD students in my laboratory, Dr. Nicole Serio and Dr. Dana DiScenza, as well as a large number of female undergraduate students.

I am thrilled to be able to continue my efforts to mentor and encourage female students even after my move to Israel in August 2019, including through my participation in the Alpha program for high school girls, as a mentor of undergraduate students in the research laboratory, and as a mentor of a team of undergraduate entrepreneurship students. The entrepreneurship students recently won first prize in a student competition for their ideas focused on the development of a sensor for date rape drugs. I am also thrilled that I have been able to open a new nonprofit organization, WonderLab Israel, where much of my efforts towards educating girls in science will be able to be centralized, formalized, and optimized.

## Advocacy

This agency, and work done using “agency” as a guiding principle, has been done concurrently with my work on advocacy, focusing on advocating for the needs of female scientists in a way that will help address the continued gender disparity. In one example, I was part of a group of faculty and staff members who established the Professional Family Travel Fund at the University of Rhode Island, a fund designed to support faculty members in meeting their caregiving and professional responsibilities while traveling. This fund, which was used almost exclusively by female assistant professors, provided supplementary money for these faculty members to travel with an infant and a caregiver for that infant or to provide assistance for an aging parent while the faculty member was traveling.

## Attention

A third principle, “attention,” refers to the ability to draw attention to injustices, inequity, and unfair situations, particularly by those who have power to highlight injustices against those who lack that power. In one example, I was able to highlight the overwhelmingly male contingent of special delegations that have been brought to meetings of the Israel Chemical Society. In one outcome of this attention, I led a discussion around such gender inequities in the first ever “Power Hour” type discussion at the 2022 Israel Chemical Society Meeting, in September 2022.

## Ambition

The fourth “A” that I want to discuss, “ambition,” is a little difficult to discuss, because I would like to encourage women to push themselves a little more, to say “yes” when they can, even when it is difficult and even if it comes at a significant expense. When I asked the organizers of an ICS meeting how they ended up with an all-male delegation, they informed that they had asked many women to be part of the delegation, but none of them had said yes. There are many possible “next steps,” including asking more women, and addressing issues that make it hard for women to say “yes,” but it can also include encouraging women to try to say “yes” a little more often, and to push themselves outside of their comfort zone.

What does it mean to push outside of our comfort zone? I can take a lesson from the times that I take my children bungee jumping, or rock climbing, or rappelling, with a fabulous tour guide who has now been with our family several times. This tour guide, Ariel, tells us very clearly that is OK to be afraid in certain situations, it is normal to be afraid, but that we can do things even when we are afraid. Even more so, every time we do something even though we are afraid, it becomes a little bit easier to do something similar the next time. We can remember that we are able to do hard things, to do things that make us nervous, and to be successful in doing so, and then we can train ourselves to push even a little bit more.

Women can do that in their professional roles too, just as my kids and I can do when we go bungee jumping. We can, and we should, and we will. When we do, we will all benefit.

## Conclusion

With tremendous gratitude to my parents, Dr. Jerry and Syma Levine, my three mild-mannered, well-behaved boys, my former research group at the University of Rhode Island, my current research group at Ariel University, and all of my colleagues, both past and present – you have all been invaluable in enabling me to be as successful as I have been. Let’s keep making everything possible.