

## Understanding and dismantling structures, one bacterium at a time

Danielle H. Dube, Convocation, September 1, 2020

As we start the academic year and you embark upon your college career, we're doing so in ways we could not have conceived of a year ago. We are being asked to navigate near-continuous uncertainty, in the face of imperfect information. We are being asked to take steps forward, with no clear sense of where they will lead. And we are being asked to do so while dealing with profound societal challenges revolving around human health, the economy, and social and racial justice.

I believe we all have important perspectives on these subjects, and I'll share mine as a Professor of Chemistry & Biochemistry.

I am an experimentalist who develops chemical tools to study the molecular basis of human health and disease. My research focuses on disease-causing bacteria which have armor that protects them and allows them to proliferate. I seek to understand the molecular structure of that armor so that I can dismantle it, ultimately transforming these disease-causing bacteria into harmless ones. I am driven, day after day, to head to the lab, where my students and I navigate near-continuous uncertainty. Like all experimentalists, most of my experiments fail, as I undertake them in the face of imperfect information. **I choose**, though, to explore the unknown because of what this work could lead to: successes, rare as they may be, shed a pinprick of light on the unknown and, added together, these pinpricks of light – from my own work, from the work of countless others who came before me, from work alongside me at Bowdoin and at other institutions, and from the work of those who will come after – will form an image, a small piece of the puzzle, that can be leveraged to tackle infectious disease.

I undertake work that I find personally meaningful each day, but I did not end up on this path with a clear plan or with self-confidence. When I began college, becoming a chemistry professor was not something I even considered. I liked science and majored in biology, bound for medical school. As I took courses, though, I struggled with feelings of inadequacy, self-doubt, and the fear that others would realize I was a fraud; I now know this has a name – imposter syndrome. These feelings were heightened when I took an infamous pre-med course, organic chemistry. I was SO scared for that class; I prepared for failure. But the most unexpected thing happened – I LOVED organic chemistry. That class changed the way I saw things; it made molecules come alive to me, it helped me to understand why chemical building blocks react the way that they do, and how having this predictive level of information is instrumental in crafting life-saving drugs. I was hooked. The following summer, I had another transformative experience. As I undertook my first research project studying coral reefs off the coast of Mexico, I had the awe-inspiring realization that science is not a collection of facts in a textbook; it is instead a process rooted in exploring the unknown, seeking answers to questions, and having those answers reveal more questions. The biggest surprise was that – **even me**, a college student on a coral reef in a remote part in Mexico – **even I** could help contribute to the unknown by asking questions that *no one had before* and collecting data to try to answer them. These two experiences fueled me and formed the intellectual foundation for where I am now.

Despite these amazing experiences in College, my path forward was not written in stone. I still questioned whether I belonged in science. On my first day of graduate school at Berkeley, where I set out to pursue my PhD in chemistry, I looked around the room filled with 50 other incoming students, and I felt like I didn't belong. My sense of security and value had crumbled; what was I thinking, that I might belong here, that I might be capable of pursuing this path? I sat next to a woman, another first year PhD chemistry student. Then other women sat nearby. This group of women went to dinner that night; dinner became a weekly event, and our dinners transformed into daily lunches. I found myself in an **uplifting and supportive group** of women chemistry students who faced the same fears, who all felt like imposters. We helped each other realize that we could do it, even in the face of repeated experimental setbacks and self-doubt. Even now, in moments of insecurity, we still prop one another up. Had I not met them, things could have gone differently. I might not have been able to muster the strength to repeatedly face my fears. **Though the science and the process gripped me, it was the community I formed within science that has kept me in this field, that has taught me to negotiate my self-doubt.**

Based on the data, as a woman chemistry professor, I am an anomaly. Though women earn 50% of chemistry bachelor's degrees and 41% of chemistry doctorates, only 20% of faculty in chemistry departments in the US are women. It's not all bad news: women with female PhD supervisors are much more likely to become academics than those with male PhD advisors. I count myself among the fortunate, as my research mentors in college, during my PhD, and during my Postdoc were brilliant and supportive women. Had I not worked with them, things could have gone differently. At Bowdoin, I have been part of an amazing support network of faculty friends and colleagues, both men and women. These relationships have helped to buoy me through countless challenges. My support network has continued to foster my growth and successes, even in the face of struggles. Some friends from my PhD support network were not as lucky – they found themselves in toxic environments that quenched their enthusiasm rather than bolstered it. That could have happened to me.

Although I have been successful, I still doubt myself and my capabilities. **I have been shaped by society in ways that make me constantly question my value in my chosen profession.** My imposter syndrome hasn't gone away; it crops up often, though less often than it once did. When I give a talk at a conference in a session with faculty from Harvard and MIT who I idolize, I wonder how I ended up on the invitation list. When I serve on National Institutes of Health grant review panels, as one of two women in the room of 20 and the only one from an undergraduate institution, I wonder why I'm there. Sometimes I'm still petrified. I have *over time* learned to navigate the fear, acknowledge it, face it, and use what I have learned to guide my students as they enter the field and push it forward.

Though my work began with seeking to dismantle the structures that bolster disease-causing bacteria, with **growing awareness** my focus has turned to much larger structures that need to be dismantled. I am a white woman from suburban New Jersey, from comfortable socioeconomic class, with parents with advanced degrees. I recognize that my experiences, my feelings of imposter syndrome, my need to find a community, my search for mentors who look like me, are the experiences of someone who, in many ways, is in a position of power and privilege. **My point is not that I am a success and that you should try to be like me. Rather, my point is that even the success stories we point to for diversifying our academic fields and our faculty are**

**barbed. And for each success story, there are countless more failures. We have much to learn to get this right, to create an environment that fosters a sense of community and belonging, where we elevate the voices that society has muted, because each of us has something to contribute.** There are those who don't want to admit that these power structures exist, that *where they are* is driven by luck as much as hard work. **No matter how insignificant we might feel, how much we might doubt ourselves, or how others might perceive our voices, we have a set of experiences that allow us to bring a unique lens to the table.** Illumination from each of these lenses sheds a pinprick of light that, when added together, provide an image and path that will help move society forward as we tackle profound structural challenges revolving around human health, the economy, and social and racial justice. Together we can dismantle the structures that provide armor to powers that seek to justify and maintain inequity.

Perhaps this moment will give us an opportunity to deeply reflect upon problematic structures that exist, that shape our experiences, that elevate some individuals and seed doubt in others, and provide an opportunity for us to create better, stronger support structures at a time when the old ones are showing their weaknesses. As you begin the academic year, I urge you to face challenges and uncertainty head-on, to find and create meaning in your days, to foster connections and community, and to fuel, teach, and uplift each other.