

Alumna Jennifer Dionne Reflects on Her Caltech Graduate Journey

Jennifer (Jen) Dionne was a graduate student in the research group of Harry Atwater, Howard Hughes Professor of Applied Physics and Materials Science, and obtained her PhD in applied physics in 2009. She is now an Associate Professor of Materials Science and Engineering at Stanford, where her focus is on developing new optical materials and microscopies to observe chemical and biological processes as they unfold, with nanometer-scale resolution. Dionne's research and academic achievements have been recognized with a Moore Inventor Fellowship (2017), the Adolph Lomb Medal (2016), and the Presidential Early Career Award for Scientists and Engineers (2014).

ENGenious sat down with Jen Dionne to discuss her story: her experiences at Caltech, her path to an academic career, and the in-between.

***ENGenious:* What inspired you to become an applied physicist?**

Dionne: I was a very curious child and would frequently ask my parents questions about how the world worked. As my questions became more complicated, they would guide me toward the World Book Encyclopedia. From reading nearly every page of the 22-volume set, I became drawn to problems in physics, especially optics and quantum mechanics. A summer undergraduate research experience in oceanography

confirmed my love of “waves” but, more importantly, my love of research—especially research that can positively impact the environment. When I applied to graduate school, I was torn between Caltech's nanoscience and oceanography programs. I took a chance on nanoscience, and it was a very good move. I have stayed in nanoscience throughout my career.

***ENGenious:* How has Caltech influenced you?**

Dionne: In so many ways! The community at Caltech has turned out to have the most influential and lasting impact from my Caltech education. For example, my classes at Caltech were small, with exceedingly bright professors and classmates. Many of my Caltech classmates became my closest friends, and it has been amazing to watch their careers unfold and learn from them. Beyond the classroom, Caltech fosters a very close-knit community of scholars that seems to extend beyond any temporal bounds. Since graduating from Caltech, I have learned from and benefited from interactions with Caltech alumni of all ages. The Caltech community inspires me and has been a major influence on my approach to science.

***ENGenious:* What are some of your favorite memories at Caltech?**

Dionne: One favorite memory involves working in the Kavli Nanoscience Institute (KNI)



before it was the KNI. At that time (2005 or so), most of the nanofabrication and characterization tools were in the basement of Steele. To get into the clean room, you had to walk through an unfinished basement with pipes and beams exposed everywhere. Not many people used the facilities, so I could often set up fabrication runs that would run overnight. One night, I set up a fabrication process that would require my input around 4 a.m. I walked over to Steele from my Catalina apartment in my pajamas, not expecting to see anyone. To my surprise, nearly all of Axel Scherer's lab was there, preparing for a big conference. Amazingly, everyone there was very supportive and welcoming, even as I donned clean-room attire over my pajamas. That memory is a perfect example of what sets Caltech apart: it is an incredibly supportive and creative community of scientists, working in the lab at any and all hours of the day, trying to make tomorrow's next big discovery a reality today.

Another favorite memory involves my very brief time on the Caltech gymnastics team. My roommate was an elite gymnast who convinced me to join some of the Caltech team's practices. Since I had done gymnastics as a kid, I thought it would be fun. I was surprisingly okay, probably due to muscle memory, but I ended up breaking my foot

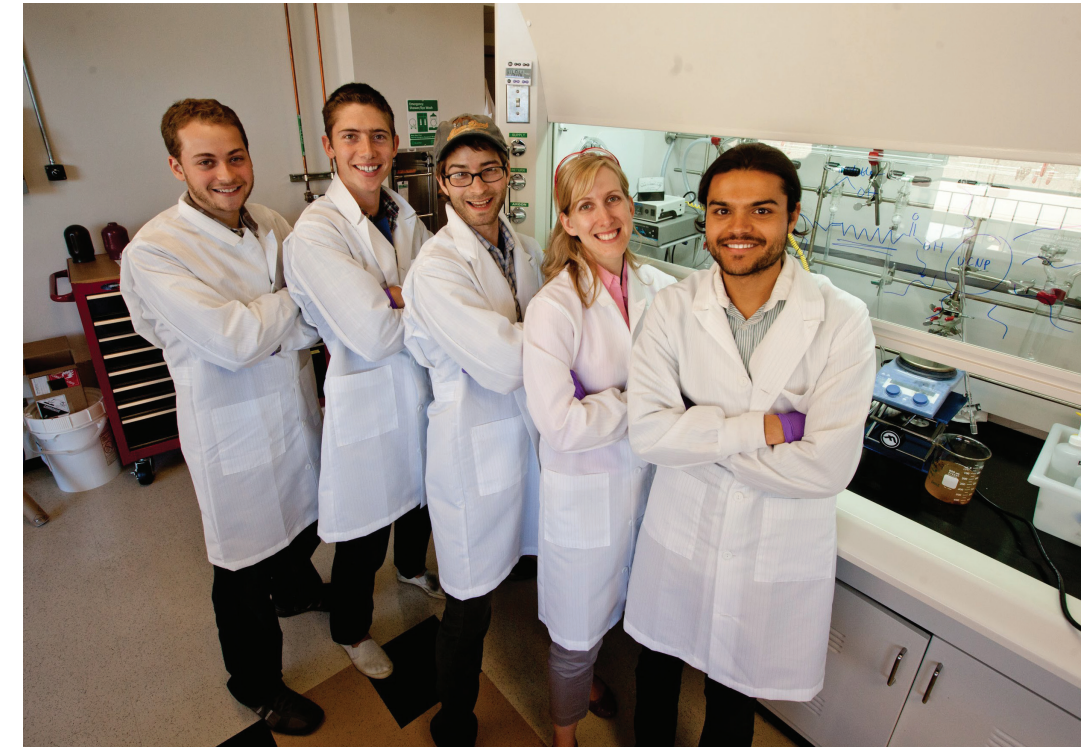
after just a few sessions. My advisor, Harry Atwater, was among the first to call me to see if I was okay, and he even took me to the hospital to get an X-ray and crutches. This is just one example of what a great mentor and friend he has been; his combination of incredible scientific creativity and kindness is a true inspiration for me.

***ENGenious:* As a woman at Caltech, was your educational experience different from that of your male counterparts?**

Dionne: Caltech is a supportive and diverse environment, and during my time there, I didn't notice any specific gender biases. In fact, the Atwater group probably fostered more gender diversity than most labs. At one point, I think the lab was almost half female. That said, I was the only female member of my applied physics cohort. I would work extra hard to deeply understand concepts being taught in class or researched in the lab. To a certain extent, I lacked confidence, but I figured I could tackle that by being as prepared as possible. Thankfully, everyone at Caltech was very willing to help me learn.

***ENGenious:* What has been a pivotal or magical moment in your professional life so far?**

Dionne: One of my scientific highlights was observing negative refraction as a graduate student at Caltech, working with Harry Atwater and Henri Lezec. This experiment required many, many long hours designing and fabricating devices and conducting optics experiments. When we finally got the experiment to work, it was a true eureka moment. This experiment laid



Left to right: Dionne lab members Jonathan Scholl, Justin Briggs, Sassan Sheikholeslami, Professor Jen Dionne, and Ashwin Atre

the foundation for my love of developing new microscopies and imaging techniques. Another highlight occurred in my lab at Stanford, visualizing photocatalytic transformations in real time with atomic-scale resolution. My group members (especially Michal Vadai, Fariah Hayee, Andrea Baldi, and Tarun Narayan) and I worked together for years to combine optical and environmental electron microscopy to image dynamic processes in situ. It was incredibly exciting to get the experiments finally working, and I think there is remarkable potential for this nascent field.

***ENGenious:* How has your Caltech graduate degree been viewed by colleagues in academia and industry?**

Dionne: I think it is viewed very highly and with great

esteem. Caltech has consistently delivered some of the brightest scientific minds, along with some of the nicest people. I try to uphold that tradition as best as possible.




***ENGenious:* Was anything lacking in your Caltech education?**

Dionne: Caltech is a magical place, and I don't see much that is lacking. There is very limited bureaucracy—which is a good thing! With limited bureaucracy, you have a lot of freedom to work on topics that you are passionate about. It certainly helped that Caltech could quickly and efficiently obtain new, state-of-the-art facilities. Also, as a student in Harry's lab, I had the ability to travel to conferences and meet top researchers in my field. It was a fantastic five years. As a graduate student, I

sometimes wished there were a nearby medical school. Though, since I graduated, Caltech has introduced a medical engineering program. This program seems like a great fit for the school, helping to bridge Caltech and top nearby medical researchers and physicians.

ENGenious: What advice do you have for the next generation of Caltech students?

Dionne: First of all, take advantage of all the opportunities you have on campus. Caltech is small enough that graduate students can acclimate themselves and figure out what resources exist, but [they have to] do it quickly because graduate school flies by. Try to serve on a colloquium committee. I served on the KNI colloquium committee and got to meet some great scientists, including Carlos Bustamante, John Pendry, Naomi Halas, and Stan Williams (while having some very nice dinners too!). I learned a lot about their research and enjoyed the networking opportunity.

Caltech holds an incredibly special place in my heart. In a nutshell, here is my advice: Use Caltech as a strong foundation for learning science and engineering. Make as many friends as you can and learn from your advisors. Also, know that when you leave, there's no such thing as goodbye. It's only "Until next time." Despite being miles away from Caltech, the community remains close and available if I need help or advice.   

Jennifer Dionne is Associate Professor of Materials Science and Engineering at Stanford University.



The Milton and Rosalind Chang Career Exploration Prize

The Milton (PhD '69) and Rosalind Chang Career Exploration Prize encourages and supports recent Caltech graduates who would like to explore careers outside of academia through a career gap experience project.

This prize provides action-oriented alumni with the freedom to intentionally explore career opportunities or transitions outside of academia, and it helps alumni build and enhance their skills as leaders and advocates, such as in government and journalism. Projects could include volunteering, either within or outside their degree or field, or the pursuit of a bold, compelling, and innovative project that has the potential to make a positive impact on society.

The Chang Career Exploration Prize can provide up to \$65,000 in financial support for a career gap experience, a finite period of time (six to twelve months) during which an individual deliberately takes a break from his or her current academic or professional path in order to explore other interests, have a diversity of experiences, and develop new skills with the goal of optimizing career pathways.

In this first year of the program, the intent is to award the Chang Prize to one undergraduate and one graduate Caltech alumna/alumnus. Prizes are awarded at the discretion of Caltech and administered by the Office of Alumni Relations.

Eligibility

Caltech alumni who have received their BS, terminal master's, or PhD from Caltech within the past 10 years, with a preference for those who are five years or less from graduation, are eligible to submit their project proposal for the Milton and Rosalind Chang Career Exploration Prize. Current Caltech students who will receive their degree by the submission deadline are also eligible to apply.

For more information, visit www.alumni.caltech.edu/learn-more-chang-prize.

Alumna Julie Eng Reflects on Her Caltech Undergraduate Journey

Julie Sheridan Eng currently serves as the Executive Vice President and General Manager of 3D Sensing, a business segment of the global technology and engineering leader Finisar. Eng holds a BA in physics from Bryn Mawr College and a BS in electrical engineering from Caltech, and she earned her MS and PhD in electrical engineering at Stanford. She has published over a dozen papers and holds seven patents.

ENGenious editor Trity Pourbahrami visited Julie Eng at Finisar to learn more about her Caltech educational experience and her path to industry.

ENGenious: What inspired you to become an electrical engineer?

Eng: It was a somewhat non-traditional pathway. No one in my family was in engineering or high tech, but I was good at math and science. In junior high, my school required us to take county-sponsored math exams. I did very well and starting winning cash prizes. I realized [that taking these exams] was an easier way to make money than babysitting or mowing lawns, so I kept doing it. When I was a senior in high school, I did so well that I was invited to a banquet for the people with the top math scores, hosted by the American Society of Mechanical Engineers. I was told that engineering is a field that typically lacks women but is also a great major to get a good job straight out of undergrad, which was important to me.

I decided to try out engineering, but since I didn't know many engineers growing up, I decided to do what is called a 3:2 program. A 3:2 program is a partnership between a technical/engineering school like Caltech and a liberal arts college in which you complete three years of a science degree at the liberal arts school along with all its liberal arts requirements, then transfer to the engineering school for the final two years of study and complete all the additional classes required for an engineering degree. At the end of five years, you get two bachelor's degrees—one from the liberal arts college in science and one from the technical school in engineering. This helps the technical school add to and diversify its student body, and it helps students who aren't sure a technical school is the right choice for them have a broader educational experience before specializing. I don't think it's widely known, but Caltech has this program with a number of liberal arts colleges. I learned about it from my dad, who found it in the brochure for Bryn Mawr College. For me, it was perfect. I attended Bryn Mawr, an all-women's college 10 miles west of Philadelphia, as a physics major. I studied there for three years and then transferred to Caltech for the final two years. When I came to Caltech, I chose to study electrical engineering (EE), mainly because I had done an internship at Bell Labs in fiber optics and EE was the most relevant engineering discipline for fiber optics.



ENGenious: Were there any EAS faculty who made a specific impression on you?

Eng: Definitely Amnon Yariv, my senior thesis advisor. He was in applied physics and electrical engineering. He had written a well-known book called *Optical Electronics* that I had studied at my Bell Labs summer internship, and I wanted to do a senior thesis with him. I talked to him, and he agreed to let me do my thesis in his group. That had a major impact on me.

I also remember Kerry Vahala. I took quantum mechanics from him. Kerry is a great teacher and very approachable. That is a great combination: someone who is very good at what they do, and good at explaining it, and approachable for students.

I remember Bill Bridges. I remember him because I knew he had invented the argon ion laser, which I thought was really cool, and was on the board of a famous laser company—but yet, he was so approachable and friendly.

ENGenious: How has your Caltech education influenced you?

Eng: One of the biggest influences my Caltech undergraduate experience had on me was