

Finding Inspiration and Fostering Collaboration: A Conversation with Professor Fatima Toor

With ventures into industry, a national lab, and academia, Professor Fatima Toor has had an incredibly diverse and successful early career. She is now a young leader in the photonics field, being sought for participation in all sorts of societies, institutes, and startups. In speaking with her about all these diverse experiences, one central theme continually emerged: her knack for connecting with inspirational mentors.

Career Profile

Professor Fatima Toor is a Ph.D. in electrical engineering and holds minors in physics and science technology and environmental policy (STEP). In her work at the University of Iowa, she focuses on various aspects of photonics research, including the development of photovoltaics, environmental sensors, and biomedical diagnostics. She has been employed in industry, academia, and a national laboratory. At a glance:

- Started forays into industry early with undergraduate internships at IBM TJ Watson Research Labs
- After obtaining Ph.D., spent 10 months as a postdoctoral researcher at Penn State University and a further 18 months at the National Renewable Energy Laboratory
- From November 2011 to June 2014, advised Innovation 1000 companies on solar technology innovations while working for Lux Research, a technology advisory firm
- In 2014, joined University of Iowa as an Assistant Professor of Electrical and Computer Engineering with joint appointments in the Physics and Astronomy Department, the Informatics Initiative Cluster, and the Optical Science and Technology Center
- Simultaneously, an affiliate member of the University of Iowa Holden Cancer Center—Experimental Therapeutics Program
- Also serves as Vice President of Laser Technology Development at Firefly Photonics, LLC and as an advisor for Advanced Silicon Group—both startup companies

Find Mentors Who Inspire You

Being a woman in a male-dominated field has its share of challenges, to put it mildly. Luckily, it is not entirely uncharted territory at this point, and Professor Toor has had the fortune of connecting with some remarkable women in photonics—and she has made the most of those connections. She has had inspirational



female mentors in her undergraduate, graduate, and postdoctoral studies, as well as in her work and research. Like sitting on the shoulders of giants, it has always given her a view of what's possible: "Having these really successful women in my career has helped a lot in terms of me envisioning, 'We can do this.'"

Seeing what is possible is a big part of inspiration, and Toor has seen a lot. These women are icons in their field, building and running large research centers, holding influential administrative positions, winning prestigious awards, and making cutting-edge contributions to scientific research. They set a gold standard for both talent and strength of will. As Professor Toor says, "I think having the female role models helps me stay persistent and on the right track without getting discouraged." And, she is kept on track by their continuous example and

support. As truly good mentors do, they continue to advise her, and they remind her of what she can and should do.

It's important to emphasize, though, that while gender in this field plays a significant role, mentors come in all types, and it's most important to find the ones who positively influence you. In Professor Toor's experience, she says, "I've had these amazing female mentors and role models, but I must credit some of the male mentors I've had as well who have really helped me." The key is to find people who really care and guide you.

Toor notes, you're looking for people who say things like this: "Because I care about your career." That's exactly the response Toor received when she asked why one of her mentors was going out of his way to help her. "And that was such a wonderful answer."

Fail Frequently... but Intelligently

Such inspiration is a phenomenal thing, but it is worth little to nothing in the wrong hands. Toor's are certainly not that. But to appropriately use the guidance received isn't always such an easy thing; it takes hard work and, more importantly, deliberate thought. It can be a struggle, as in Professor Toor's case in graduate school. "For the first three years I didn't have a publication, and I was working really hard." We all find ourselves in this sort of position at some point, where things just don't seem to be working no matter how hard we try. So what do we do about it?

Well, hard work is foundational and a theme we've visited in this article series before. However, it's half the story. The other half is "work smart." Hard work is for naught if it isn't properly directed. That's a tough lesson to learn, but here it is: "I realized that the long hours don't actually mean results... you have to be strategic." Planning, background research, strategic and tactical coordination... these are all integral to successful work.

However, just because everything is well planned, it doesn't mean it all will go according to that plan. Things don't work sometimes and failures happen. "That's part of the process. Every time you fail, you learn something from that failure. Because it hurts, you remember that you did this [one thing] and it's wrong and this [other approach] is how you fix it. And the more often this process happens, the better." In other words, it's in the failures that we learn. So don't be afraid to fail. Just persevere. "You have to learn from those experiences and keep going."

That process never stops, and it's everywhere. Even for Toor, who has been a professor since 2014, it didn't come without challenges. In looking for her current position, she says, "I did apply to around 20 or 25 universities." It takes some bravery and strength of character to be in this field.

Don't Forget Your Soft Skills

Speaking of strength of character, it's one of those more intangible things that we lump into the category of "soft skills." It's great, even essential, to have the intellect, knowledge, and technical talent to execute on scientific pursuits. However, those skills alone are not enough. In her current academic career, Professor Toor sees it clearly: "There is no shortage of students with 4.0 GPAs... but if they aren't willing to work with other people and learn from other people [they won't be successful]."

The soft skills that are part of our ability to socialize are crucial to success. We've touched on this a bit in a previous article, discussing the importance of building a professional network and utilizing conferences and other gatherings to do so. That's great for making connections for career advancement. But as Professor Toor points out, it's also crucial for the pure scientific progress as well. A popular adage sums this up well: "Innovation doesn't happen in a vacuum." Nowadays, collaborative work is essential to rapid progress. "In the long term, I think that does help the whole group dynamic and the productivity of everybody involved."

The need for collaboration is particularly prevalent because of the multidisciplinary nature of research today. Professor Toor herself especially embodies this. After all, she seeks to have broad impact in fields as diverse as medicine, energy,

environmental sensing, and fundamental science. These actions are a clear echo of her words: "In this day and age multidisciplinary research is key to success." And that gets to the heart of the matter. "I have realized that real innovation happens when people with different skill sets get together to come up with ideas that would almost be impossible without the contribution from each team member."

Photonics Makes a Brilliant Community

So, we've hit on it twice: being connected to people is essential (a) for your network and (b) for your actual work. What's more, if you don't include this social aspect, you're kind of missing out. What are you missing out on, you ask? Well, just Professor Toor's favorite part of all her different work experiences. "The favorite thing about my jobs have been my colleagues."

The photonics community is pretty special. Building on that root word, it's highly specialized, which means it makes for a rather comfortable, close-knit group. At the same time, it's far-reaching, which makes it very open and inviting. It's a pretty unique set of characteristics, which is made evident in everything Professor Toor has pointed out to us here.

Let's leave with this impression of her colleagues that Professor Toor has gained over her fantastic career: "I learn so much from them every day and am inspired by their generosity, patience, and intellect." That's a pretty good pitch, particularly because it so succinctly runs true. And with that, I encourage you to engage with your photonics community and us here. We look forward to meeting you.

Connect with the photonics community and join the Photonics Society on Twitter (twitter.com/IEEEPhotonics) and Facebook (Facebook.com/PhotonicsSociety).

The Highlights

- Seek out mentorship from people who inspire you, who you can relate to, and who are willing to be personally invested in your success.
- Don't fear failure, but be smart about it. We learn from mistakes, and we succeed by knowing how to deal with them.
- Develop your soft skills. Collaboration is essential in science today because we get further together than we ever could alone.
- And, take pleasure in the interactions those soft skills interactions bring. The photonics community is filled with wonderful people, so enjoy their company!

