INTERVIEW WITH ALICIA SIT: PHYSICS AND MATHEMATICS UNDERGRADUATE STUDENT

By Samiha Hossain

The FSST approached Alicia Sit, an undergraduate student at the University of Ottawa to shed some light on a student's perspective on women in fields of physics and mathematics. Being a final year physics and mathematics student, Alicia plans to one day earn a PhD in quantum physics/photonics. As a recipient of the Undergraduate Research Scholarship, Alicia started her research career in a mass spectrometry lab during the summer before she began university. There, she assisted in studying the energetic and entropic behaviours of organic gas phase ions found in the interstellar medium known as polycyclic aromatic hydrocarbons (PAHs) through their distinctive dissociation pathways. Today, Alicia works in a research group where her team explores the uses of orbital angular momentum of massless and massive particles. Her latest research project was to establish a secure quantum communication free-space link across the campus of her university. Alicia's passion for her field has led her to many great experiences, including speaking at several conferences and coauthoring six papers. In addition to this, she has participated in several collaborations around the world, such as at the Swiss Light Source in Switzerland, and the Max Planck Institute for the Science of Light in Germany. When she isn't coupling single photons into optical fibers, Alicia enjoys playing video games, writing novels, and fine tuning her abilities in the digital arts by designing posters, logos and journal covers.

What fascinates you the most about quantum photonics?

When I first started my undergraduate degree, I thought for sure that I would go on to study astrophysics. The thought of studying the vast universe with its black holes, galaxies, and dark matter was tantalizing. But when I started to work in my current research group, I discovered that quantum photonics (quantum physics, in general) was much more intriguing and fascinating to me. On the one hand, there are all the weird quantum mechanical phenomena that you don't normally experience that are fascinating, such as splitting a blue photon into two red photons, bunching photons at a beamsplitter, Schrodinger's cat, or the general wave-particle duality of photons and other subatomic particles. On the other hand, there is the experimental side of quantum physics that I find to be the best (and sometimes most frustrating) part: building and aligning optical setups, and then re-aligning, re-re-aligning, and re-re-re-aligning the setup... And then finally taking data. Every day, I learn something new that is usually mind-blowing.

What is one of the biggest challenges you have encountered in your research career?

One of the biggest challenges I have encountered in my research career - one that many researchers might be able to relate to - is the realization that failure is an option, but that failing is not necessarily a bad thing. All throughout high school and undergrad, I was (and still am) that one student who had to get A+'s on everything - anything less than near perfect was unacceptable. So when I started working on my own projects in the lab, I had the same mentality: I should be able to make all the experiments I work on be successful (e.g. measuring good enough data to be published). However, I quickly learned that not all experiments succeed, despite the months of effort involved on each and every one. Many of my experiments have not worked for a number of reasons, whether because of faulty equipment, simply not feasible according to the theory, my own fault, or otherwise. Nevertheless, with every failure, or let us say non-success, I have gained valuable knowledge and refined my experimental techniques which has helped in all of my following experiments. Accepting that failure is an option has helped to better shape me as a scientist and a person. Every day is a fresh start to try again: today is the day I get my experiment to work!

A recent study states that women make up 26% of the STEM workforce (Landivar 2013), why do you think that is the case?

My first thought after reading this question is that surely 26% must be substantially more than it was 20 or 30 years ago. Though there are definitely more women in the STEM workforce than when my parents went through their engineering degrees, the growth in numbers over the past decade has been slow. I speculate that perhaps one of the biggest reasons for

weird quantum mechanical phenomena that you don't normally experience that are fascinating, such as splitting a blue photon into two red photons, bunching photons at a beamsplitter, Schrödinger's cat, or the general wave-particle duality of photons and other subatomic particles. On the other hand, there is the experimental side of quantum physics that I find to be the best (and sometimes most frustrating) part: building and aligning optical setups, and then re-aligning, re-re-aligning, and re-re-re-aligning the setup... And then finally taking data. Every day, I learn something new that is usually mind-blowing.

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My first thought after reading this question is that surely 26% must be substantially more than it was 20 or 30 years ago. Though there are definitely more women in the STEM workforce than when my parents went through their engineering degrees, the growth in numbers over the past decade has been slow. I speculate that perhaps one of the biggest reasons for the slow increase of women in the STEM workforce stems from the gender stereotypes that society continues to perpetuate, even from a young age, that STEM is still a very masculine thing. Though perhaps not applicable to everyone, boys are encouraged to pursue more physical activities, technical hobbies, or other roles that require spatial awareness, including the STEM areas. Girls, on the other hand, are encouraged to mind their manners, be diplomatic, and be able to handle social situations. Though today, girls are being challenged more and more to break this stereotype. Another factor that could contribute to the low numbers of women in the STEM workplace is the issue of confidence to succeed in the STEM programs. Growing up and making my way through high school and undergrad, many of my female classmates dropped out of science courses in favour of the social sciences or arts, many stating that they were too difficult or citing a lack of interest. Of course, though not as many, there were also some of my male classmates that did the same thing. Women might just not be as well advised or encouraged to pursue a career in STEM as their male counterparts. Without encouragement, a lack of confidence to continue might arise. After all, we are much more likely to do something if someone first tells us, "I believe you can do it."

Do you have any suggestions for how schools and organizations should empower women entering STEM or women aspiring to do so?

My suggestion would be to have schools invite women (and men) working in STEM, or students that have gone through a STEM related program, to talk about their experiences and what they do. If they were informed at a younger age of the possibilities available to them in STEM, women might be more inclined to think, "Hey, I could do that, too!" In general,

the slow increase of women in the STEM workforce stems from the gender stereotypes that society continues to perpetuate, even from a young age, that STEM is still a very masculine thing. Though perhaps not applicable to everyone, boys are encouraged to pursue more physical activities, technical hobbies, or other roles that require spatial awareness, including the STEM areas. Girls, on the other hand, are encouraged to mind their manners, be diplomatic, and be able handle social situations. Though today, girls are being challenged more and more to break this stereotype. Another factor that could contribute to the low numbers of women in the STEM workplace is the issue of confidence to succeed in the STEM programs. Growing up and making my way through high school and undergrad, many of my female classmates dropped out of science courses in favour of the social sciences or arts, many stating that they were too difficult or citing a lack of interest. Of course, though not as many, there were also some of my male classmates that did the same thing. Women might just not be as well advised or encouraged to pursue a career in STEM as their male counterparts. Without encouragement, a lack of confidence to continue might arise. After all, we are much more likely to do something if someone first tells us, "I believe you can do it."

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Are there any women in STEM that you look up to?

There is no single woman that I look up to in STEM. However, there are many women that I admire for their strength and commitment to their work. In particular, I admire the women who have gone back to pursue a Master's or PhD degree despite having had children - those that are able to balance a family and a career without compromising either one.

Do you have any advice for young girls who aspire to pursue a career in physics and mathematics?

"My advice, to quote Galaxy Quest: Never give up, never surrender! The statistics may vary from university to university, but at least in my year, physics seems to have the smallest female to male ratio, with slightly more in mathematics. It is by no means a simple or easy career path, but it is more than possible and certainly rewarding."

Throughout the interview, Alicia Sit proved to be a prime example of how one can be successful in the field of STEM, regardless of their gender. She offers valuable insight on the slow progress of women in the STEM workforce and what can be done about the issue. Alicia made her specific fields, physics and mathematics, seem very attainable, which may contradict the daunting image many young girls have of these fields. Overall, Alicia's inspiring words emphasize that with enough dedication, patience and most of all, passion, the sky is the limit.

REFERENCES

Landivar, L. C. *Disparities in STEM Employment by Sex, Race, and Hispanic Origin*; 2013.