

The Future of Women in STEM

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This year marks the 125th anniversary of women's suffrage in New Zealand; a major step forward to achieving gender equality. However, 125 years on, how close are STEM reliant industries to achieving gender equality? Since 1903, there have been a mere 21 female Nobel laureates in science, a shocking comparison to the 629 male laureates. Even today, New Zealand's STEM industry is alarmingly male dominated with no female CEOs of any of our Crown Research Institutes.

My name is Sophie Mance, I'm a year 12 student at Wellington High School. I'm a keen science student taking physics, biology and chemistry, which I hope will lead to a career in molecular biology, genetics or engineering. I'm just one of a growing number of female STEM students in New Zealand behind recent milestones like the University of Auckland's record 27% of female engineering students. Of course, 27% is far from gender equity. Women are still a minority in many fields of science, particularly 'maths heavy' subjects like physics or computer science, and certainly a minority in senior research positions. The cause of this gender disparity is hard to pin down - a combination of different obstacles and systematic sexism that make it harder for women in STEM compared to men. To paint an accurate picture of the challenges that women and girls face I drew on my own experiences, and those of a group of girls from all over New Zealand, in Year 11 up to postgraduate study.

It appears that most of us are lucky enough not to have faced overt sexism while in school - just more male students in physics, economics and computer science and predominantly male staff. At university, this split becomes more apparent. In the words of one postgraduate student, "there's a noticeable change in the male to female gender ratio from sciences like psychology through biology through physics, with less and less women engaged in the study. There was some social pressure suggesting that women weren't good at chemistry or physics, that we were better off in the "softer" or "easier" sciences like psych and bio." Her experiences are mirrored by second year biotechnology student Zoe Risner, who says that although she hadn't experienced much of a gender imbalance in her subjects, her female friends in computer science told a very different story: "In these courses male dominance is obvious with around 80% of the class being male, and most of the lecturers being male. But, not only is there a large disparity in numbers it is also evident it is a slightly different environment, as in first year courses lecturers often make a point of saying that it is not appropriate to hit on any of the girls during the lab classes. I would assume this message had to be given due to this being an issue in the past." She does note that computer science is at the extreme end of the spectrum, nevertheless she makes her point. On a more positive note, it does show the university's recognition of these issues and a willingness to work towards a more equitable future. In her own words: "these issues arise before university and that universities are actually doing an amazing job of trying to compensate for number disparities and other issues that occur."

I've made a point of stating there are social issues that stop women getting into STEM fields, because even though girls are holding their own at school, there's a whole culture challenging our abilities as scientists. Izzy Bremner represented New Zealand at the 2017 International Young Physicists Tournament with four male teammates. Again, she said there was no outright sexism, but she was approached by some of the older male jurors who were impressed by how she was doing "such difficult physics." Not offensive, but certainly patronising and again highlighting the novelty of female physicists. Unfortunately, it seems the male dominated culture is pervasive throughout the STEM industry, not just in physics. Just one example for Sylvia English was while studying for her masters, when she organised an interview with a highly regarded scientist. "At the end of our thorough and professional discourse on health systems and related areas, he specifically gave me unsolicited advice on when to have children in my career before I got too old. I remember it because before that moment, I really admired his professional insight. It feels sad to have potential mentors let you down with sexist and inappropriate comments."

Although in no way exclusive to the STEM industry, Sylvia's experience highlights one of the most significant barriers for women trying to make a career for themselves - motherhood. It has been suggested that one of the reasons for the lack of women in senior roles in any industry is the employer's perception that women aren't suited for a senior role; they'll just leave to raise a family. Gaps in women's CVs from maternity leave are another obstacle for women compared to their male counterparts. It's a challenge faced by numerous women including the Prime Minister's Chief Science Advisor, Professor Juliet Gerrard. When I contacted her, as an influential New Zealand woman in science, she answered the question 'what was the most significant challenge you've faced during your care' with, "Getting an academic position with two small children. There was lots of prejudice at that time that mothers didn't have enough time for an academic career."

Despite these barriers, the number of girls in STEM is growing. Earlier this year, I was lucky enough to participate in the Eureka! Sir Paul Callaghan speech competition, an event challenging participants to present on how STEM can help New Zealand socially, economically and environmentally. In a break between speeches, a group of other female students and I were approached by one of the organisers keen to start a discussion; his main question, "Why are there so many girls at Eureka now?" He went on to elaborate that when the Eureka! programme started 5 years ago, there were very few girls participating and now the gender split was roughly even.

Like any social change, there's a combination of individual and cultural factors behind the rise of girls in STEM. Personally, I've always been interested in STEM subjects and my innate competitiveness is partly why I'm where I am, but on a larger scale my generation is inspired by the massive social changes we've seen recently. The #MeToo movement, Emma Gonzalez' incredible activism against gun violence and Malala Yousafzai's advocacy for girls' education are all female led social movements. Although not specific to STEM, they're feminist icons who are daring to defy stereotypes and stand up for themselves. Another factor responsible for the scale of the change is that we're also the first generation to have women in STEM as mothers,

aunts, neighbours and friends. Although they're still a minority and play a different role to a traditional mentor, *we're the first generation to see women in a wide variety of professions, proving that it's possible for us* 

The media is always a catalyst for change. By reflecting upon the increase of women in STEM, they're inspiring change on a wider scale. There are fictional role models like Shuri from *Black Panther*, the new female doctor in *Doctor Who* and of course Hermione Granger. Equally there are historical figures too, the incredible female mathematicians Katherine Johnston, Mary Jackson and Dorothy Vaughan from *Hidden Figures* and Joan Clarke, the World War Two cryptographer from the *Imitation Game*.

However, for continued change we need more real-life female role models. Our ideal role models won't preach from a soapbox. As Izzy Bremner puts it, "let's have STEM women loud and out there, as role models. Be open that as a female in a male-dominated field, you may be made uncomfortable at times, and it likely isn't intentional. Be open with how you deal with it and have systems and suggestions in place for what to do in that kind of situation. Don't make everything about how you're female, but how you are a scientist who has faced challenges, giving advice to people who may face similar ones."

In January, I will be travelling down to the University of Canterbury for their Women in Engineering summer programme. I'm incredibly excited at the opportunity to meet more like-minded girls and get inspired. However, programmes like this generally only attract an audience who are already interested in STEM careers. So maybe as Katrina Young suggests, there's a way of targeting younger students, "even as young as middle school and providing students the kinds of opportunities to see what STEM is all about in a hands-on way... to get all students motivated to pursue studies in these areas."

Our vision for the future of women in STEM is where we see women in STEM become the norm. It's a vision shared by many others, including 2018 Physics Nobel Laureate Donna Strickland, when in an interview she gave she stated: "Hopefully, soon, there's enough women and enough people of colour, and enough of every group out there, that feels that they get the recognition they deserve, and then we don't have to talk about it anymore." Or in the words of Izzy Bremner: "I guess my big aim is that I can meet a little girl one day and have her say that she wants to be a scientist, and not have to worry that she'll have to grow a thick skin."

It's here that teachers have an incredibly important role. Our ideal science teachers inspire us and encourage us to learn more regardless of our background, gender or race. After all, and again well put by Izzy Bremner, "different people think fundamentally differently, and different perspectives can and will always be useful on any kind of project, and especially in science." Science is so much more than just passing NCEA and sometimes we students need reminding not to get too obsessed with counting credits. There are so many opportunities outside of school for any students interested in STEM to put their knowledge to use, gain crucial problem solving skills and be the face of a more diverse STEM industry. To use the words of Professor Juliet

Gerrard, we need to be inspired to “go for it! Follow what you are passionate about. Be ambitious and aim high.”

By Sophie Mance Wellington High School.

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