

Editorial

Ada Lovelace Day and Celebrating Women in STEM

October is a special month for the *Patterns* team as it is the month when we celebrate Ada Lovelace Day, the annual celebration of Women in Science, Technology, Engineering, and Math (STEM). This is celebrated on the second Tuesday of October every year, which this year falls on the 13th of October.

Patterns' ethos is all about sharing data science solutions that cross multiple domains, so readers can learn from the work that other researchers have done. A key part of this sharing is diversity of experience—different people have different issues with data, and that's all perfectly understandable. Our world is a glorious, complicated place, and that's what makes being a scientist so rewarding and fun. Complications also mean that for so many problems, we need to come together to solve them, and the more perspectives and views we have, the better a chance we have of coming up with solutions to deal with the grand challenges we face as humans.

Data science, and STEM in general, have always had women working in them, but historically speaking, this work has often been forgotten. Thankfully that is now changing with Ada Lovelace Day, and with the wider recognition of the work women do, and always have done, in STEM. Names like Hedy Lamarr, Rosalind Franklin, Lise Meitner, Katherine Johnson, Emmy Noether, Marie Curie, Jocelyn Bell Burnell, Maggie Aderin-Pocock, and many, many others are becoming more prominent and well known. The stereotype of the scientist as the older white man with wild hair staring at a blackboard is weakening, and not before time.

This editorial is a chance for the *Patterns* team to reflect a little on what being a woman in STEM means to us, and to share our personal stories about our experiences.

Sarah's Story

I was always fascinated by science, even from a young age, and my dad was instrumental in encouraging this. Yes, it might have been my brother who got Lego for Christmas and figured out how to work Dad's new computer the day it arrived, even before Dad got home from work, but I was the one reading about chaos theory and Gödel's incompleteness theorem and programming in Turbo Pascal when I was still in school.

A big influence on my scientific interest was the annual Young Scientists Exhibition, held in Dublin every year, which started in 1965 and is still running strong (https://en.wikipedia.org/wiki/ Young_Scientist_and_Technology_Exhibition). This is a big science fair for school kids where you do a science project, alone or in groups, and then display it. The first year I went, I was displaying a solo project on the chaotic behavior of a leaky waterwheel—literally an old bicycle wheel and axle cemented into a paint pot, with buckets made out of tomato puree tins. Coupled with a flowmeter borrowed from the local technical college, I had everything I needed to investigate chaotic behavior. It was great and I loved it, with the bonus that I even won a prize in my age group and scientific domain.

In university I went from an all-girl school to a physics degree that was about 90% male, with no female lecturers, and this was quite a

shock to the system. It was also in university that I got told that my technical knowledge was painful to others. It was meant as a joke, but it did have an impact, where I would hide my excitement and enthusiasm about science from others. I had my first experience with artificial intelligence then too, where my undergraduate dissertation project was training a three-layer artificial neural network on the differences between pieces of music by J.S. Bach and Stravinsky (my degree was in physics and music). This was back in the late '90s—things have progressed a lot since then.

For a while I dabbled in science communication in a local science museum, then got my first "proper job" working as a data processor and analyst for a long-term radio propagation experiment. Despite it being a radio communications research group, I wasn't the only woman in the team, although as time went by and I got more experienced, there were plenty of meetings that I attended where I was the only woman, and often, the only person under 35. I was also, more often than not, chairing these meetings and managing the projects the meetings were about which was a double-edged sword, as yes, I had increased responsibility, but it was also moving me out of the technical work and into more of a support and management role.

I've had ups and downs as a result of my gender, but thankfully far, far more ups than downs. I even navigated the tricky back-towork-after-maternity-leave successfully, with the help of my wonderful teammates and mentors. Sure, I have stories of being propositioned during training courses, of over-friendly project reviewers at progress meetings, of being in conversations during coffee breaks with a couple of men where the men just spoke to each other, and when one left, the remaining man just stood there in awkward silence before walking away. I've stood isolated and ignored at conference receptions, feeling very out of place (my top tip for dealing with that is to look around the room for another person standing by themselves and to go say "hello"). I've held my hand up at conference sessions for repeated long minutes to ask a question, to see man after man called upon by the chair for their question, ignoring me. I've been to a conference keynote where an optimization problem in computing was illustrated by an example of choosing the best characteristics for a wife, where the options were "cooking," "cleaning," "attractiveness," and "sense of humor." I was even told recently that I couldn't be editor-in-chief of Patterns because that job really needed to be done by a highly respected professor of computer science instead.

Now that I'm older and more experienced, I'm more likely to sigh and roll my eyes at this sort of behavior, and then call people out on it. People are listening, and people do want to change. In more than one case, pointing out the situation resulted in a profuse and personal apology. But it's not an easy thing to do, and I am very aware that I have the security in my role and the personal reputation to be able to do it.

I feel that things are getting better for women in STEM. I see it for my own daughter, who I made sure has plenty of Lego (and not just because I wanted to build it). After-school science and







coding clubs show all kids that they can do science, and the role models for women in STEM are out there and highly visible.

Yes, we have a long way to go when it comes to dealing with inequities in STEM, but with persistence we'll make things better. We've come a long way already, and we'll keep going.

Tessa's Story

In discussions about women in STEM, I feel compelled to highlight that I am, somewhat controversially, relatively new to the world of STEM academia. I haven't spent the years in hallowed halls or flickering labs that are the general rite of passage, I haven't slogged my way through systems that stonewalled me on the grounds of my gender, and all together the suffering of women in STEM came as something of a culture shock.

My parents didn't teach either of their daughters about gendered expectations, to the extent that my mum insisted that relatives resist buying us "girly" toys. This caused some confusion and resulted in a particularly memorable and utterly horrifying spider hand puppet with huge hairy legs. My parents built us farms out of papier-mâché, castles with secret passageways, and treehouses in the garden. I didn't learn these lessons at school, either. Teachers told me I could be whatever I wanted to be, and I never experienced sexism from figures of authority at any point in my education. As a caveat, though, while I didn't endure sexist behaviors, I found the microaggressions of classism to be rife when I moved from Lancashire to London, and I have, over the years, changed my accent to blend in with the cut-glass crowd.

Since then, I have experienced my fair share of sexist behaviors in the workplace, along with the ubiguitous cat calls, sexual aggression, and oppression that characterize the everyday lives of most of the women I know. It wasn't really until I started working in data-driven marketing that I began to notice just how often information trails are selectively used to discriminate based on protected characteristics, including gender. I've lost count of the number of products available in marketing which claim to predict age, sex, location, race, lifestyle, interests, abilities.... The list is extensive. This information is used to separate the audience into groups that receive targeted advertising, endlessly perpetuating harmful stereotypes. We think this person is a woman; she will want softer messaging. We think this person is black; we'd best offer products for coarse hair. It can sound great; it isn't. It's manipulative, exhausting, and full of hollow promises that the company really cares.

I've been lucky, however. Early in my career, I started attending AI conferences in London with the aim of writing about "trends" for whichever company I was working for at the time. At one of these I met the first of the people who would become my long-term collaborators on various projects under the umbrella of "trust in technology." This group are people I would describe as "proper academics" from all over the globe, and I am honored that they consider me a valuable part of their work. They have supported mad project ideas, allowed companies I worked for to take credit so I could get the time to research, and encouraged me to stand up and present our work at conferences, including Data for Policy 2019, where I met Sarah. The rest, as they say, is history.

I don't know that things are starting to get better, you only need to switch on your news stream of choice to read about

pay gaps, imbalanced care-giving burdens, blocked promotions, and discriminatory behaviors, but I hope that we can change a small part of the story as it goes on. At *Patterns*, I work in an all-female editorial team of supportive, excellent, and bold women, and we work hard to promote authors who have fought through oppression due to their gender identity.

Sahar's Story

As a child, I was lucky to live in a green neighborhood in the metropole Tehran. I was allowed some hours of the day to play outside, and this is how I spent those hours: I was watching the insects' behavior very patiently. My 1-year-younger brother would get very bored and would leave me alone with my investigation after a few minutes. It is so surprising for me now how much a small kid could have learnt from those investigations in plants' and animals' behavior. Later I started to do simple experiments on myself or on my brother to find out how things work on my body. My mother decided to watch us more closely to prevent any trouble caused by the crazy kid's experiments. So, this is how I got fascinated by life sciences and human physiology. This passion was controlled, and a bit suppressed (unfortunately) later by dos and don'ts of society; however, my father, an electrical engineer, had always got my back and let me do what normally boys do. So, I also started to build various electrical circuits with his help and learned about electronics.

My childhood was passed in the Iran–Iraq War while the schools were mainly closed. We had to study at home, no internet at that time (very weird now to think about it), so teachers were teaching on TV and I was not only watching my own class, I would spend the whole afternoon listening to the science class of the grades 3, 4, and 5. And I learnt there how to test a hypothesis scientifically (my poor mom!). When I finished the elementary school, I won a competition to be admitted to a specific school called "national organization for development of exceptional talents"; however, due to my family issues, I could not join that program.

After finishing high school, I joined one of the best medical universities of Iran due to my passion for clinical sciences. Soon I realized that being a clinician is not equal to doing research, so I switched to a medical research program. There I got very passionate about the human brain, and I started to think about the fundamental question I had since I was a small child, the question that still today there is no clear answer to: "How are we conscious?"

During and after finishing my master's program, I started to do a research project with the supervision of an amazing woman Prof. Mahyar Janahmadi. There, everything I have learnt in childhood about electrical circuits came to be relevant as she taught me electrophysiology and welcomed me to the amazing world of cells, neuronal networks, and ion channels. While searching for an answer to a question raised by my small research project, "how an inhibitory neurotransmitter like GABA can act as an excitatory one in a pathological and physiological situation," I came across a beautiful work of another amazing woman Prof. Joke Meijer, who soon became my PhD advisor in a distinguished lab in the Netherlands. And this is how I ended up in Europe, the perfect world for women to grow!

In my mind, I had pictured myself in an ideal world that does not exist yet. When I arrived at Europe, my picture of being a

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female scientist in the Western world was immediately broken. I am from a culture that judges me based on my appearance, and I did not expect to be judged in the same way in my first scientific conference held in Europe, but unfortunately I was. This did not disappoint me, but it made me more determined to achieve my goal: the ideal picture of STEM world in my dreams. Although recently we see that the stereotype of the scientist as the white man is changing, I still think that "the image of a scientist is subject to culture and needs revision," as is mentioned in the last point of my PhD thesis propositions.

I moved to the Netherlands Institute for Neuroscience as a postdoctoral researcher, one of the most masculine environments I have ever worked in. There I learnt being an isolated woman in a group sometimes can make you doubt your capabilities. Therefore, women need to stay next to each other and help one another. I should not forget to mention that Prof. Dick Swaab, Dr. Valeria Gazzola, Dr. Valentina Cenedece, and Dorien Bisselink helped me to turn an otherwise difficult situation to a constructive experience.

Despite some people who stood against me, many women and men empowered me during my journey in the science world, and among them Mahyar and Joke have a major role. To achieve the ideal world in which all humans have equal chance to grow and participate in STEM regardless of their gender, race, and geographical location, each of us who has the ability should at least empower one other person! And if we are not able to empower others, we should just step aside and do not close the road.

Summary

It is an honor and a privilege to work with such a wonderful team of experienced, confident, and strong women, both in the *Patterns* team, and within the wider Cell Press range of journals. We all have stories to share and the willingness and ability to build and maintain a supportive and caring environment, where everyone in STEM can thrive.

Data are the foundation of science, there's no denying that. But what we also must remember is that without people, there is no science either. *Patterns* is all about celebrating the data science we learn and share and about the people communicating with each other to solve problems, discover new things about the universe around us, and generally make our world a better place.

This month we hope you will join us in celebrating all the women in STEM who you know and appreciate. We'd like to give a special acknowledgment to all our women authors and reviewers, and wish all our readers a very Happy Ada Lovelace Day!

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