Change is in the air

Krystal Vasquez, PhD student at Caltech, talks to *Nature Chemistry* about her experiences as an atmospheric researcher — both in the lab with her favourite instruments and in the scientific community as a disabled scientist — as well as her love for science writing.

What are you working on at the moment?

Too many things if we're being honest! Right now, I'm in full PhD dissertation writing mode since I'm trying to graduate fairly soon. It helps that I've managed to publish two papers during grad school, making these parts of my thesis a bit easier to write, but I still need to write up a few more chapters and pass my viva before I can start referring to myself as Dr Vasquez.

I've also recently been working as a freelance science writer on the side. This is something I was introduced to near the beginning of the pandemic, and I quickly fell in love with being able to share amazing scientific discoveries with more general audiences. I also regularly use the platforms I'm given to discuss ways of making academia and STEM more equitable and accessible.

Your research focuses on oxygenated volatile organic compounds (OVOCs), whose abundance in the atmosphere is on the order of a few parts per billion, or even parts per trillion — how do you detect and measure such small amounts, and how do you probe the behaviour of these very reactive compounds?

In my research, the primary technique I use is chemical ionization mass spectrometry (CIMS). I recently wrote a 'Tools of the Trade' piece about this instrument for *Nature Reviews Earth & Environment* (https://doi.org/10.1038/s43017-021-00163-x). This is a very sensitive technique that can measure atmospheric compounds even at low abundances and is also relatively gentle. The ion chemistry ensures that the compounds aren't destroyed as they make their way to the detector.

I've also combined CIMS with gas chromatography (GC). GCs can measure compounds at low concentrations as well, assuming that you pre-concentrate the sample in a trap (we use a cryo-trap) before separating it on the GC column. GCs also have the added bonus of being able to separate isomeric or isobaric compounds, unlike CIMS, which can only separate compounds by nominal mass. I may be a little biased, but I think

combining the two makes for a very powerful analytical instrument.

How did you get into analytical chemistry and atmospheric science?

It was a complete accident!

If we rewind to high school, I had no idea what a scientist — much less a chemist — actually was. I'm the first in my family to receive a college degree. As far as I was concerned my only options were becoming a medical doctor, a lawyer, or an accountant. So, when I applied for undergrad, I chose medicine because I enjoyed science the most.

But when I got to college, I discovered there were a lot more job opportunities in STEM than I ever thought possible! I came in as a biochemistry pre-med but quickly changed my major to chemistry because I love how nearly everything can eventually be broken down to the interactions between atoms or molecules.

As for atmospheric science, it all started when I took an introductory environmental science course in the summer after my first year. Even though I only signed up because I needed units to qualify for financial aid, I absolutely fell in love with it. When I learned I could apply my chemistry background to help solve problems like environmental pollution, I was sold. I tacked on an environmental science minor, which eventually led to me taking an atmospheric science course. Fast-forward to the end of my undergrad career, I applied exclusively for atmospheric science-related internships and eventually went on to pursue an atmospheric chemistry PhD.

You also created and run the website "Chronically Invisible", can you tell us about it?

When I became disabled in grad school, I didn't know of anyone else that was going through the same things I was. I've never (knowingly) had a disabled professor or colleague. There was no one to ask for advice, no role-models to look up to. And when I Googled "disabled scientists" the only person who flooded the search results was Stephen Hawking. Don't get me wrong, he was a great scientist. But his disability and mine are completely different; I simply couldn't relate.

Through my own research, I eventually found out about Dorothy Hodgkin, a chronically ill Nobel Prize winner. She is the first person I wrote about for Chronically Invisible, a blog I started with the goal of not only showcasing that disabled people do, in fact, exist in STEM, but also to show that disability is extremely diverse. Dorothy Hodgkin had rheumatoid arthritis which, like me, she developed as an adult. The second person I wrote about, Phyllis Stearner, was born with cerebral palsy.

Unfortunately, the blog has recently been on a bit of a hiatus because I have been rather busy trying to publish my latest research project in the middle of a pandemic. I haven't forgotten about it; I'm hoping to restart it soon because I'm tired of learning about science through the eyes of non-disabled white men.

In your career so far, what has been your experience with the resources and flexibility offered by chemistry departments to make lab work and field work more accessible to everyone?

I've definitely had supportive and accommodating people around me — in my lab and my department — but this is probably due to a combination of privilege and luck. Even so, I'd still say my experience in both chemistry and geoscience departments has been fairly negative.

It's difficult to receive accommodations for lab work and field work. For the most part, Disability Services offices are only really equipped to provide classroom accommodations. After that, it really starts to fall on the student to figure out what they need. And that's no easy task, especially if you've never taken a lab class before, haven't had any prior research experience, or recently became disabled.

Some students and staff who are chronically ill or with disabilities have been making adjustments to working patterns and habits long before the current pandemic. In what way can universities learn from these communities to help in their responses to the current crisis and to make campuses more COVID-secure?

They can start by remembering we exist. Anecdotally, very few universities even took their disabled students into consideration in the beginning of the pandemic. For the most part, it was up to us to coordinate with Disability Services and ensure we were still going to receive the appropriate accommodations. We have also been excluded from any of the conversations surrounding campus reopening, despite the fact that many of us are at-risk for severe COVID-19 outcomes or can't get vaccinated for one reason or the other.

What are your plans for the future?

In the 11th hour of grad school, I've decided to leave research and academia. While I absolutely love tinkering with analytical instruments and doing field work, I've just had too many negative experiences. I no longer think this type of working environment is a place where I can thrive and be myself.

I've toyed with a few 'alternative' career paths. Currently, I am thinking of switching to science communication, specifically science writing. The one good thing that came out of this pandemic is that I've had more time and energy to freelance on the side. I've really enjoyed it thus far. The next step is to find an internship that can help me decide if I'll like science writing when it shifts from hobby to career. If it all works out, I'll be looking for full-time employment once I get my PhD in the next few months.

Interviewed by Anne Pichon

Published online: 1 June 2021
https://doi.org/10.1038/s41557-021-00719-w