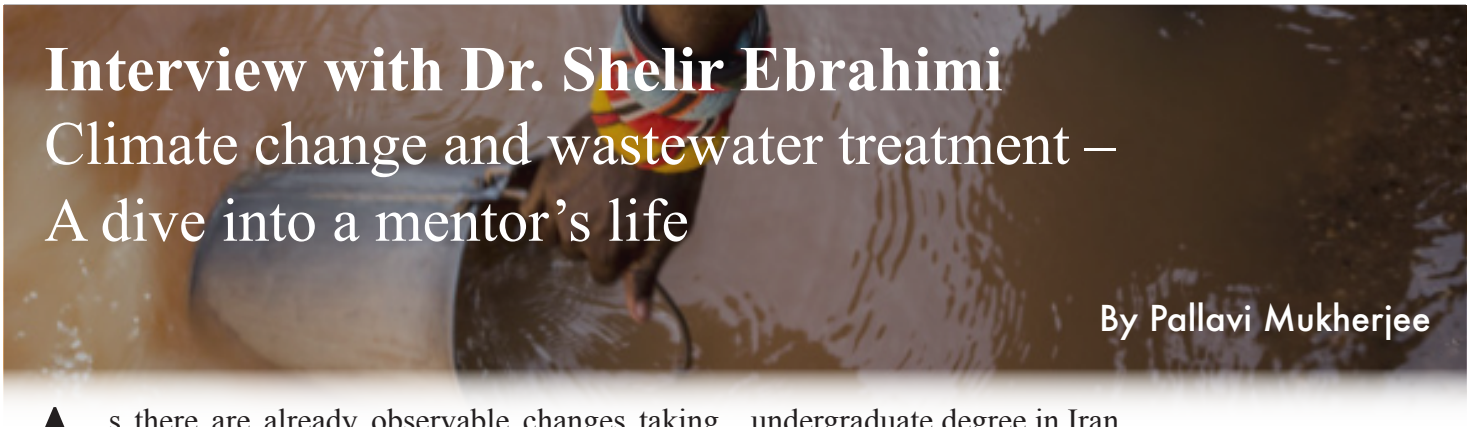

Interview with Dr. Shelir Ebrahimi

Climate change and wastewater treatment – A dive into a mentor's life

By Pallavi Mukherjee

As there are already observable changes taking place, climate change requires our immediate attention. Climate change is defined as the change in temperature and weather conditions over a long period of time.

Climate change can be due to natural reasons like changes in Earth's orbit and rotation or variation in solar activity,[1] as well as human activities such as burning fossil fuels and industrialization. However, the current escalation in the situation is primarily caused by man-made activities. CDC reports that climate change along with other man-made stressors has a significant impact on human health.[2] This includes increased respiratory and heart-related diseases, deaths from erratic changes in weather conditions, air and water-borne diseases, and negative implications for mental health.[2]

The Intergovernmental Panel on Climate Change predicts a rise of 1°C over the next 100 years.[3] One of the most important aspects that is affected by the ongoing climate change is water.[4] The increase in the global temperature is likely to cause higher levels of atmospheric water vapour resulting in heavy rainfall and floods. The unabsorbed and now contaminated water (such as by fertilizers, effluents etc.) is predicted to drain into water bodies, causing water-borne diseases and limiting access to potable water.[5] It is predicted that the extreme weather changes and accumulation of greenhouses gases is likely to make wastewater treatment difficult. As a result, the need for more practical wastewater management, limiting water waste and access to clean water is urgent.

Dr. Shelir Ebrahimi, Assistant Professor in the Department of Chemical Engineering at McMaster University, became fascinated with the processes involved in wastewater treatment and its far-reaching effects on mitigating the impact of climate change, while working as an intern in a refinery during her undergraduate degree in Iran.

Following up on her initial interest in wastewater treatment, she moved from Iran to Canada and started working in Dr. Deborah Roberts's lab at University of British Columbia (UBC) as a doctoral student. Her dissertation focused on developing a new process to regenerate exhausted resins that come from an ion exchange process and finding a solution to deal with brine (salty water) i.e., the by-product obtained from the resin regeneration process.[6] The goal of her PhD research project was to develop a method to remove nitrate (a contaminant) from water found in rural communities, as they often do not have access to the municipal wastewater treatment.[6]

Moving from her home country to Canada wasn't a particularly different experience for Dr. Ebrahimi: *"I have lived in so many different cities with different cultural backgrounds and even languages during my childhood. So, I am kind of used to immigration, in a sense."* But it came with its own set of challenges. It meant becoming independent all too abruptly, adjusting to a new culture, navigating through the pressures of a graduate students' life while also trying to have a life outside academia. As time went on, she became more resilient and found friends who became her family here; however, the challenging part of being a graduate student, as she recalls, was finding a healthy work-life balance. This is often the problem with most (if not all) graduate students. But, with an extremely supportive and motivating PhD advisor, who was truly invested in her students' growth both as a researcher and mentor, she was able to navigate through the difficulties of leading a graduate student life. For Dr. Ebrahimi, the most demanding memory of her doctoral journey wasn't so much as the research itself, but the pressure and stress that came as her thesis defence came closer. This ultimately resulted in her spending the night after

her defence in the hospital. *"Someone told me once, if something is not worth the same in 5 years from now, then you don't need to worry about it and that is so true although it is not easy to act like that."*

During her PhD research, Dr. Ebrahimi, like many graduate students, was also working as a teaching assistant, but for her teaching was extremely special and meditative as it brought back wonderful memories from her childhood. Sharing one such experience, Dr. Ebrahimi recalls that when she was in grade one, she remembers coming home from school, going straight into her room, arranging her dolls and toys in one line and then teaching them all that she had learnt in school that day. Later she would schedule a test and grade their notebooks. Through teaching her dolls and toys, Dr. Ebrahimi found a creative and an engaging way to learn and comprehend material throughout her school life.

Her innate love for teaching eventually helped her open new career doors. During her third year of doctoral studies, Dr. Ebrahimi participated in an eight-month teaching training program at UBC where participants not only learned how to build an elective course but also engaged in hands-on experience by designing and teaching one course to both fourth year undergraduate and graduate students.

"By the time that I was teaching my own course, I was pretty sure that is what I want to do for rest of my life" Although her heart was still set on teaching, she joined the Drinking Water Research group at University of Toronto as an NSERC postdoctoral fellow on the suggestion of her PhD advisor. The focus of her research work was analyzing the effectiveness of various water treatment processes and removing microplastics in different water treatment plant processes.

However, moving from British Columbia to Toronto proved to be quite difficult for her to adapt due to Toronto's fast paced, expensive and crowded life. Being an outgoing person and habituated to doing yoga and hiking, Toronto was quite different for her. Also, like many graduate and postdoctoral fellows, Dr. Ebrahimi faced a disparity between salary and living expenses of a modern city. But as she pushed through the obstacles, she met Dr. Chirag Variawa (Director of the first-year engineering program at University of Toronto) who quickly became a great mentor and presented her with opportunities to focus on teaching and engineering pedagogical research. Before joining McMaster University, she was a full-time instructor at University of Guelph.

Dr. Ebrahimi's work on wastewater treatment compels one to think about the ongoing effects of climate change, urging us to alter our habits and making conscious lifestyle choices if we want our planet to remain habitable in the years to come. But bringing about a change starts through awareness, education, and knowledge. *"It is important to look at climate change and sustainability as the core knowledge that all students need to have regardless of their discipline. Anything and everything can affect the climate change, and sustainability is part of every topic. So, I guess that it is the role of us instructors, to deliver this message to all our students"*

Aside academia, Dr. Ebrahimi practices yoga as it helps improve her physical and mental health. She enjoyed doing outdoor yoga back in British Columbia, but after moving to Toronto, especially during the pandemic, she started practicing at home. Additionally, she is used to play a string instrument called Tar, but she no longer feels the need to play it and adds:
"My partner is a musician, so I think he has brought enough music to my life that I don't feel the need to play Tar myself. I still try it sometimes though.". Dr. Ebrahimi is a self-motivated individual who doesn't believe in having role models, as she feels everyone is unique and the concept of having a role model overshadows that in some ways.

Nature has been kind and giving to us, but humans have taken her kindness and compassion for granted. And if we continue to pollute Mother Earth and betray her for all the things she has provided to us, there will come a time when she wouldn't be kind anymore.

Climate change has become a major concern in today's time. As a community, we can shift gears that can control, and with time, even reverse the effects of climate changes by taking small, conscious steps. This can include raising awareness about climate change, greening your commute by using public transport or driving electric cars/carpooling and flying less, using recycle bins while

limiting need for electronic items, opting for more plant-based diets and/or growing your own food/buying local or organic and limiting waste of food and water, and switching to renewable energy sources like solar panels to avoid the burning of fossil fuels.[7] We cannot change the world in one day, but together we can make our Earth a habitable, breathable planet for us and for the future generations to come.

Photograph from the National Geographic image collection

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Photo source: https://www.nationalgeographic.org/article/how-climate-change-impacts-water-access/