The Secret Lives of Scientists, Engineers, and Doctors: Volume 2 is the second in a series of books that shares uniquely personal stories of the growth, struggle, and success of twelve STEM (Science, Technology, Engineering, and Mathematics) professionals. From a chemist, to a soil scientist, to an expert in satellites at NASA, to an artificial intelligence (AI) researcher and beyond, *The Secret Lives of Scientists, Engineers, and Doctors: Volume 2* contains stories from a variety of professions that are sure to inspire children and young adults of all ages.

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Faisal Hossain

Volume 2: The Secret Lives of Scientists, Engineers, and Doctors

MASCOT BOOKS

The Secret Lives of Scientists, Engineers, and Doctors

Volume 2

Faisal Hossain

Illustrated by Hatice Sena Balkan and Merve Cirisoglu

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For our earth's most precious
resource: our children

This book was sponsored by generous contributions from:

Sayma Rahman and Faisal Hossain

University of Washington

Gordon and Betty Moore Foundation

The idea for this children's book was conceived in 2018 as part of a program called the New Voices under the National Academies of Science, Engineering, and Medicine. In my lifelong passion for science communication, I toyed with the idea of using fun, cartoon illustrations to describe inspirational and hopeful stories about extraordinary scientists, engineers, and doctors. By highlighting a personal story of struggle, a moment, or a journey, my hope was that our children will understand that they, too, can become successful professionals in science, medicine, engineering, and other allied disciplines. The purpose of the idea was to show our children that, while pursuing such disciplines, it is still okay to fail or be different from others, because all successful scientists, doctors, and engineers were just like them once. So in early 2019, the journey to publish this book for elementary school-aged children began.

I want to thank two particular New Voices members who went above and beyond in accompanying me on this journey: Colleen Iversen and Tyrone Grandison. Together, Tyrone and Colleen built the apparatus for the dissemination and collection of stories, and cheered us on with their common passion for selfless service to others. This book could not have been completed without the sacrifices Tyrone and Colleen made this past year. I also want to thank the New Voices initial cohort of 2018 who allowed their stories to be used to prototype such an effort. Last but not least, I am very grateful to the sustained and affordable illustrator services provided by my dear friends Merve Cirisoglu and Hatice Sena Balkan of Animatick Arts. If it were not for their willingness to patiently listen to me and other authors' visual wish lists, this book would never have been published with the very limited resources we had.

So, after two years of relentless effort, I am now pleased to share this book with our earth's most precious resources—our children. I hope they like it, because we are just getting started!

Faisal Hossain
Bothell, Washington

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The Secret Lives of Scientists, Engineers, and Doctors: Volume 2

Illustration artwork by Hatice Sena Balkan and illustration design by Merve Cirisoglu of Animatick Arts; animatick.com.

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The Secret Lives of Scientists, Engineers, and Doctors

Volume 2

Faisal Hossain

Illustrated by Hatice Sena Balkan and Merve Cirisoglu

Colleen Iversen

Oak Ridge National Laboratory

I am a scientist.

I am curious. I walk through a forest, dissatisfied with the dappled light dancing over green leaves. I want to know what is hidden beneath the surface. The rhythmic pulsing of roots being born, living, and dying. They are the life support system for the towering trees above, and the compost for a multitude of creatures, big and small.

I am an explorer. I look up and catch my breath at the view of the vast and alien landscape around me—it could be another planet. I dig into the tundra, down, down—a few inches that span a millennium—until I reach the permanently frozen soil and have to stop. I wonder, how do the living interact with the dead and decaying? What does the future hold for a frozen ecosystem that is quickly thawing?

I am a child. My wild blonde curls blow in the wind as I run through the tall grass, kneeling on skinned knees, rushing to flip over one more rock, one more log before we have to go inside for dinner.

I am a mom. I hold my boys in arms that have been made strong from digging in the dirt. I lean their heads on shoulders that have felt the burden of being the new, the first, the only. I rescue a worm from the chubby fingers of a toddler that has dug it from its moist home. I dream of the dark matter that sparks the imagination of a boy with green eyes.

I am a scientist.

Ali Nouri

Federation of American Scientists

Flying has been a consistent theme in Ali Nouri's career. Getting his PhD in molecular biology involved working with different genes that impact fruit fly (*Drosophila melanogaster*) development. He later left benchwork and went into science advising on the Hill (Congress), where he worked for ten years. There, he realized that scientists do not have a strong voice in the halls of Congress. He left the Hill and now leads an organization to help the science community have a stronger say when it comes to public policy decisions. As a pilot who loves flying, Ali has a vodcast where he flies policy-oriented experts around the Washington, D.C., area and interviews them about their work.

Patricia Silveyra

University of North Carolina

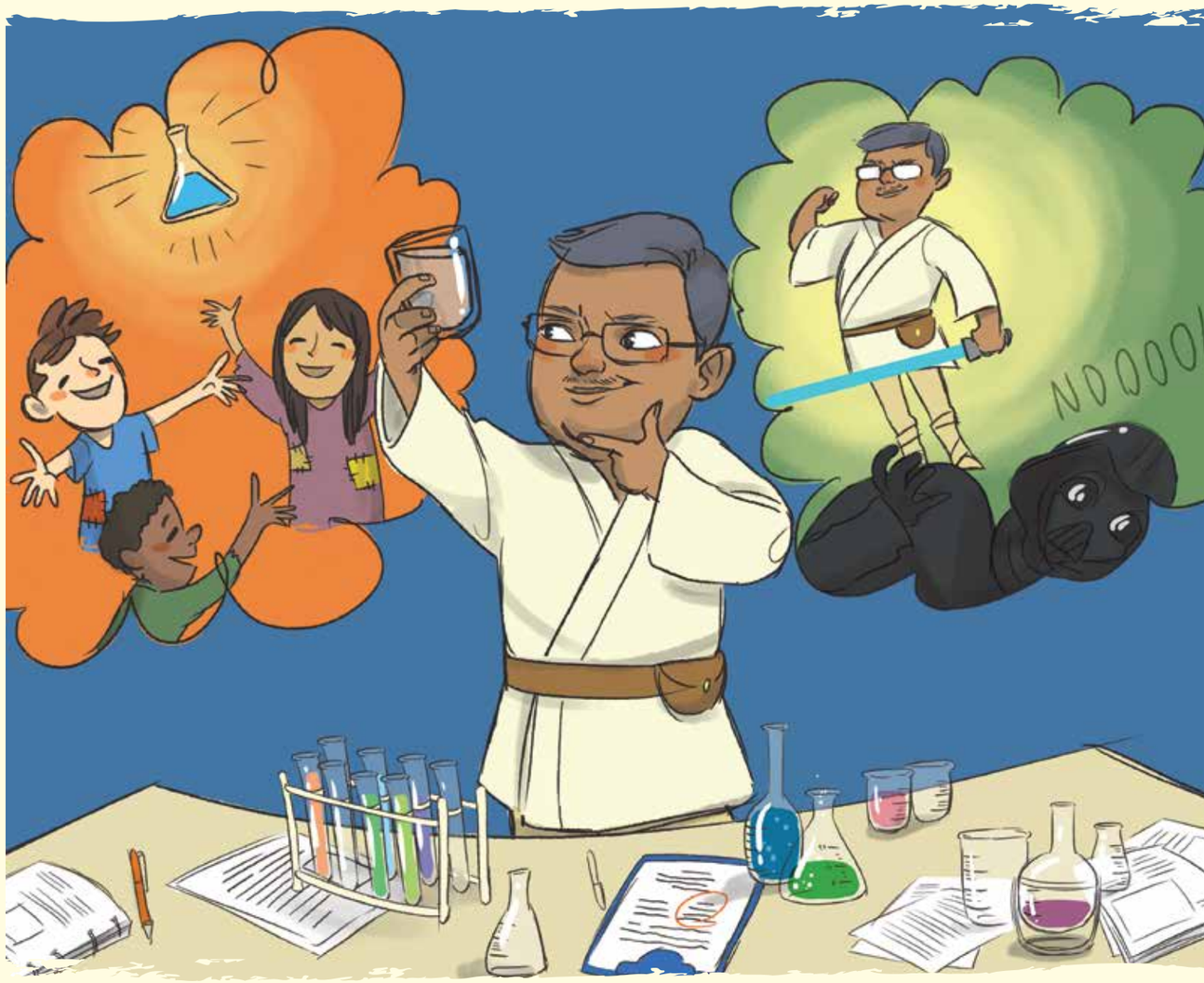
Dr. Patricia Silveyra is a passionate scientist who studies how being exposed to air pollution (and even our own hormones!) can affect how we breathe. In her laboratory, she compares lung cells from males and females. She tries to understand why there are more women than men suffering from lung diseases such as asthma. She also tries to understand why some women with asthma get sicker before their periods. To protect both men and women from breathing dirty air, she works to inform policymakers on how to regulate gas emissions.

Dr. Silveyra believes in teamwork and in educating the next generation of scientists. As a strong leader and advocate for research, she spends significant time mentoring trainees and serving in national organizations that are devoted to increasing diversity in science careers. She wants to see a scientific workforce that reflects the demographics of the population. By doing so, she believes science can be more effective in addressing problems that affect all communities, not just some.

Abhishek Roy

Dow Chemical

My father used to take me to see *Star Wars* and *Star Trek* films—I think *Star Wars* was the one that got a lot of people inspired and fascinated by science. Although I didn't grow up to be a Jedi Knight, the "big visions" presented by science fiction left an impression on me. I ultimately made my own real-life story into a science career that's helping sustain the natural resources here on earth. Today, I am motivated to solve significant challenges facing humanity: the long-term availability of energy and water. I am a chemist by training. Whenever I think about the next chemistry we should be working on, the challenge is understanding how it could be applied to a current market need. If that need isn't there, then we aren't doing the right thing. After all of the research and hard work spent addressing those needs, seeing how the results impact real people is a gratifying experience.



Alison Sheets

Nike, Inc.

Alison Sheets's love of science came from her love of sports. Her gymnastics coach in school, a physicist at the Army Research Laboratory, used his physics knowledge to make training tools that helped Alison understand how her strength and speed influenced performance. By high school, Alison had already realized that physics could take her very far—not just on the track, but also in her career. Although biomechanics and bioengineering had not emerged yet as majors in the United States while she was in college, her patience with mechanical engineering during her undergraduate studies paid off. In graduate school, Alison made computer models for gymnasts swinging on uneven parallel bars to understand how their strength and size affected their performance. She admits that she is probably better at thinking about sports than playing them, which is why she now works at Nike, making amazing products for consumers that are built with her love for science.

Faisal Hossain

University of Washington

That scene in *Raiders of the Lost Ark* where Indiana Jones is chased by a giant boulder inside a cave sometimes gives me goosebumps. Back in my college days in India, going back home meant a lot of preparation for a two-day journey that involved almost all modes of transport—train, bus, scooter, rickshaw, and even walking across no man's land into another country. We never knew what the weather conditions would be like. Once, as I moved from Varanasi in Northern India and headed toward Kolkata, the train stopped in its tracks after a few hours. Floodwaters had submerged the rail tracks a few miles ahead and the next station was out of service. I changed course and planned a detour up north. Same story. I ended up stuck in a town called Bhagalpur in Bihar because floodwater had covered the rail tracks there, too. I decided to make another uninformed detour to Kolkata—this time by bus. After a few zigs and zags, I finally made it to the border and crossed to get ahead of the floods. The usually two-day journey took four days, exhausted my cash supply, and wiped out my energy reserve. Twenty-five years later, it is probably no accident that I sometimes get nightmares while trying to forecast floods using science, models, and satellites.

I'm Faisal Hossain, and I am a flood chaser who gets his inspiration for science watching Indiana Hossain get chased down by giant boulders.

Yan Liu

University of Southern California

When I was a child, I was always intrigued by how the brain functions. I majored in computer science and wanted to study how we can engineer the computer to think like a human brain. After my daughter was born, I was really fascinated by how babies learn.

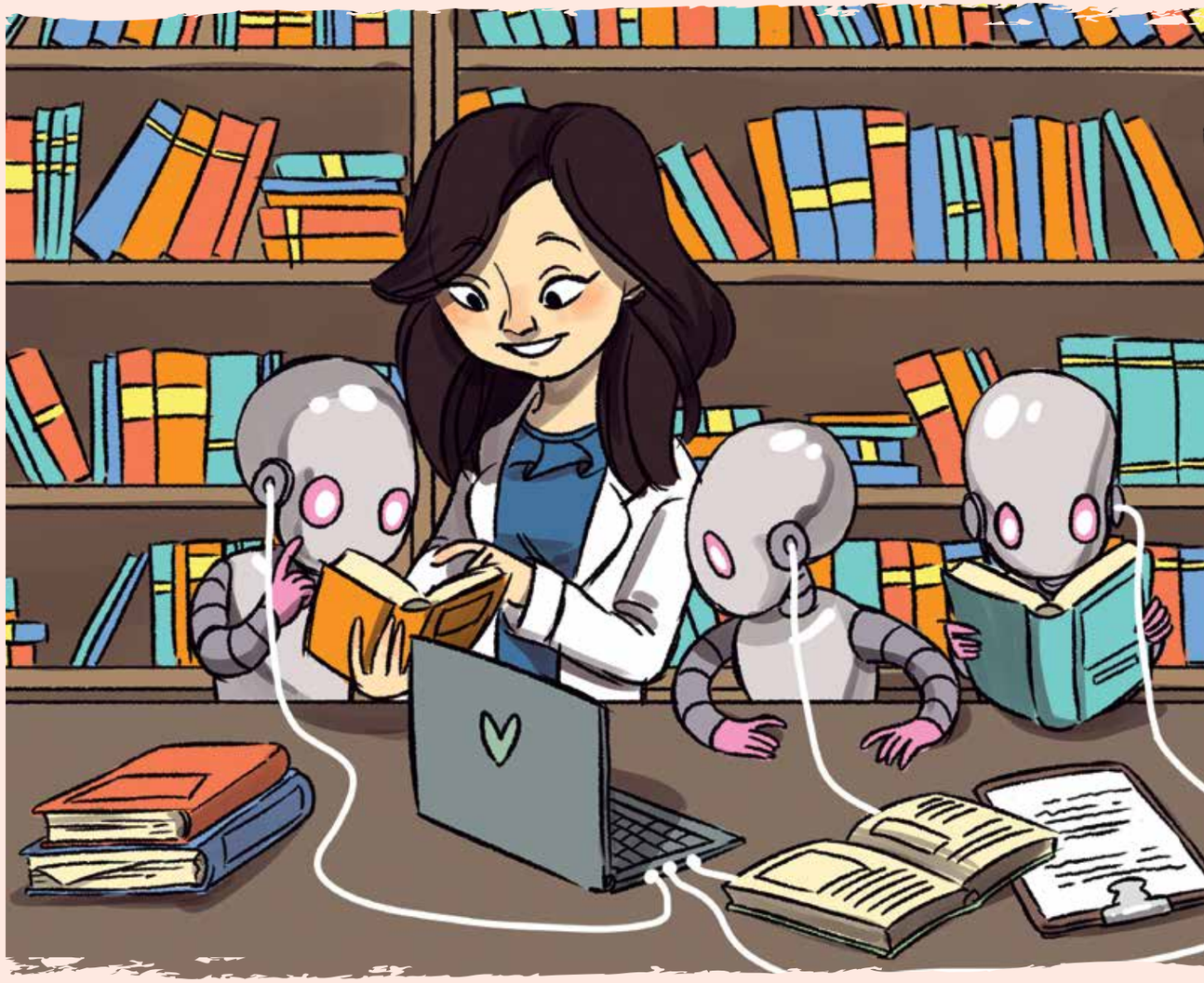
For example, once I took my daughter for a hike with my students. When we sat down for tea, my daughter was keen on pouring tea into cups. After she quickly filled all five cups, there were no empty cups left for her to pour tea into. Without any thought, she then made a suggestion: why don't you guys have a competition to see who can drink the tea fastest? Her idea would enable her to go back to playing her game of pouring tea into empty cups. The reasoning behind what she did as a four-year-old is far beyond the best artificially intelligent models we can build in the world today. Thinking of my daughter gives me hope about how far my research can go.

Yunyao Li

IBM

I have always loved reading. Growing up in a small town in a remote province in Southwest China, books were my only window to the world. My dream was to become a librarian so that I could read books all day long! I haven't veered too far away from my dream. I am now very lucky to make my dream more exciting using artificial intelligence and machines as my friends. My research team focuses on helping machines read and extract unstructured text to gather knowledge. This knowledge is then used to open new frontiers of societally useful applications for humanity. For example, by building knowledge from reading, understanding, and integrating millions of scientific publications on drug compounds, we can now program machines to help scientists explore and discover new drug compounds that might be useful to try. Machines running on AI can be our friends, helping us cut the time in our journey through the infinite universe of information. They can speed up the discovery of newer and better drugs to cure diseases.

I am Yunyao Li and with the help of my AI friends, I read books all day to help the world make important discoveries for humanity.



Asmeret Berhe

University of California

I am a soil scientist. I was born and raised in Eritrea, in East Africa, along the coast of the Red Sea where Mother Nature is at her flamboyant best with her incredible natural ecosystems.

I study how carbon and nitrogen are cycled in the earth system, how they are stored in soil and prevented from going back to the atmosphere as greenhouse gases that warm our planet. I am often busy studying how soils control the earth's climate by trapping organic matter that decay or remain in soil for up to millennia. I worry about the impact of humans on soils that we depend on for food security. I study the social and political impact of land degradation. I explore how landmines disturb land for decades after the drums of war have been silenced and long after opposing militaries have agreed to a ceasefire. I am mystified by the realization that even when peace between warring parties is enjoyed by all, the soil takes much longer to experience real peace that allows communities to thrive.

I am Asmeret Asefaw Berhe, a soil scientist and educator who is passionate about all things related to the science and beauty of soils.

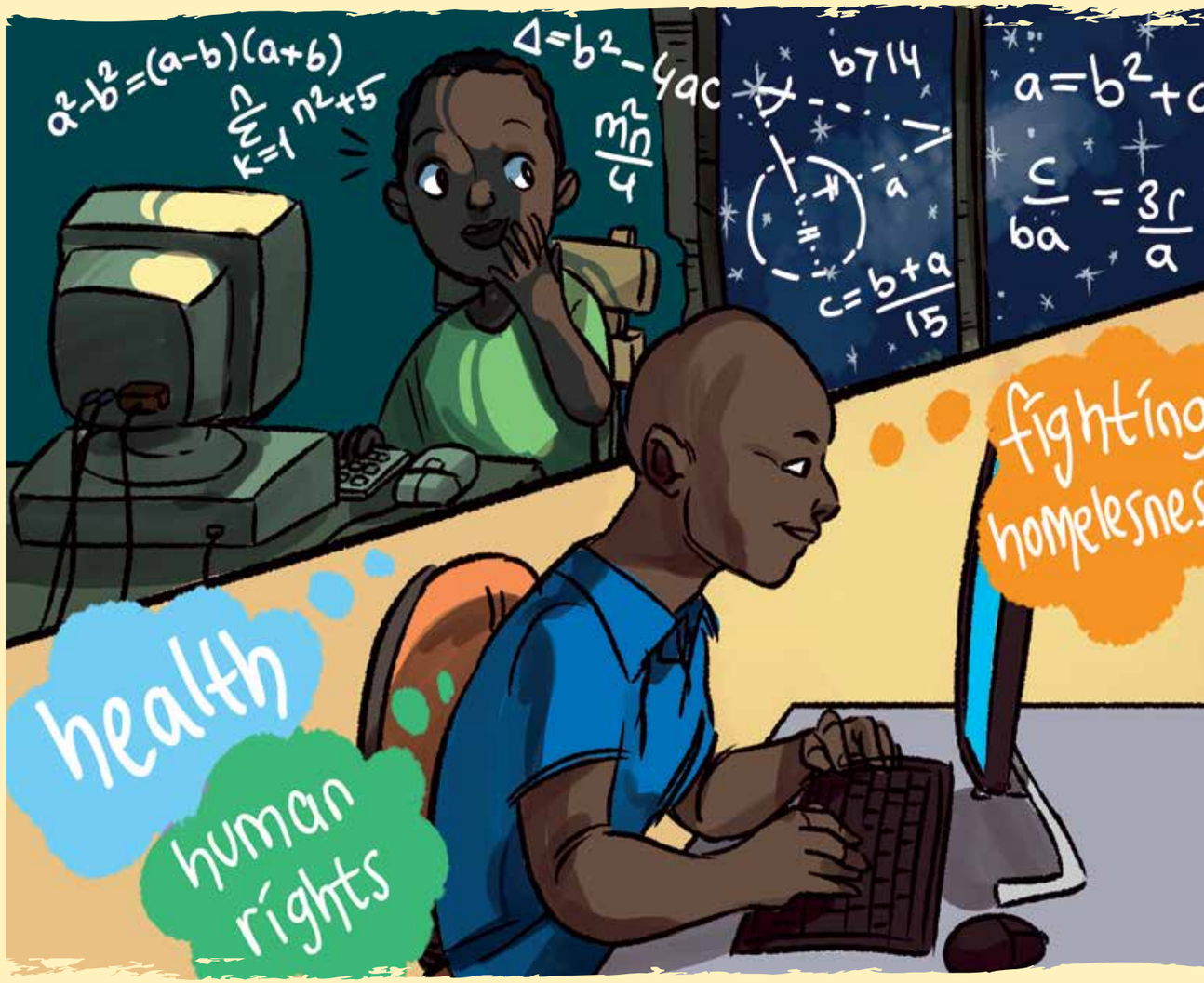
Tyrone Grandison

Data-Driven Institute

Growing up in a lower-middle class family in Kingston, Jamaica, has its highs and lows, from unbounded laughter, joy, and dancing to debilitating poverty, desperation, and hopelessness. I can remember as a young boy, I would fall asleep while reading books on the history of mathematics and wondering what was in store for me. Nights spent looking up at the stars, hidden in the plants by the front gate, wondering about the cruelty of the human experience and if it was going to get better. Unsure of how mathematics were going to be relevant or help in "anything." What I did know was what my family emphasized: "Education is key." I always had to be learning.

It wasn't until my third year in high school when a lightbulb went off. That was the year that my school got a bank of computers and started an inaugural class to figure those computing things out. For the first time, I knew what it was to be a magician, what it felt like to create something (useless or fun) out of thin air. This was it. This was how I would be able to help.

Three decades, three degrees, and many certificates later, I am finally using computing for social good—helping make healthcare systems more secure, advocating for human rights, and leveraging data to address inequality, homelessness, and crime.



Dan Irwin

NASA

When I was ten years old, I went to a summer camp and one of our projects was to find an old barn known to have been in the area 100 years before. The camp director had some aerial photos of the barn. When I looked at those pictures, it hit me for the first time that you could see things from the past with "eyes in the sky."

After I got my master's degree, I was doing some mapping work in Guatemala for an international conservation organization. Here I was, struggling through the muddy, rugged jungle and fields for six to eight hours every day with an old GPS to do my mapping. Yet, there was this incredible way to map and display the area and its environmental resources using satellites in space. I literally packed a slide projector on a mule and trekked for miles from village to village, showing the people these satellite images of the deforestation in their country. From the ground, the forest appeared to the villagers to go on forever. The satellite images showed them the truth—the devastation nearby.

I now work at NASA. The best thing about my work is that I stand on the shoulders of great people at NASA who develop satellite and other space technology, and I get to take these data and tools to the ground for that last mile, using them for the good of society. We play a huge part in understanding our home planet and what the human footprint is leaving for future generations. Like the "eye in the sky" that found that old barn back in summer camp, we can use our satellites to teach us about past and current patterns, and about how to protect earth's future.

Negin Dahya

University of Toronto

Growing up, my parents always said that whatever happens in life, no one can take your education away from you. My Iranian mother and Indian father met in England where they fell in love and married in the 1970s. England was home for a time. There were political problems in Uganda, where my father grew up, and Iran, my mother's homeland. When my brother and I were very little, my parents chose to immigrate to Canada with hopes of a better life. I grew up with all the comforts Vancouver, Canada, could offer. I had a loving and supportive family. Even so, I struggled to find myself and my place in the world. I often felt in between cultures. This is the backdrop for my life's work as a social scientist studying how young people learn about racial and culture differences through the everyday media and technology that we use, like making short films and videos, or using social media.

University was challenging for me, and I decided to travel to better understand the world. I saw the face of poverty in young people just like me. I also saw how much TV, film, music, video games, and cell phones were teaching young people about the world. I earned a master's degree and then a PhD. I started to conduct research about how refugees learn using technology with a focus on girls and women in refugee camps. I saw clearly that any one of us could be faced with this type of unpredictable and unfair life change. As a social scientist, I am driven by a desire to understand humanity and the ways society, culture, and technology come together to teach, learn, inform, and share knowledge to improve the lives of people who need it most.

About the Author

Faisal Hossain is a teacher who enjoys interacting with students at all levels and disciplines as part of his day job as a professor in the Department of Civil and Environmental Engineering at the University of Washington. His night job, to which he devotes an equal amount of energy, is about filmmaking and the communication of science. He uses these to build bridges between communities and solve pressing problems for society. His research group at the University of Washington focuses on improving quality of life in challenging environments through the application of science, technology, engineering, and math (STEM), with a focus on the supply of water, energy, and food. He initiated the Engineering Student Film Contest at the University of Washington in 2017, which is the nation's first and biannual student film festival for STEM majors as a way to explore the arts.

More information about his work can be found at WWW.SASWE.NET

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