An Avid Chemical Engineer

Amir Sheikhi, a chemical engineering professor at Pennsylvania State Univ. (PSU), has always been fond of science and research.

Recently, he was awarded a fellowship by the Institute of International Education (IIE) for a collaboration with the Univ. of Fortaleza (UNIFOR) in Brazil. Together, the two institutions will work on projects that could change the future of soft materials and tissue regeneration.

Sheikhi spent his formative years in Iran. His father, a farmer, instilled in him a love of nature and natural materials that would endure. His mother, a homemaker, was an enthusiastic supporter of her three children — they are pursuing ambitious careers in engineering, science, and architecture.

As a child, Sheikhi developed a healthy interest in science. “I wanted desperately to become an astronaut,” he says. “I was so obsessed that I began collecting astronomy journals. My parents quickly became concerned that I wasn’t playing with my friends, just reading these journals. I took very good care of my teeth, because I had read that the force exerted on the human body during a shuttle launch can dislodge dental fillings, and I was so sure I would be an astronaut.”

Although Sheikhi did not become an astronaut, his fascination with the cosmos inspired him to explore how science and engineering can have an impact on human life.

After earning bachelor’s and master’s degrees in chemical engineering from the Univ. of Tehran, Sheikhi left his country at the age of 24 in 2010 to pursue a PhD at McGill Univ. in Montreal.

He recalls feeling brave and excited rather than nervous. In the months leading up to his departure, Sheikhi read countless scientific journals and watched English-language movies, communicating in English with everyone he could.

“One of the things I was most excited about was attending an AIChE meeting,” he says. “It is super prestigious in Iran. We all know AIChE, but we could never actually attend the meetings because of travel restrictions.”

The first AIChE meeting that Sheikhi attended was the 2018 Annual Meeting in Pittsburgh, PA. Since then, he has attended several more AIChE meetings to present his research to other chemical engineers. “In the last two years, I have delivered five presentations,” he says.

After earning his PhD and conducting two years of postdoctoral research, Sheikhi pursued further postdoctoral research at Harvard Univ. and later at the Univ. of California, Los Angeles (UCLA), where he developed several platforms for tissue engineering and regeneration. Last August, he was offered a faculty position at PSU in the chemical engineering department.

At PSU, Sheikhi’s research focuses on engineering bio-based soft materials to address pressing biomedical and environmental challenges.

He uses microfluidic-based technology to engineer soft materials such as hydrogels made of biopolymers compatible with the human body. These materials can be used to accelerate the healing processes of different tissues, such as muscle, bone, and even cornea tissue.

Sheikhi’s team has also dabbled in 3D bioprinting to make more functional organs, using their biopolymeric platform to grow cells for implants or drug screening. His environmental research explores nanoengineering of the world’s most abundant biopolymers, such as cellulose, for water treatment.

With IIE’s global research fellowship, Sheikhi will have the opportunity to host researchers from UNIFOR to further his tissue engineering research, particularly his tissue-healing work. The research team, which includes chemical engineers from both Brazil and the U.S., will develop tissue-like biomaterials that accelerate healing processes.

Although Sheikhi did not know much about chemical engineering when he entered the field, he believes he was lucky to choose the topic. Today, chemical engineering is his true passion.

“I love it so much,” he says. “Sometimes, I find myself in the office at three in the morning proposing some new action of research.” One of his ultimate goals is to create at least one or more technologies that inspire or change human life. “That’s really my driving force — it is the chemical potential and gradient of things that drive me,” he says.

Teaching and mentoring are also extremely important to Sheikhi. His research group consists of students from ten different countries and diverse backgrounds. Training the next generation of scientists and passing on knowledge is something he would like to dedicate his life to.

In that vein, Sheikhi encourages students entering higher education to pursue engineering. He has a strong message that he frequently passes on to students who are entering their freshman year of college and are undecided on their discipline: Choose chemical engineering.

“Chemical engineers these days are extremely capable of doing different types of science and engineering in industries such as energy, food, water, environment, and biomedicine,” he says.