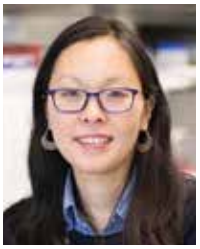

Profile

Keeping It Local: Engineering for the Community

A chaotic, sprawling innovation hub called the MakerSpace is the heart of the Tandon School of Engineering, a branch of New York Univ. (NYU). Piles of tools, drills, screwdrivers, chunks of plastic, and metal parts populate the room — what looks like an entire car engine, yanked from its frame, sits casually in a corner. Milling machines and 3D printers are interspersed among clusters of young engineers, collaborating with their heads pressed together and exclaiming as they unveil handmade musical jewelry boxes or laser-cut designs.

A few floors above the pandemonium is a labyrinth of lively, shared lab spaces arranged in an open, fluorescent-lit space. Here, too, a communal atmosphere is fostered by a common love for interactive science, specifically engineering. Jin Kim Montclare's office is quieter, bare-boned, and sparse, with books lining the shelves and a simple, wooden desk — after all, the chemical and biomolecular engineering professor is barely ever there. Instead, she spends most of her time in the lab, in class, or at the MakerSpace.

Montclare engineers proteins for drug delivery and tissue regeneration to target cancer and other diseases. She studied chemistry as an undergraduate at Fordham Univ., then earned a PhD in chemistry in 2003 from Yale Univ. She completed postdoctoral work at the California Institute of Technology.

Montclare was raised in the Bronx, in a largely Jewish, Irish Catholic, and Italian-American community. In the 1980s, several parts of the Bronx were wards of urban decay with a reputation for gang violence and arson. But besides the occasional burning car, Montclare remembers her childhood as happy and safe. She could go anywhere and everywhere — as long as she was home for dinner. Her parents, immigrants from Korea, both had full-time jobs and often left Montclare in the care of her devoted grandmother.

Her teachers at school were exceptionally encouraging. "I didn't always want to be a scientist," says Montclare. "But I grew up in a system where my teachers looked out for me, and saw and encouraged my ability in science. I developed a love for it through my teachers and mentors, who shaped me in ways I am so grateful for."

Montclare grew to love chemistry, particularly for its messy laboratory work, and she began planning a career in science. Things fell apart when Montclare's younger brother injured his leg and was admitted to the emergency room. She was in high school when the doctors found a rare tumor in his leg and told the family that they were lucky they'd caught it.

Montclare's parents eventually moved the family to the suburbs to take care of their 12-year-old son.

"The neighborhood changed for the worse when my brother got sick," she says. "Everything changed when my brother got sick. Suddenly, you find out that you have this diagnosis, and you're immediately hospitalized, and you have to come to terms with the fact that you're going to be living in the hospital for the next two years to battle the cancer that you have.

"He was such a happy kid, and I felt so helpless watching him go through chemotherapy, which is literally poison. He had to get sick to get better, and it was such a hard thing to watch — as an older sibling, you want to look out for your little brother, but there's nothing you can do."

That experience shaped Montclare's trajectory more than anything else. As she saw her younger brother essentially fade from exhaustion and the onslaught of constant, toxic treatments, she decided that there had to be a better way to heal cancer patients. Today, Montclare works on proteins that can encapsulate hydrophobic cancer drugs to precisely treat tumors. By engineering targeting peptides on the surface of these molecules, she has designed a therapeutic that affects only cancerous tissue, not the entire body. This alleviates many of the side effects associated with chemotherapy.

For the past 14 years, Montclare has been driven by her brother's battle with cancer to develop better therapeutics. She is a staunch believer in hands-on science and, as a professor, she encourages her students to find what drives them.

"When you get inside a laboratory, you're actually experiencing science," Montclare says. "Things go wrong, your experiments don't always succeed — there's so much frustration and excitement and emotion that you don't normally equate to science. You can't learn that in a lecture hall."

After an influx of students expressed interest in entrepreneurship, she engaged with the National Science Foundation (NSF) to receive a grant that would ultimately lead to the creation of Brooklyn Bioscience, a student-run startup that takes enzymes from Montclare's research and works to detoxify pesticides.

Montclare carries this enthusiasm into her outreach program, which pairs female Tandon engineering students with groups of young, mostly minority girls from local schools. They work with teachers to develop activities and lessons — one memorable class brought the students into the MakerSpace, where they were able to use a 3D printer.

"It's important for them to visualize what a successful female STEM student looks like," Montclare says. "That's why it's important for educators to reach out to communities and create positive experiences, because even one positive experience can change so much. I'm a living example of that." CEP