I'VE ALWAYS HAD A PASSION FOR INNOVATION.

ERIC YANG '15 BIOMEDICAL ENGINEERING

I've always had a passion for innovation. My dad's an engineering professor, and he encouraged me to try to understand how everything works.

McCormick was a pretty easy decision for me—I was drawn to the course work, which sparked my interest in diagnostics. Last year, Professor Hao Zhang gave me the opportunity to work in his lab on research that may lead to a non-invasive diagnostic for breast cancer that only requires a blood sample from the patient.

When you work on a research project during the regular school year, the time you have in the lab is limited. I wanted to make some real progress and that could only be done by conducting research during the summer. I was lucky to get a McCormick Summer Research Award, thanks to funding from Ben Slivka and Lisa Wissner-Slivka. That was the only way I was able to fund my stay here.

I actually worked on two projects this past summer, both having to do with breast cancer. The primary one is to develop a way to filter out circulating tumor cells in late-stage patients. Around Stage 4, the tumor cells metastasize and go to other parts of the body. That's why it's so devastating—you can't control where the cells go, and they can make tumors anywhere. Our idea is essentially to filter the tumor cells out of the blood.

We're developing a microfluidics chip through which we can push the blood after introducing it to a solution of nanoparticles that have functionalized mRNA strands specific to the type of cancer cells we're trying to filter out.

This chip sorts the cells by density as well as weight. When the cancer cells absorb the nanoparticles, those properties will change and it will be a lot easier for us to dissociate.

Our second project also deals with circulating tumor cells. A blood sample from a patient is mixed with our nanoparticles and incubated, allowing the nanoparticles to enter the cancer cells and produce a fluorophore when endogenous mRNA strands specific to cancer cells hybridize with the mRNA strands functionalized on the nanoparticle. Detection of the fluorescence is how we determine if the cancer is present or not.

Given the extremely low concentration of these tumor cells in the blood during early stages of cancer, the bulk of the effort has been to ensure that the sensitivity and specificity of our system and protocol are capable of reliable detection.

There's a chance this could be used to detect breast cancer early. The primary project could improve the prognosis of the disease by helping prevent the metastasis of the cancer. We hope both projects will be applied in clinical settings.

I've learned a lot this summer, but one of the biggest things is how to conduct research independently. I've had to figure things out myself and learn organization skills and time management. I've also gotten experience presenting my project to an audience that wouldn't necessarily understand the technical aspects.

It's really unique that as undergraduates, we can have experiences like this. Not only do we get to conduct independent research, we also get to help pioneer innovative technology and create new knowledge. You don't get an opportunity like that elsewhere.

Photographs by Chris Strong