# Computer models looking to make cancer treatment more selective

*Part of a series profiling undergraduate researchers provided by University of Pittsburgh Office of the Provost.*

**By Niki Kapsambelis**

When Lillian Chong was an undergraduate, a mentor handed her a research project that paved the way for her to become a chemistry professor.

Now Chong, who arrived at Pitt in August 2006, is looking to return the favor with a promising young student of her own: senior Brandon Mills.

Mills, a double major in chemistry and philosophy who is also minoring in economics, began working for Chong, an assistant professor in the Department of Chemistry, in the spring of 2007. His project involves creating computer simulations of protein systems — work that may one day help researchers perfect the delivery of cancer-fighting drugs.

"Basically, the entire problem of fighting cancer is a selectivity issue," says Mills, who recently decided to complete a fifth year of undergraduate work in pursuit of the prestigious Bachelor of Philosophy (B.Phil.) degree. "How do you kill the cancer cells without killing the healthy cells nearby?"

If scientists can create a protein that is toxic and active only when it finds cancer cells, yet inactive when it locates healthy cells, they theorize that they will be able to create more effective treatments.

Mills' models magnify how proteins behave under certain conditions, such as slight changes in temperature, acidity, or in the presence of other molecules. A lab at SUNY Upstate Medical University headed by Stewart Loh, a professional colleague of Chong's, designed a molecular switch for proteins.

"It's becoming apparent that more proteins seem to be primed to switch on and off," says Chong. In addition to delivering drug therapies more effectively, applications also include the ability to sense pollutants, which could result in a highly sensitive test for illegal substances such as cocaine.

"The idea is you want to engineer in selectivity for the presence of the small molecule of whatever you're looking for," explains Mills.

His model helps Loh's lab test its hypotheses, molecule by molecule.

"It's easier to change conditions or make a mutation on my computer model than it is to do it for real," says Mills.

When he works, he keeps the long-term goal — better treatment for cancer patients — in the forefront of his mind.

"I'm a very practical kind of guy," he admits. "I wouldn't want to devote myself to something that I didn't feel would have a useful application. Really, I see this as a whole new path in protein engineering and a whole new path in drug development."

**Assistant Professor of Chemistry Lillian Chong and undergraduate researcher Brandon Mills use modeling to understand how protein malfunctions link to disease.**

He first decided to look for a research project in November 2006, something he'd previously delayed doing because he wanted to establish a stronger foundation in chemistry. Since he liked physical chemistry and thought Chong's previous work was interesting, he approached her, sight unseen, and asked for a project.

"I was just ready to get into the field, and I was looking to have some of that experience to see if I could hack it in graduate school," Mills says. His long-term plans include obtaining a degree in computational biology, earning a PhD and teaching at the collegiate level.

That vision parallels Chong's career.

"I started in this field doing work as an undergrad," she says. "When I started, someone gave me a real project that led to a first-author paper. So when I met Brandon, I was really excited, and he seemed like someone who could handle this."

Mills was a Brackenridge Fellow during the summer of 2007, and believes his work with Chong's lab will result in not only his B.Phil. thesis, but also more than one publication. Originally from Houtzdale, Pennsylvania, Pitt was his first and only choice for college after a single visit, thanks in part to the breadth and variety of offerings.

"I saw opportunities for me to basically do whatever I wanted in science," he says. "There's nowhere else I'd rather be."