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JAMIN VER VELDE (99)

Dr. Manuela Ayee-Leong ('06) has several research projects going—all of them at different stages.

One project involves a collaboration with researchers at the University of Iowa Carver College of Medicine, where they are studying Charcot-Marie-Tooth (CMT) disease, one of the most common inherited neurological disorders, caused by mutations in genes that produce proteins found in peripheral nerves.

"It's a progressive disease, and there is no cure," explains Ayee-Leong. "It affects the extremities—hands and feet—and causes deformities, muscle weakness, and other symptoms. We don't know how protein mutations cause it. My role in the project is to look at the molecular interactions between proteins that are found in the myelin sheaths of peripheral nerve fibers to see how mutations affect the way they interact."

CMT patients experience a range of symptoms. More than 200 different mutations of the myelin protein have been identified, but no one knows how these mutations would cause such a large-scale neurological disorder.

Ayee-Leong is also collaborating with a researcher at the University of Illinois at Chicago's Department of Medicine. Their work focuses on hypercholesterolemia, or high levels of cholesterol in the blood, and its effects on atherosclerosis, the hardening of the arteries.

"Specifically, how does atherosclerosis begin? Currently, we're dealing with high levels of bad cholesterol (also known as low-density lipoprotein or LDL) and the specific molecules that make up LDL particles. Some of these molecules can be oxidized and then interact with the membranes of cells lining the large artery (endothelial cells). That can lead down the line to the hardening of the arteries. So, how do these oxidized LDL molecules affect or change the properties of the cell membranes in the large artery that makes it ripe for future hardening the arteries?"

Ayee-Leong also recently participated in the Scholarship and Christianity in Oxford (SCIO)'s Supporting Structures: Innovative Collaborations to Enhance STEM Research at Council for Christian Colleges and Universities (CCCU) Member Institutions program. This incorporates training, support, and events for faculty members and others to deepen their understanding of and engagement with issues pertaining to science, religion, and society.

As part of the program, Ayee-Leong worked half-time over the course of two semesters on research related to CMT disease. She also participated in a monthly seminar series with faculty from other institutions.

"It was a nice opportunity to meet researchers and scholars from different institutions, as well as people who have written very interesting work on Christian scholarship," she says. "We also have the opportunity to go to a 10-day workshop at Oxford University this summer, where there will be different speakers and activities."

Most of Ayee-Leong's research is done on a computer. "I create computer models of cell membranes, proteins, and other small molecules," she explains. "We have access to a high-performance computing cluster here at Dordt and that allows me to run models. Then we do some post-processing: where did the molecules move? How do they interact? What is each part interacting with? From there, we can make predictions and support experimental efforts."

"This type of work combines my interest in chemical engineering with biomedical applications and problems that biomedical scientists have been studying for years," adds Ayee-Leong. "I'm able to apply my problem-solving and other chemical engineering skills to that area. Being able to do that is such a joy and a pleasure."