A global push to unlock the genome

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Prof. Bill Hancock is the Bradstreet Chair and a professor of chemistry and chemical biology.

A Northeastern chemistry professor is a leader in the international effort to advance the understanding of human genetics and genomics by assigning each of the 23 pairs of human chromosomes for in-depth study by research groups in different countries.

William Hancock, the Bradstreet Chair in Bioanalytical Chemistry at Northeastern's Barnett Institute of Chemical and Biological Analysis, is on the executive committee of the Human Proteome Organization (HUPO) and a key player in the project assigned to the United States team: to analyze the role of proteins in chromosome 17, which includes the gene that makes people susceptible to breast cancer.

The project is a daunting one: the human genome has 22,000 genes and probably about 500,000 proteins, which each serve a different role and

have been shaped by millennia of human evolution. The project is specifically looking at a chromosome's proteomes, which produce proteins as directed by RNA — an effort so large that it quickly became clear the work needed to be conducted on a global scale.

The project is similar to previous work to sequence the human genome, which gave scientists a far deeper understanding of genetics. This project will help scientists better understand the role myriad proteins play in human chromosomes, which can improve the monitoring of disease and the development of more effective drug treatments in the next decade.

"There are gaps in our knowledge, and this project will help us to fill in those gaps," said Hancock, editor-in-chief of the Journal of Proteome Research.

Barnett's team at Northeastern, which includes two research professors in the Barnett Institute, Billy Wu and Marina Hincapie, and a group of PhD students, is working with researchers from the University of Michigan Medical School, Stanford University and the University of Vancouver to map out the role of each protein in the chromosome to better understand what each does and how modern medicine could treat diseases that some genes cause.

The project began in September and will take 10 years to complete. In the first year, HUPO will work to organize the 14 countries that have already signed on and recruit more to study all 23 pairs of chromosomes.

Barnett's team includes five chemistry PhD students — Emma Zhang, Suli Li, Julia Yan, Fateme Tousi and Fan Zhang — who will focus on areas including stem cells and the proteins in chromosome 17 that affect breast, gastric, renal and other forms of cancer.

“The impact is straightforward, really,” Hancock said. “Our hypothesis is if we know a lot about the missing parts of chromosomes and proteomes, we can do a lot better at diagnosing disease and treating disease through therapies that specifically target the genes that cause disease.”

Provided by Northeastern University

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