Assistant Professor Ashleigh Theberge has been named a 2019 Packard Fellowship for Science and Engineering for her research on cell signaling. Every year since 1988, the David and Lucile Packard Foundation has awarded Packard Fellowships in Science and Engineering to early-career scientists to pursue the types of innovative projects that often fall outside the purview of traditional sources of funding, such as research grants from government agencies. As one of 22 fellows for 2019, Theberge will receive $875,000 over five years.

Theberge's research probes the chemical signals that cells use to communicate with one another. The organization of our bodies, with different types of cells taking on discrete functions, depends on this biochemical language.

“We're alive because our cells can exchange chemical messages in appropriate ways,” said Theberge, who is also an affiliate assistant professor of urology at the UW. “All cells — human cells, microbes — utilize chemical signals to deliver information and influence the properties of other cells.”

Theberge focuses on the chemical messages released by cells, which diffuse out into the environment — be it a body or a colony of microbes — and are picked up by other groups of cells. To measure these signals and characterize their effects, scientists need precision: experimental systems that will let researchers set up a population of cells, identify the types and precise amounts of chemicals the cells release, how they diffuse through the environment, which chemical messages are picked up by other groups of cells and their effects.

Theberge and her collaborators — which include Erwin Berthier, a UW affiliate assistant professor of chemistry and co-founder of the medical device company Tasso, Inc. — develop and manufacture laboratory tools to make these precise measurements possible. These include microscale plastic and gel-based dividers, which can partition commonly used cell culture plates or the surface of a slide into more complex arrangements of compartments. These allow researchers to grow different populations of cells in close proximity and sample the types of chemical signals that pass between them.
“While we pursue our own biological hypotheses, we’re also focused on exporting the technologies we’ve developed to other laboratories,” said Theberge. “We really want these tools to be available and used widely.”

Depending on the arrangement of compartments, signals can diffuse horizontally between cell populations separated by short walls, through vertical stacks of cells or other arrangements. Theberge and her team design their cell culture devices with the physics of fluidics in mind. They precisely control the position of liquids in their devices via capillary forces — the passive forces that allow fluids to flow.

Theberge has also put these tools to work. She has started more than 20 collaborations since joining the UW faculty in 2016. The tools she and her group have developed are being used to identify cellular signals involved in testis development and male infertility, communication between epithelial and endothelial cells in kidneys and the immune system signals involved in inflammation. Some of these experiments study chemical signals present in tissue samples from patients, including a collaboration with the University of Washington Male Fertility Laboratory.

Her group has also been working on molecular methods to accurately quantify the amount of different types of chemicals that are received by individual cells.

“That will give us information not just on the type of signal reaching a cell, but how signal strength and origin can affect cell communication,” said Theberge.

Theberge earned a bachelor’s degree in chemistry from Williams College and a doctoral degree in chemistry from the University of Cambridge. Prior to joining the UW faculty, she was a postdoctoral researcher at the University of Wisconsin–Madison. According to the UW Office of Research, Theberge is the 11th faculty member to earn a Packard Fellowship, and the fourth overall from the Department of Chemistry, after Brandi Cossairt, Munira Khalil, and former UW faculty member Younan Xia.

To learn more about Professor Theberge and her research, please visit her faculty page and research group website.