U of T home to first molecular printer in Canada

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Think of it as a miniscule dot-matrix printer that uses biological ink. Students and faculty at the University of Toronto's Institute for Optical Sciences (IOS) will have access to the Nano eNabler, the first benchtop molecular printer in Canada, which will allow them to place microscopic dots of biological material onto surfaces with nanometer spatial precision.

In a six-month pilot project, Bioforce Nanoscience of Ames, Iowa has loaned the printer to the IOS, so that faculty and students can apply the technology in new research scenarios and experiments.

"This is a great example of how researchers and industry partners are working together," says Karen Grant, managing director of the IOS. "The company benefits because we are writing application notes on how it's used. We benefit because we can offer state-of-the-art equipment to our faculty, who can bring their students to come and work with it and experience it."

The printer places dots on a variety of substrates by channeling a solution of biomolecules such as proteins, DNA, or antibodies from a reservoir onto a tape tip. The tape tip is then lowered with meticulous accuracy onto a surface to drop the dot.

Cynthia Goh, associate director of the institute, is a physical chemist who saw the potential the device could have for her research. Part of her work is in tissue engineering, where she requires the ability to immoblize

biomolecules so she can study their material properties. Goh is also working on building micron-sized channels to control fluids at the microscale. The printer will allow her to innovate new designs quickly.

“Before, if I wanted to try out an arrangement of molecules, I’d have to build a whole mask, trace a design onto silicon, expose the silicon to light and then etch the channels. This takes time. It’s costly,” Goh explains. “But with this printer you don’t have to do complex microfabrication. You almost just type in the pattern you want.”

Venkat Venkataramanan, head of IOS scientific operations, says that though the Nano eNabler is designed to place biological dots, there could be many other applications in phototonics, semiconductors, or in microstructures used in optics. The company behind the printer hopes the institute, which brings together diverse faculty and students from chemistry, physics, materials science and electrical and computer engineering, will help find those new uses.

Given that the printer is just on loan, it is possible that demand for time with the equipment may exceed its availability. “We’re expecting to also have people from medical sciences, hospitals and other universities wanting to use it, because this is a one-of-a-kind instrument in Canada right now,” explains Venkataramanan. “But that’s OK. We’re here to make the device available.

“And we’ll see how it goes. If we’re making progress, they’ll let us keep it longer.”

Source: University of Toronto

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