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IMPACT

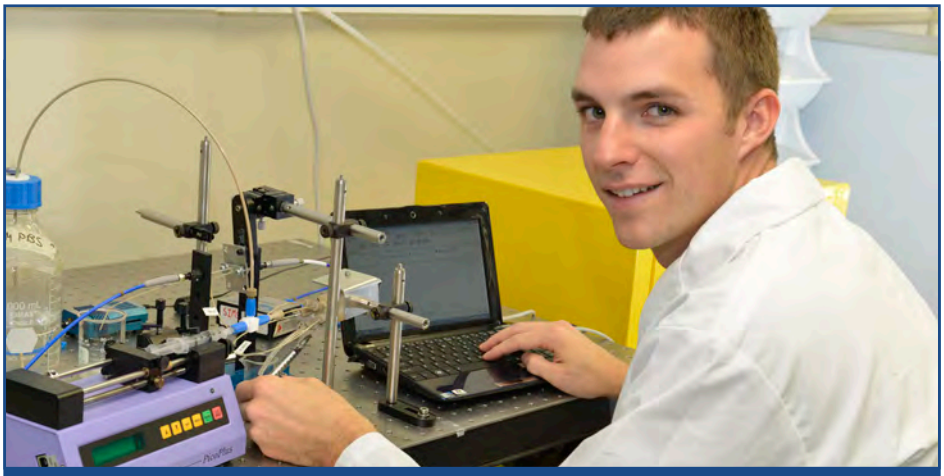
Connecting bears, biomarkers and business opportunities

Ask Ryan Denomme about the start of his career as a medical device entrepreneur and he is likely to talk about grizzly bears. While completing his Master's degree in Mechanical Engineering at the University of Waterloo, he took part in a project to assess the health of grizzlies by measuring stress proteins found in samples of their blood. Denomme was part of a team that designed equipment to enable scientists to take the necessary readings in the field, rather than having to collect samples and then return them to a laboratory for later analysis.

The equipment is designed and built around a physical phenomenon called "localized surface plasmon resonance", a fundamental alteration of the absorption spectra of metals when they become nanoparticles. It is the central principle behind certain biosensor applications, including lab-on-a-chip devices. Materials such as silver and gold have familiar colours when seen in bulk, for example, but as nanoparticles they can take on a wide range of colours depending on their size, shape, and other properties, which we are only now able to assess due to advances in nanotechnology. When such nanoparticles are attached to an agent intended to bind to a desired biomarker, changes in these colours can indicate the presence of that biomarker.

"Our device was designed to take measurements in the middle of the forest," Denomme explains. "But we quickly realized that this was far more than just an aid for biologists. There are opportunities to leverage this device in the realm of point-of-care diagnostics, with applications on the medical side, rather than the environmental side."

The device developed for grizzly research in the field also served as a proof-of-concept of a technology that Denomme is now pursuing for large-scale production—with a goal to better manage the chronic diseases that represent a large and growing burden on the health care system.



Nicoya Lifesciences was started in 2012 by Ryan Denomme using innovative biosensor technology he developed at the University of Waterloo. The startup is an early-stage nanotechnology company developing medical diagnostic products that will allow for earlier disease diagnosis, better management and prevention of chronic diseases, and improved therapy programs.

"This device offers us an opportunity to improve the way we address these diseases—using real data from a patient. Rather than asking people how they feel, or looking at what symptoms they have based on occasional laboratory tests, clinicians can use our device to measure and monitor a biomarker to manage a person's therapy more accurately, more frequently and more cost-effectively." says Denomme. "Close and accurate monitoring will allow health care providers to potentially reduce complications, or hospitalizations, which is better for the patient and represents huge cost-savings to the health care system."

The potential from this innovation earned Denomme a $60,000 fellowship from the Federal Economic Development Agency for Southern Ontario, a program that supports Waterloo graduates who want to start businesses based on technological innovation. Denomme has used that funding to found Nicoya Lifesciences. The fellowship provided the necessary resources to get Nicoya off the ground more quickly, and he is now focused on commercializing the product for market and developing a plan to attract other investors.

Denomme's appreciation of such intricate physical behaviour grew out of his undergraduate education at the University of Waterloo, where he acquired a Bachelor of Applied Science degree in Nanotechnology Engineering. He worked extensively under the directorship of Dr. Patricia Nieva at the University's Sensors and Integrated Microsystems Laboratory (SIMSLab), a facility dedicated to the testing of Micro-Opto-Electro-Mechanical Systems (MOEMS) and Micro-Electro-Mechanical Systems (MEMS), earning his Masters degree in 2012, where Denomme continues to serve as a part-time employee.

Denomme recalls how his SIMSLab activities were enhanced by ties to CMC Microsystems, an organization that provided connections to other centres to ensure that research teams have access to the right hardware to complete a particular project.

"During my fourth year we designed a microfluidic pump on a chip, and it was CMC that helped us to connect with a European company to fabricate prototypes," he says. "If we hadn't had access to that kind of help, we never would have been able to afford it."

Denomme especially values the access to software that CMC provides, including CMC's assistance in finding the best software for various applications, as well as the prior testing and help-desk style services that CMC performs to enable users to make the most of these tools.

Denomme believes Nicoya Lifesciences has a strong future, a belief validated by the recent startup funding he has received. "There is a huge gap between the technology that exists and the technology that's required to change the health care system as we know it today," he concludes. "There's definitely a business opportunity there. I have a pretty good technology. Let's see if we can bridge the gap." ***cmc***