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University of Dayton

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NEWS

Tuesday July 19, 2016

Opportunities Abound

A University of Dayton education means hands-on opportunities for students to transform the world. Nine students from three countries in four departments hope their work someday passes the smell test.

Their goal is to create a fiber-optic, hand-held biosensor, calibrated to different elements, that can sniff out specific molecules. Unlike a Breathalyzer, which is designed to detect and measure one thing – alcohol – the device would help identify biomolecules present in one's breath, the surrounding air or water. To help reach that goal, the group is examining how light passing through sensitive optical fibers can detect the presence of specific molecules, such as those present in our sweat, saliva or breath.

It's not good enough for the device to indicate *something* is wrong. The device would indicate *exactly* what is wrong.

"If there is a physiological change like a fever or flu, there's going to be a biochemical change," said Karolyn Hansen, an associate biology professor who specializes in biosensor development. "It's reflected in the composition of your saliva, blood and urine. Why wouldn't that change be reflected in the composition of your breath or air. "We envision the day when you go to your doctor, you breathe into this device and your doctor can say, 'OK, you're presymptomatic for flu or we have a cancer biomarker.' It could detect something you can fix immediately or refer for more checking, an early warning before you have a pain in your abdomen or have a bloody stool."

Other applications for the device could include hazardous materials spills or homeland security.

Students in the chemistry, physics, biology and electro-optics departments and School of Engineering Minority Leaders Program, plus students from Mexico and Colombia, are working on the project. Hansen said it's been good for the students to see different perspectives and work as a team. They're also using current technology like 3-D printers, which helps students develop skills they can use for getting a job when they graduate.

"Working with people of different programs has been an amazing experience," said electro-optics doctoral candidate Diego Garcia Mina. "I like how this interdisciplinary project intends to contribute to the early detection of some health diseases. I'm very excited with the progress and results we are achieving day-to-day, and how this fiber-optics sensor can have many applications."

The project started seven years ago with just a little tinkering by electro-optics professor Peter Powers.

"Peter was always willing to try anything," said Joe Haus, an electro-optics professor and colleague of Powers until his death in 2014. "We thought we'd jump in, try a few things and see where it all leads us. When you start, you never know. We had to try it."

Hansen and Haus have presented their preliminary findings at international optics and photonics, electrochemical, photographic instrumentation and electronics conferences. An international journal devoted to research and development of chemical transducers also has published their findings.

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