COMING UP NEXT

Viola Munos, undergraduate researcher

In high school, Viola Munos excelled in biology, chemistry, and math. But she never took a physics class – her school didn't offer it.

"Even though I'd never had a class, I knew I wanted to do something with physics in college," she says. "It was the only thing I knew would be challenging enough to hold my interest."

Munos enrolled at UNCG last year, after earning an associate degree. Though she's an academic junior, she plans to remain for at least another two years, gaining as much experience as possible.

A big part of that, she says, is undergraduate research.

UNCG's STAMPS program, which supports underrepresented students showing significant science and math capabilities, presented her first research opportunity. Through the NSF-funded initiative, she visited the Joint School of Nanoscience and Nanoengineering, where she secured an internship with Professor Tetyana Ignatova.

In Ignatova's lab, Munos is working on methods to transfer single-atom thick biosensor materials – specifically graphene – onto chips.

The biosensors can help scientists determine how much force a cell applies during growth. "Neuroscientists want to put these sensors on neural stem cells to see how they send information from one to another – how they move, how they push each other," Ignatova says. "Potentially, it will provide information on normal and abnormal neural cell behavior." The ultimate hope is to use these 2D nanoscale biosensors to repair neural injuries.

Currently, collaborators from Penn State University are growing graphene sheets on copper foil, and Munos is developing ways to transfer the graphene to different chip types, including glass, silicon, and other biocompatible polymers.

Graphene, a honeycomb-patterned nanocarbon material, is extremely sensitive to any type of strain. Consequently, it has high potential as a biosensor – if it has no rips. But the current process to separate graphene from the substrate on which it is created – called electrochemical hydrogen bubbling – uses a sodium hydroxide solution to pull them apart, sometimes damaging the graphene. Munos is working on a liquid-less process to side-step this problem.

"There are a lot of publications on the problem of transferring graphene," says Dr. Ignatova. "It's an extremely important area of work in nanotechnology."

So far Munos's work, which she will present during an upcoming South Carolina conference, has contributed to the lab's creation of a 5mm x 5mm graphene nanosheet, which is large enough to house around 100 biosensors.

It's a first step in a long process, Munos explains. She's also putting clean, continuous graphene on glass, in collaboration with nanobiologists at the JSNN, to study graphene-bacteria interactions. The results could benefit medicine and beyond.

"I'm contributing to improving graphene's efficiency, so it can be used in everyday life," she says. "Maybe technologies will be less expensive so we can cure different diseases."

By Whitney Palmer
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