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Spinning nano into gold: Economic developers looking favorably on GSO's joint school

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State legislators may not know a fullerene from a nanopore, but apparently they appreciate the potential economic benefit of supporting those who do.

The Joint School of Nanoscience and Nanoengineering, a shared project of UNC-Greensboro and N.C. A&T State University, was the only request related to economic development made by the university system during this year's budget process to actually receive an allocation from a penny-pinching General Assembly.

JSNN received a nonrecurring allocation of \$1 million for staffing and equipment, while requests for similar funding for the N.C. Research Campus at Kannapolis, the N.C. State College of Engineering and the East Carolina State University School of Aviation among others received nothing.

The \$1 million is just a fraction of the money the state has invested in the JSNN, including about \$50 million for its 88,000-square-foot building currently under construction at Gateway University Research Park. That building is expected to open next year.

The JSNN is at the top of the list of funding priorities of area economic developers because they see it as a boon in several ways: The school boosts the region's credentials in a burgeoning area of technology; it should attract nano-related companies to locate

nearby; and the research it produces could generate jobs, licenses and spin-off companies.

All of those goals will take years to pursue, but the foundation is being laid now in temporary laboratories next to the JSNN building-in-progress. And the science taking place could someday yield commercial opportunities in areas ranging from anti-aging formulas to the National Football League (see related box on this page).

Helping hands

Exactly what business opportunities arise is largely in the hands of the school's growing faculty, which currently numbers four in the department of nanoengineering and seven in nanoscience, including the JSNN's founding dean **James Ryan**.

Those faculty members are scientists first, but commercialization often isn't far from their minds, said **Christopher Kepley**, an associate professor of nanoscience who also has an MBA.

Kepley's research involves fullerenes and their potential application to inflammatory diseases and the aging process.

Through Kepley, JSNN has already established a research relationship with Luna Innovations, a Danville, Va.-based company that controls much of the intellectual property related to his research. Kepley was a director at the firm before joining the JSNN faculty, and he continues to consult for them as well.

Kepley said the arrangement is complex, but essentially Luna pays for access to JSNN expertise and equipment, and would get first dibs on any future potential products generated from its intellectual property. Depending on various factors, JSNN could ultimately benefit from later revenues or additional research funding.

"I'm a researcher at heart, I enjoy the intellectual stimulation" of investigating little-known areas of science, Kepley said. "But it does have real commercial applications."

Keys to success

The commercial viability of a particular piece of science depends on three main factors, according to **Andrew Wooten**, director of outreach and commercialization for the JSNN and Gateway University Research Park. Those are technical feasibility, intellectual property and market size. In other words: will it work, can it be protected from copycats, and would anyone want to buy it?

Partnerships with private industry may be the best way to answer those questions, and they'll play a big role at JSNN in coming years, Wooten said.

Companies with relevant needs and expertise such as Advaero (featured in a story in the July 15 Business Journal), which is already co-located at JSNN, can help academics guide their research toward goals with sales potential, he said.

"They're experts in their fields, and we can't be experts in everything," Wooten said. "Having a great partner in hand can help you refine your goals and get them to market."

And if all goes according to plan, the result will be new jobs as partner companies see the benefits of having direct access to JSNN equipment and faculty by setting up operations nearby. A number of companies have already expressed interest in co-locating with the school once its new building opens, and Wooten said he expects to see some of that activity happening right away when that happens.

For all the investment of money and brain power, there's no guarantee that the JSNN will ultimately deliver everything its supporters are hoping for, especially since lots of other states and universities have similar aspirations. But Wooten says all the effort does give the region a better chance.

"It gets you in the game, but it doesn't seal the deal," he said. "What will seal the deal is the competency of the faculty, and our ability to make a match between what they can do and what a partner needs."

What's in the lab?

JSNN researchers are working on a wide variety of projects with potential commercial application. Here's a look at just a few:

Fullerenes: Associate Professor Chris Kepley is investigating how fullerenes may be able to treat inflammatory diseases or potentially delay the general impact of aging — scientists have been able to extend the lifespan of rats by 15 percent in some tests using fullerenes, Kepley said. Fullerenes are carbon nanoparticles that are activated by various other materials to make them soluble in water, and Kepley said his team's work right now involves toxicity testing and trying to identify what add-on materials have the desired influence on the nanoparticles. The potential commercial applications of the technology include treatments for diseases such as asthma and arthritis.

Nanopores: JSNN research into nanopores has the potential to dramatically reduce the costs of genetic sequencing for individuals, according to Assistant Professor Adam Hall, who is investigating potential applications. The technology uses a nanometer-scale hole in a thin membrane that is dividing two salt solutions. The hole is only big enough for a single molecule such as DNA to fit through at a time, allowing for a highly specific analysis of its characteristics. Eventually, the technology could yield a device that can tell an individual what specific diseases he or she is prone to, or allow for affordable personal genome sequencing.

Traumatic Brain Injury: JSNN researchers are developing technology for a portable device that could more accurately diagnose concussions on the spot by testing for the presence of molecular markers in the blood that are released at the time of injury. Since people show different outward symptoms of concussions, such a device could be used by the NFL and other sports leagues to reduce the odds that a significant injury to a player is

misdiagnosed on the field. Assistant Professor Shyam Aravamudhan and others are working on the research.

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