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# Innovative Intellectuals

MU's Biodesign and Innovation fellowship produces business-savvy inventors who are poised to improve medical care and spur economic development.

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## Surgery resident, businessman, innovator

**IT WOULD BE IMPOSSIBLE** to sum up Anthony Harris' occupations and aspirations in a single sentence. He's a first-year general surgery resident at MU who enjoys tinkering in his garage. He's a stylish dresser who holds an MBA and multiple patents. He's a personable entrepreneur who has lost thousands of dollars trying to produce a sturdy closet hanger for belts. But his innovative spirit lives.

"The frustrating moments get downplayed," Harris says. "The fulfilling moments are more memorable."

Harris of Palm Bay, Fla., hopes that his business Adroit Motion will fall into the latter category. He co-founded the laparoscopic device company as a result of his 2008–09 fellowship with the MU Biodesign and Innovation Program.

Since 2007, MU's biodesign fellowship, the second of its kind in the nation, has guided postgraduates through the medical invention process, from idea to commercialization. The program selects three individuals with advanced degrees and entrepreneurial spirit: a physician, an engineer and a business professional. The fellows learn from one another and from MU medicine, engineering, business and veterinary medicine faculty. For the first

**After his 2008–09 MU Biodesign and Innovation fellowship, Anthony Harris decided to stay at Mizzou for his general surgery residency and start a laparoscopic device company, Adroit Motion. The company has office space at the MU Life Science Business Incubator.**

four months, they immerse themselves in MU's health care environments and identify medical needs that they could meet. The remaining two phases are spent developing a rough prototype and a business plan.

Harris applied to the MU program because he knew firsthand that it takes more than a good idea to become a successful entrepreneur. After shopping for belts one day, he designed a sturdy wire hanger that impressed his roommate and patent lawyer, both of whom said they'd buy one. Harris went through the four-year patent process and took his idea to a San Francisco manufacturer. "Fifteen thousand dollars and one year later, I had nothing to show for it," he says.

His failure motivated him to pursue an MBA in addition to a medical degree at Indiana University. As the business fellow in MU's program, he learned how to put it all together and co-started Adroit Motion, where he plans to create the first hydraulic laparoscopic tool giving surgeons hand-like motions.

"It's designed to improve the limited dexterity and movement of physicians," says Harris, who believes this could lead to more possibilities for single-incision surgeries.

In the \$200 billion laparoscopic hand instrument market, numerous companies already produce similar products, but Adroit's tool is different. The hand piece is ergonomically tailored to meet the needs of the nine out of 10 doctors who have reported feeling discomfort while performing minimally invasive surgeries. Adroit's real innovation, however, is the hydraulically

controlled shaft that connects the hand piece to a grasper at the other end.

In current models, the thin, disposable shaft has a predetermined shape, and a wire threaded through the shaft controls the opening and closing of the grasper. The shaft is limited, only moving straight in and straight out of an incision. Adroit's model uses hydraulic fluid rather than wire, allowing physicians to bend the instrument at different angles.

"This will help surgeons do complex procedures with more simplicity and increase their degrees of freedom, or wrist motions," he says.

Currently, Adroit's articulating hand tool and shaft are only concepts. The company is raising money to hire a manufacturer to produce a working prototype based on Adroit's computer model. The team, led by CEO Xandra Sifuentes, BS '04, MBA '10, has amassed more than \$24,000 from competitions, including a \$20,000 NASA/Space Engineering innovation award it won during the 2010 Rice University Business Plan Competition.

Since starting his residency, Harris has taken on more of an advisory role with Adroit, though he admits that juggling the time commitments is still tough.

"It's almost impossible," he says. "If I didn't have a really good team behind this, there would have been no way, no how."

But this is just the way Harris likes to live. While wearing his white coat, he's thinking about patient care. Then hours later, in suit and tie, he's trying to raise capital for Adroit and contemplating his next big business idea.





## Engineering better surgical tools

**AT AGE 28**, Rebecca Rone has already co-founded two medical device companies in Columbia and is searching for commercial partners to license several other inventions. It's quite an accomplishment for an engineer, who typically isn't well versed in surgical needs or business plans. Such unfamiliar territories might take inventors much of their careers to navigate, but Rone, BS BE '06, sped through the learning curve in just one year during her fellowship with the MU Biodesign and Innovation Program.

"I enjoy collaborating with doctors, understanding the health care market and knowing the number of people my innovations can affect," says Rone of Portageville, Mo., who has a master's from the University of California, San Diego. "What drives me is seeing the need from the beginning, knowing there's no adequate solution out there, and then finding a solution that could help patients and surgeons."

The fellowship is as much about designing devices as it is about producing future entrepreneurs such as Rone, who has stayed with the program for the past two years as its super-fellow. For Rone, the fellowship was her first deep dive into the complex work — and language — of surgeons. She and her co-fellows set out to design products that would improve laparoscopic surgeries. Unlike her colleagues, who both had medical degrees, Rone had never even seen a minimally invasive procedure. Through four intense months of clinical immersion, Rone grew more familiar with the medical environment, and placing an engineer, physician and businessperson in operating rooms spurred creative brainstorming for new devices. Rone quickly grew to appreciate the dynamic of three postgraduates with different strengths, all teaching one another and working toward a common goal.



**Rebecca Rone, BS BE '06, hopes to find investors or licensing companies for several medical devices invented by MU Biodesign and Innovation fellows.**

As a result of the fellowship, the team disclosed 15 medical device innovations to the MU Office of Technology Management and Industry Relations. The fellows also started two ventures — Adroit Motion and EternoGen, which will soon become known for its better-than-Botox product. Rone knew that biological engineer Sheila Grant had been researching collagen for hernia meshes. After Rone discussed it with her co-fellows, they realized that the improved collagen, which uses nanotechnology to decrease degradation and promote better cellular integration, could have multiple applications. Cosmetically, it could be used as an injectable dermal filler, like Botox, or a night cream to reduce the signs of aging.

"It'll decrease the number of injections that people have to get and decrease recurring costs," says Rone, who's looking for product manufacturers. This more permanent collagen also could be used as a treatment for burn wounds, heart disease, bone regeneration and urinary incontinence.

Such innovations could bring new revenue streams to the university and partial royalties to the student inventors. Since its inception in 2007, Mizzou's biodesign

fellowship has led to the creation of three businesses, 23 invention disclosures, eight provisional patents and four pending patents. However, most of these ideas still need companies to license and produce them.

That's where Rone, who has been the program's super-fellow since 2009, comes in. She gives these products that extra push by applying for grants, pitching them to potential companies, seeking funding from angel investors and continuing development in campus labs. A London company has shown interest in the program's articulating catheter, a device that relieves spinal pain while decreasing the risks of catastrophic injury; a spinal clamp, developed by the 2009–10 fellows, has demonstrated superior ability to stabilize the vertebrae during a spinal fusion using cadaver models.

Rone says she's been impressed with the collaborative spirit of University Hospital physicians, who have made themselves available to help despite their jam-packed schedules.

"I'm driven to give them something to try out in the operating room," she says. "They're so passionate about the potential of these devices to reduce complications and improve patient health, and that passion's contagious." ■■