

MARVEL could Re-Invent Laproscopic Surgery

By Glenn Cook



Distinguished University Professor Richard Gitlin
Department of Electrical Engineering

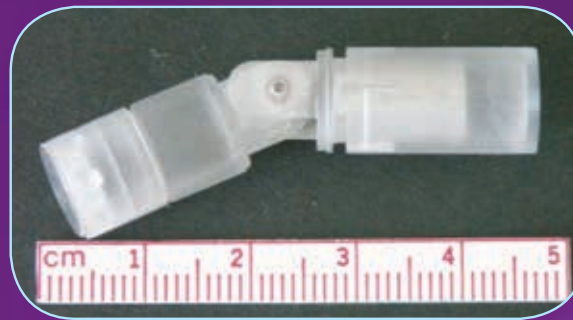
Richard Gitlin wants his students to think like innovators.

“What ultimately counts in the real world is innovation,” says Gitlin, Distinguished University Professor and Agere Systems Chair in the Electrical Engineering Department. “Invention is necessary, but it’s not sufficient. You have to find a way to translate inventions into innovations – services and products that change the way people think or do things.”

Gitlin knows what he’s talking about, after receiving a doctorate from Columbia University he spent 32 years researching and leading teams at Bell Labs in the R&D of digital communications, broadband networking, and wireless systems. His accomplishments, which include being co-inventor of DSL in the mid-1980s, received substantial recognition including election to the National Academy of Engineers. He brought his talents to USF in 2008 to work on the research and development of wireless communication devices to advance health care and surgical fields.

“Everyone can’t be an innovator, just like in baseball not everyone can hit a curve ball, but a large percentage of people can and should innovate,” he says. “They should have the confidence to throw their ideas out there, be tested, improved, and see what sticks. Often, even excellent technologies and inventions will not make it into practice, but if you’re innovative

you will learn from your experience and recognize other opportunities that lead to products and services that help people and improve the quality of our lives.”



MARVEL 10mm system model [HD low-latency video and high-speed digital communications]

Gitlin retired from Bell Labs in 2001 as Senior Vice President for Communication and Networking, then spent time as a visiting professor at Columbia University before moving to Silicon Valley, where he was Chief Technology Officer of Hammerhead Systems, a venture funded networking company for five years. Gitlin notes, “We raised over \$100M, had a great product, strong intellectual property protection, initial customers, but the downturn in the economy forced us to close.”

“I had never been full time in academia, and when I started thinking about what I was going to do, Florida was not on my radar initially,” he says. “Florida is not a big telecom player, but is big in biomedical. So I was able to come to USF and form a team to realize the MARVEL system, which used knowledge from my earlier career in wireless systems and my

life experience to create a new paradigm for minimally invasive surgery.”

MARVEL is an acronym for Miniature and Anchored Remote Videoscope for Expedited Laparoscopy. It is a robotic imaging device, or camera, with an embedded light source, that when inserted in the surgical cavity gives surgeons the ability to get multiple views of the operative field making the procedure safer and more efficient. The MARVEL system, which includes the camera, is a distributed network of wirelessly observable and controllable devices, including the camera, surgical tools, sensors, actuators, power supplies, and other devices that are serially inserted into the surgical site through a single incision. The surgeon uses a joystick or a computer console to wirelessly select and control the devices giving surgeons unimpeded access to the surgical site.

The initial challenge for MARVEL, Gitlin says, was to find a way to make minimally invasive surgery more flexible and cost effective. The first step was to develop a powerful robotic camera with an integrated light source that initially is 30mm in diameter as a research model and will be “shrunk” to only 10 millimeters in diameter for human applications. Such a device could eliminate the need for a laparoscope, which is a \$10,000 piece of equipment. The pan, tilt, and zoom capabilities

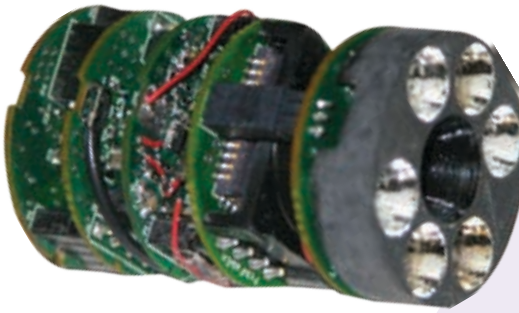
of the MARVEL camera are wirelessly controllable, and the camera transmits video from the surgical site to an external display.

"I came up with the idea before I was recruited to come to USF," Gitlin says. "I asked the dean of the College of Medicine if it was completely crazy to develop a distributed wireless network of devices that are inserted into the body for a medical procedure, or whether anyone had thought of it," he says. "He told me to go for it, and so we did." He introduced me to pioneering USF minimally invasive surgeons, Drs. Alex Rosemurgy and Sharona Ross, who are now at Florida Hospital. The surgical team, along with USF College of Engineering faculty colleagues in electrical engineering, computer science, mechanical engineering, and external partners performed several vivarium experiments on porcine subjects with 30-millimeter prototypes to validate and improve the initial inventions.

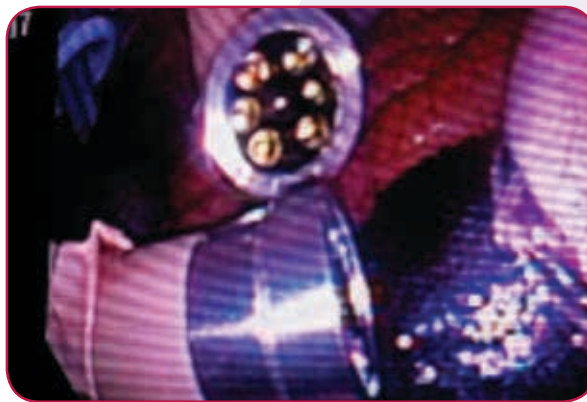
Research was funded by grants from the university's foundation, the Florida High Tech Corridor Council, the National Science Foundation, and a private start-up company (Innovatia Medical Systems) formed by Gitlin, the surgical team, and an experienced CEO, Peter Savage, to implement advanced MARVEL features and reduce the size of the devices to 10mm and make them commercially viable.

"It's been a slow process, but we've found a way to combine the light source and the camera and provide some very powerful capabilities that can be used to track the motion of organs," he says. "It enables surgeons to work faster, and it supports the trend of minimally invasive surgery, so you could remove the gallbladder under local anesthetic rather than general anesthesia. Eventually, I hope for further technological advances so that the devices are able to harmlessly dissolve in the body after a period of time just like stitches do."

Moving to USF after almost four decades in the private sector, Gitlin says he has been very pleased by the university's approach and support of entrepreneurship and innovation. "USF is very highly ranked in patents, and the creation of the National Academy of Inventors was a brilliant idea on Paul Sandberg's part," he says. "The university's leadership is doing the right thing in terms of nurturing and supporting entrepreneurship and they've been very encouraging and supportive of me and



MARVEL circuit board "stack" with imaging system, light emitting diodes, motor controllers, and wireless communication system.



MARVEL module (with motors) during vivarium experiment.

the team throughout this entire process. It's been really good to see."

As Gitlin notes, an engineer's mission is to make things that are "new and interesting." USF's "enlightened and supportive approach," he says, allows interested students to gain practical research experience and make numerous connections that will help them after graduation.

"You can be an entrepreneur any place," he says. "You don't have to start a company to do it. That's a key to being an innovator. If you look at the number of patents issued, and the number of which produce commercial products, it's very small. It's not just the invention. It's the blood, sweat and tears you get from taking one step forward and a half step back as you work to bring your innovation to market."

"I have been very fortunate to have students who quickly internalized the innovation mentality. In addition to writing research papers, they have all filed patents and several capture technology that is integral to advancing our research," he said.

As a very current example, he points to a student he recently recruited who will come to USF this fall from Sri Lanka. The student, who Gitlin interviewed via Skype, wants to join the team working on a new form of electrocardiogram that is being researched with major support from Jabil, Inc., and Dr. Peter Fabri, a recently retired College of Medicine and College of Engineering faculty member.

"He is keen on creating the software that will predict when a patient is having a cardiac event," Gitlin says. "This student invested his own time and started tracking medical databases looking for online information while increasing his knowledge in machine learning and related technology.

That ambition, he says, is what distinguishes innovators from inventors.

"He's doing this on his own. He has his own agenda and his own idea," Gitlin says. "That's the type of student I want. Ultimately, I want the students to be teaching me."