

# SCIENCE *for* LIFE

**An \$8.1 million grant from the Kauffman Foundation will help bring new drugs and biomedical aids to patients who need them.**

**By Lisa Scheller**



In search of new cures: Sitta Sittampalam, left, director of drug discovery for the Institute for Advancing Medical Innovation, meets with laboratory director Rathnam Chaguturu. They oversee researchers who measure the effects of new synthetic and natural compounds on living cells—and seek treatments for cancer and many other life-threatening diseases.

**KU Endowment seeks to raise an additional \$8.1 million to match the Kauffman Foundation grant. This will complete an endowed fund supporting the new Institute for Advancing Medical Innovation. New graduate fellowships will play an integral role in the institute's work.**



## Imagine the thrill of watching cancer cells die.

Inside a pharmaceutical laboratory in a new wing of KU's Structural Biology Center, a highly automated and powerful microscope dispenses cancer-fighting compounds onto individual cancer cells.

Often, it's only a matter of hours before the cancer cells visibly begin to die, said Sitta Sittampalam, director of drug discovery for KU's newly established Institute for Advancing Medical Innovation (IAMI).

"Not only can we see if it's killing the cancer cells," Sittampalam said, "but also how it's killing the cancer cells." While chemotherapeutics have existed for decades, researchers want to create drugs that attack cancer cells without causing side effects such as nausea, hair loss and immunosuppression.

An \$8.1 million grant from the Ewing Marion Kauffman Foundation established IAMI. The institute is directed by Scott Weir, director of The University of Kansas Cancer Center's Office of Therapeutics, Discovery and Development. IAMI is not a building. It's an umbrella that encourages collaborative research among scientists and bioengineers on KU's Lawrence campus and at the KU Medical Center in Kansas City, Kan.

Weir described IAMI as a national model for translational research — taking ideas from the laboratory bench to the patient's bedside — and for the development of tomorrow's medical innovators.

“The Kauffman Foundation is investing in us,” he said. “They’re confident that we’re going to deliver and that we’re going to establish an institute unlike any other in the U.S.”

Sittampalam, who holds faculty appointments on both campuses, serves as deputy director of the KU Cancer Center’s drug development program. He said IAMI’s primary goal is to develop pharmaceuticals and biomedical devices to treat cancer, as well as neurological and metabolic diseases. Research conducted through the institute will run from initial idea through pre-clinical proof-of-concept stage, when treatments are tested on laboratory animals.

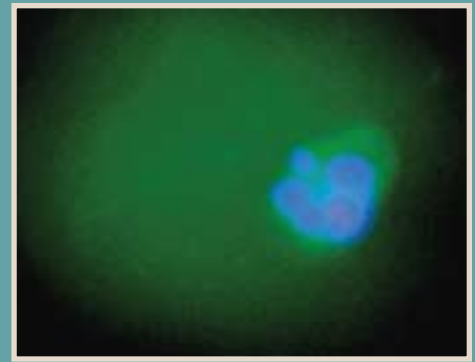
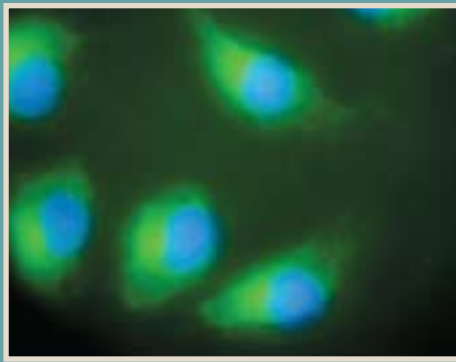
To train researchers who will be prepared to move their products to the marketplace, the institute will include a focus on business entrepreneurship through KU’s School of Business.

“The Kauffman grant not only will bring drugs to proof-of-concept, but also will train scientific researchers and bioengineers how to be entrepreneurs and bring their ideas into commercial ventures,” Sittampalam said. “That’s the gist of it.”

### Funding for fellowships

In order to accomplish IAMI’s goals, it’s necessary to provide fellowship support to bring outstanding students to KU. Eventually, the institute will support fellowships for 10 graduate and four postdoctoral students. The first Kauffman fellowships will be awarded to at least seven researchers for the 2009-2010 academic year. Because none of the fellowships exist yet, here’s a look at some KU graduate students who are conducting research similar to what might occur through the institute.

**It’s 7 o’clock in the evening** when Joshua Sestak returns to a laboratory in KU’s west campus Multidisciplinary Research Building. Sestak, a KU graduate student in pharmaceutical chemistry, is investigating therapeutics to treat multiple sclerosis. He plans to stay about 30 minutes, but one thing leads to another, and it’s



PHOTOS COURTESY OF KATHY ROBY

## HOW TO KILL A CANCER CELL

Normally, cells in our bodies have a finite lifespan. Cancer cells, however, do not. They continue to divide and create new cells, causing tumors or overproduction of certain cells.

When cancer cells are healthy (left), the nucleus (stained blue) is round and smooth. Several hours after chemotherapeutics are applied (right), the cell becomes large and swollen, and the nucleus begins to break apart. Once the nucleus disintegrates, the cell dies.

Because research has shown that cancer cells lose their ability to recover only if the nucleus is destroyed, pharmaceutical researchers are developing new chemotherapy drugs that target the cell nucleus.

midnight when he leaves, tired but invigorated. “I do science,” Sestak said. “This is what I love to do.”

If his research passes the proof-of-concept stage, there’s a good chance it could advance to the marketplace. Aware of strong connections among autoimmune diseases, Sestak envisions carrying his research further. “If we find our therapeutic is successful in

certain types of cancer,” Sestak said. “Our hope is that we can use the same research we’re conducting to treat autoimmune diseases and, with some minor changes, we could also target specific cancers.”

**Across campus**, bioengineering graduate student John Domann is working on a device that could

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—Sitta Sittampalam, director of drug discovery,  
Institute for Advancing Medical Innovation

treating multiple sclerosis, ideally, we can make simple changes to apply it to other autoimmune diseases, such as rheumatoid arthritis and diabetes.”

Sestak is attending graduate school on a Self Fellowship, created by Madison and Lila Self to recruit exceptional Ph.D. students in the sciences, engineering, business and economics. Research like his may someday help fight cancer. “It’s hypothesized that some of the mechanisms involved in autoimmune diseases are similar to those in

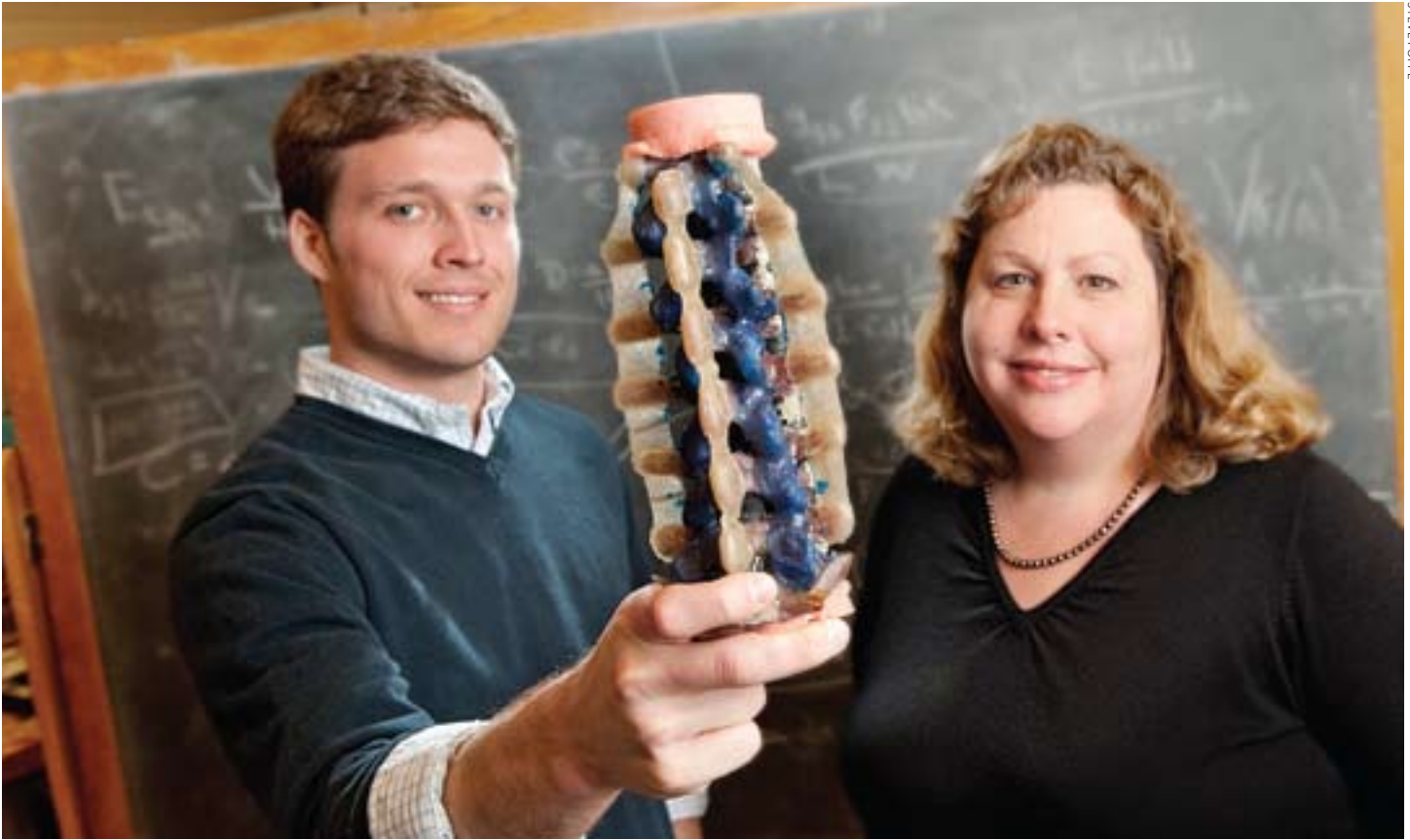
revolutionize the way spinal implants are designed and inserted.

At a laboratory in KU’s Learned Hall, Domann works with Associate Prof. Lisa Friis, who led development of a model of the lower spine that will go on the market this spring. The model enables surgeons to test spinal implants before they’re used in back surgeries.

Domann is helping Friis create an advanced version of the spine model, one that will include sensors to indicate how much force will be borne by the facet joints in the lumbar portion of



In a pharmaceutical laboratory in KU's Multidisciplinary Research Building, students Joshua Sestak, Sheng-Xue Xie and Magdalen Obiefule seek new ways to formulate and deliver existing drugs for a variety of diseases and conditions.



A model of the lumbar spine, new on the market this spring, will allow surgeons to test spinal implants prior to back surgeries. Lisa Friis, right, KU associate professor of mechanical engineering, led the team that invented the model. John Domann, bioengineering graduate student, is helping her develop an updated version that includes electronic sensors.



DENISE ANDERSON/INIST

**KU graduate engineering student Mark Bailey studies new ways to use nanoparticles to detect even the smallest of tumors. Bailey is spending a two-year internship at the National Institute of Standards and Technology.**

the spine after surgery. Facet joints allow for freedom of movement as a person bends backward and forward, and rotates. “With this model, we hope it will turn out that you’re no longer just fixing and stabilizing a

portion of the spine, but also creating devices that allow the patient the same level of motion as before the spinal injury,” Domann said.

The next step is to take the product from the laboratory to the

marketplace. “You can develop a great bit of technology,” Domann said. “But if you don’t understand how to turn it into a successful product, your technology could just sit on the shelf and go to waste, losing its chance to benefit society.”

**In a laboratory** at the National Institute of Standards and Technology in Gaithersburg, Md., KU graduate student intern Mark Bailey researches a nanoparticle-based design to create a new contrast agent for use in magnetic resonance imaging. The theory is that the nanoparticle formulation will greatly enhance the ability to view tumors in their earliest stages, or to view other areas inside the body.

Bailey chose KU in part because of its entrepreneurial environment. He described KU as following a new paradigm that combines sciences with entrepreneurial training: “So you get idea generation and product development. But you also get the technology transfer element — there’s a good chance that whatever you develop will actually hit the market and make an impact on people’s lives.”

Like Sestak, Bailey attends KU on a Self Fellowship. “It gives you the freedom to be innovative,” Bailey said, “because you’re not tied down to any other sort of funding obligation.”

Bailey’s KU faculty adviser, Cory Berkland, said faculty members often obtain support for graduate students

## SUCCESS STORY

One recent invention, the NTrainer, a device that helps premature infants learn to suck, shows how the Institute for Advancing Medical Innovation will help researchers take products from the bench to the bedside.

After KU professor Steven Barlow created a prototype for the NTrainer, KU’s business entrepreneur students created its business plan. KU’s Center for Technology Transfer directed the patent, trademark and licensing processes, then leased the product to a local entrepreneur, KC BioMedix, Inc. The result: The NTrainer received FDA approval in February 2008 and went on the market this year.

“IAMI is all about harnessing research to save lives,” said Wally Meyer, director of KU’s School of Business entrepreneurship program. “The winners are numerous. KU gets a royalty, the faculty inventors get money that they spend back into their labs to develop more products, students get wonderful educational and employment opportunities, and—babies live, where before they were at risk.”

Principal funding for the NTrainer’s development came from the National Institutes of Health, with additional support provided by Todd Sutherland, of Lawrence, and his mother, Norma Sutherland, of Fairway, Kan.



COURTESY KC BIOMEDIX, INC., 2009

by applying for grants from national foundations. These grants tend to be tailored more to advancing science than to developing new products.

“The Kauffman fellowships will allow students to figure out what they like and then work with their adviser to define a project,” Berkland said. “These fellowships open up space for their creativity and their independence.”

### Improving lives

Berkland, a KU professor in chemical and petroleum engineering and pharmaceutical chemistry, said the beauty of IAMI is that it unites disciplines across KU’s campuses. He already knows firsthand that collaboration and discoveries can lead to startup companies. Berkland has helped start two companies,

Spencer said. “They ask, ‘How can I make a difference in the lives of those individuals who aren’t receiving the required treatment, and how do we make sure they get that treatment before it’s too late?’”

### Looking forward

The institute is all about providing future researchers with the necessary tools: support, faculty mentoring, collaborative networks and state-of-the-art laboratory equipment. Equally important, they’ll be trained to take their skills out into the world so their discoveries will reach the people who need them.

Meanwhile, at a laboratory in KU’s Structural Biology Center, research associate Peter McDonald locks the door of the lab as he leaves for the

“This is a powerful way to enable research that’s going to make a difference.”

—Cory Berkland, KU professor of chemical and petroleum engineering and pharmaceutical chemistry

one of which is housed in a business incubator at the KU Medical Center.

“IAMI is funded by the Kauffman Foundation to pursue proof-of-concept studies to prove or disprove innovative ideas. In my opinion, that’s a powerful way to enable research that’s going to make a difference,” Berkland said. “It’s research that’s going to produce intellectual property and patents, research that’s going to end up as real products that will affect people’s lives.”

Paulette Spencer, University Distinguished Professor and director of KU’s Bioengineering Research Center, said that whatever her students’ interests are, one constant holds true: “They care.” Bioengineering research runs the gamut from developing imaging devices for detecting cancer at its earliest stages, to creating a bioscaffold material, which helps cells rebuild damaged tissue after a massive injury.

“What they look to first is, ‘How can I change the life of a patient?’”

night. Behind the door is an automated microscope and analysis system, which will automatically measure and analyze cancer cells that night after they’re treated with compounds to identify new chemotherapeutic drugs.

By morning, when he returns, another ray of light will be shed on a disease that strikes nearly 1.4 million Americans each year. Like other researchers, McDonald knows someday there will be a cure for cancer. It’s just a matter of time. 🌊



### BE PART OF THIS

Your contributions to KU Endowment for the Institute for Advancing Medical Innovation can support graduate fellowships and other priorities. To help, please contact Stephanie Grinage at KU Endowment’s office at the KU Medical Center, [sgrinage@kuendowment.org](mailto:sgrinage@kuendowment.org), 913-588-5552 or 888-588-5249, or visit [kuendowment.org/IAMI/](http://kuendowment.org/IAMI/).

## FAST FACTS ABOUT IAMI

- The institute’s goal is to foster innovative collaboration among researchers and bioengineers on KU’s Lawrence campus and at the KU Medical Center to hasten discovery and development of new drugs and medical devices.
- Beckloff Associates, an Overland Park, Kan., pharmaceutical and biomedical consulting firm, will guide all IAMI projects through the regulatory approval process.
- The institute includes funding for up to 24 pre-clinical proof-of-concept projects to advance innovation each year.
- The institute’s fellowship curriculum will include training in business entrepreneurship. The fellowships will support 10 graduate students and four post-doctoral students.

## KEY PLAYERS IN IAMI

Kauffman Foundation  
The University of Kansas Cancer Center  
KU School of Medicine  
KU School of Engineering  
KU School of Pharmacy  
KU School of Business  
KU Center for Research  
KU Office of Therapeutics, Discovery and Development  
Institute for Pediatric Innovation  
Children’s Mercy Hospital  
Beckloff Associates  
Other universities and hospitals



STEVE PUPPE

**Scott Weir directs the Institute for Advancing Medical Innovation. He is also director of The University of Kansas Cancer Center’s Office of Therapeutics, Discovery and Development.**