SYNERGY

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Whether it's a sudden insight or careful attention to detail, the path to scientific discovery has taken many directions at the Beckman Institute.
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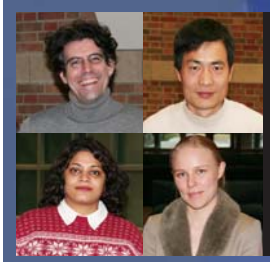

With their Ph.D.s firmly in hand and future careers looming, four Beckman Fellows reflect on their research and upcoming prospects.
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Zenzi Griffin credits the human and technological resources at the Beckman Institute for helping to launch her career as a psychology professor and researcher. Page 6

Beckman faculty member Ioannis Chasiotis is finding new ways to understand the fundamental mechanics that underlie microscale and nanoscale devices.
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ILLINOIS BECKMAN INSTITUTE

Pathways to Discovery

Scientific discoveries have come from rigorous investigations of phenomena and a sudden flash of insight. They have also come from long-term studies and a fresh variation of an oft-repeated experiment. The path to scientific breakthrough can take many directions, as evidenced by a few examples of the discoveries made by researchers from the Beckman Institute.

The most exciting phrase to hear in science, the one that heralds new discoveries, is not 'Eureka! (I found it!)' but 'That's funny...'

-Isaac Asimov

Dahl-Young Khang wasn't trying to make scientific history. He wasn't even trying to push the boundaries of silicon into territory scarcely imagined by researchers.

The young Rogers Research Group postdoc may have done both those things, however, by improvising a low-tech solution to a laboratory problem and by paying attention to what happened next.

Working in the Materials Research Laboratory, Khang, a postdoctoral research associate for Beckman Institute faculty member John Rogers, was repeating a process he had done many times before as part of Rogers' wide-ranging explorations of the nexus point where electronics meet materials.

Swathed in the required cleanroom garb of thin plastic gown, cap, and boots, rubber gloves, and thick goggles, Khang gently pressed down on the little trapezoidal-shaped piece of clear, rubbery material just as he had done dozens of times before. The tiny (about an inch long) organic polymer piece of Polydimethylsiloxane (PDMS) wasn't contacting well with the silicon substrate, however, thus preventing the experiment's goal of transferring thin ribbons of silicon onto the piece of PDMS. So Khang decided to try using a glass vial from the lab to press down on the PDMS, much like a baker using a rolling pin.

When Khang peered at the results under a microscope the view wasn't one of flat, straight ribbons of silicon that he was used to seeing, but a series of undulating patterns on the thin strips of silicon. Surprised and disappointed, Khang went over in his head what had happened. Two days before, he had left the silicon—etched into strips through a lab process that uses hydrofluoric acid—in his office desk for a couple of days. The exposure to room temperature left them difficult to work with—so Khang reached for that glass vial.

After seeing the results, Khang followed up on the aberration by repeating the new procedure, and by getting a better look at the wavy patterns on the silicon strips through an atomic force microscope. He then reported the news to Rogers, a member of Beckman's 3-D Micro and Nanosystems group. Rogers said Khang was practicing good science.

"Our experience is that a lot of science is just being a careful observer of what's happening in your experiments," Rogers said. "This is a very good postdoc I have. A less careful observer would have just glanced over it and said 'oh what are these wavy things? I must not have done the printing right' and gone back and done the printing and forgotten about it."

Khang said his first reaction to seeing the wavy patterns was disappointment, but then his scientific curiosity took over.

"Right afterward, I thought about the possibilities," he said. "What led to this weird shape instead of flat, beautiful images? So I started to think about what caused this kind of result."

The finding mushroomed from experimenting with a new method for making silicon strips into testing the discovery of stretchable silicon for its electron transport properties. Research by the group showed the silicon strips could be stretched and buckled, then return to form, and still retain their electronic properties. The work eventually led to a paper published in *Science* in January of 2006.

The results have proven to be another breakthrough area of research for Rogers, who has been pushing the electronics envelope at every corner for the past decade or so. His work with flexible displays for electronics was what had Khang pressing down on the PDSM with a glass vial.

Now the idea for a new form of electronics—not just bendable, or flexible, but silicon-based and stretchable— has entered the realm of discovery. Gone would be the need for hard-cased electronics based on rigid silicon wafer technology. One can easily imagine, for example, an elastic wristband with the processing power of a PC, sending signals to a paper-like rollout display.

"In principal you could put any level of circuit or device into this geometry," Rogers said. "We've demonstrated p-n diodes and silicon transistors, but our next step is to produce instead of strips, a 2-D plate of silicon where you have this rippled, wavy geometry in both dimensions and the plate itself supports complex integrated circuits."

Which means stretchable silicon technology could someday become as ubiquitous as rigid silicon wafers. And it all started when some funny-looking patterns caught the eye of an observant postdoc.

Researcher Dahl-Young Khang prepares a sample of silicon strips in the Materials Research Laboratory at Illinois.

The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them.

–William Bragg, Sr.

Karl Hess leapt from his chair. "That's it!"

And with that, a new technology for extending the life of microchips many times over was born.

Beckman Institute faculty member Joseph Lyding is well known for his development of the first-ever scanning tunneling microscope at the University of Illinois and for his invention of an ultrastable STM. But he is also celebrated for his many research accomplishments, one of the most famous being a collaboration with Hess that used deuterium to reduce hot electron damage in integrated circuit transistors.

Hess, an original Beckman faculty member and world expert in electron transport research, and Lyding had offices in close proximity at the Institute back in 1996 and often talked about research issues. Lyding had worked on an experiment with the STM that used deuterium instead of hydrogen on silicon and gave talks on the heat desorption effect of the method. Hess had attended one of those talks but neither he - nor any other researcher - had thought of applying it to transistor technology. Until, that is, Lyding stopped by Hess' office one day on his way to the lab.

Hess asked Lyding about his work with silicon and hydrogen and Lyding responded: "Well, has anybody tried deuterium in transistors?" That is when the normally unassuming Hess jumped from his chair.

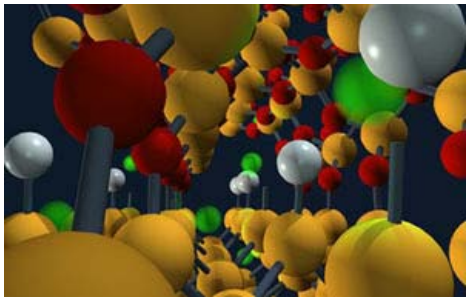
"It was one of those type moments," Lyding said. "It was sort of perfectly obvious to him."

Their collaboration resulted in a paper that received worldwide attention, and eventually the technology was patented and included in the manufacturing process by chipmakers. Lyding said the connection may have happened by chance, but never would have taken place without their shared Beckman affiliation.

"Proximity makes all the difference in the world," Lyding said. "There's absolutely no question about it. You can't force interactions to occur. They have to occur naturally. There is no better way to do it. Before Beckman, Karl's office and my office were almost a half-a-city mile apart. We saw each other more at conferences than in our offices, so the chance of that type of interaction occurring was practically nil."

It was that interaction that led to one of those rare 'aha' moments in science that befits a movie script.

"I guess the biggest satisfaction I get is that occasionally without knowing it, you stumble across something," Lyding said. "And that's exactly what we did."



Joe Lyding had one of those rare 'aha' moments in scientific discovery when he and Karl Hess collaborated to use deuterium in transistors. Image created by ITG.

The real voyage of discovery consists not in seeking new landscapes but in having new eyes.

–Marcel Proust

Feng

When asked to conduct a survey of research projects at the University of Illinois, Al Feng didn't think to include his own work. After all, the survey was geared toward protecting intellectual property emanating from U of I research projects, such as the one that produced the first popular Internet browser, Netscape, a huge commercial success that didn't benefit the university where it was born.

Feng's work on the hearing capabilities of frogs in noisy environments was known worldwide, but it was basic science—geared toward advancing our understanding of biological systems. It wasn't the type of work that led to commercial applications, but in 1994 Feng began to think of his research in a new way, and out of that new perspective came an advanced technology for the hearing impaired.

When Feng sat down with an outside consultant hired by the University to present the survey results, the consultant had a question: where was Feng's work? Feng said he was working on some basic problems in neurobiology.

"I'm trying to understand how frogs extract sounds in a crowd, in a chorus specifically," Feng told him. The consultant then mentioned a relative who was finding her new and expensive hearing aid nearly useless, especially in noisy settings.

"He became curious as to whether I would be able to contribute to solving this problem," Feng said. "That triggered my curiosity."

It took another push, however, before Feng became totally convinced to pursue this new research line. Feng was also working with the National Institute on Deafness and Other Communication Disorders on a long-range plan for its future goals.

"One of the problems they identified to me as one of the main problems was the performance of hearing aids in real-world environments," Feng said. "So the two kind of reinforced the idea that this is a real problem."

So Feng contacted fellow Beckman NeuroTech group member Bruce Wheeler and they took a proposal to then-Director Jiri Jonas. Funding from the Beckman Institute and two foundations got the project started, and Chen Liu was brought over from Israel to serve as a Beckman Fellow and guide the project's early stages.

The original goal was to see if the algorithm derived from Feng's research on how frogs separated sounds in a noisy environment could be applied to technology.

"The simple algorithm seemed to work, to do the job that we thought it might do," Feng said. "We were frankly surprised at how effective it was.

"The rest then becomes engineering. To make it practical to use as an everyday listening device, you have to have a real-time device. So a lot of engineering effort went into that."

The project group headed by Feng eventually grew to include a dozen researchers from speech and hearing science, electrical and computer engineering, and other disciplines. After a few years of work that included modifications on the algorithm, and some engineering innovations, the Intelligent Hearing Aid was developed. Hearing aid manufacturer Phonak bought the rights to the technology.

Feng is continuing his basic science research, focusing on the neural basis of sound pattern recognition in the auditory systems of frogs and bats. But translational research such as with the Hearing aid Project is now a part of his portfolio.

"I didn't expect the meeting with the consultant to pique my interest in transferring basic science knowledge into solving engineering problems," Feng said. "It all came together at the right time."

SYNERGY is a quarterly publication of the External Relations office of the Beckman Institute for Advanced Science and Technology at the University of Illinois at Urbana-Champaign. Each issue will spotlight the people and science that make the Institute one of the premier facilities for interdisciplinary research in the world.

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Q&A with the 2005 Beckman Fellows

The Beckman Institute Fellows program allows recent Ph.D.s an opportunity to do highly focused, interdisciplinary research without the burdens of teaching or taking classes. The four 2005 Beckman Fellows are about midway through their appointments—long enough to have some perspective on their experience but at a stage where a post-Fellows life is growing closer. Beckman Institute writer Steve McGaughey posed questions about their present work and future plans to the quartet of **2005 Beckman Fellows: Chandramallika Basak, Silvio Savarese, Emma Falck,** and **Zhihong Zeng.**

Silvio Savarese

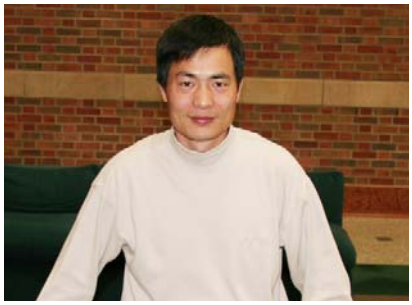
Silvio is a member of the Human-Computer Intelligent Interaction research initiative who earned his Ph.D. at the California Institute of Technology. He researches 3-D scene modeling and understanding, human visual perception, and other aspects of how the interactions of computers and human beings can be improved.

Q: Has your research gone as expected when you first applied for the appointment, or has it changed in some ways?

A: In a way my research has gone as expected. When I started I was very excited by the idea of collaborating with other faculty and to try different research topics, and this is what happened. I have been working on different parallel projects, and my first year was both exciting and challenging. It was setting the basis for all my future research and future goals. Now I think that things are finally coming to the point of giving us interesting results and in the next few months we'll be able to present the results. The nice thing is being able to carry out independent research according to my own agenda thanks to the Fellows appointment. I don't have to teach and can carry out my goals and find the right directions and right collaborations.

Q: Where do you see yourself in 5 years?

A: I would like to pursue my career in academia as a faculty member at a nice school (laughs), hopefully. My research area is computer vision and I hope that in five years I can bring some significant contributions to this field and try to accomplish what people in it are trying to do, namely to make computers see and understand words. Hopefully we will be close to that in a few years.



Zhihong Zeng

After earning a Ph.D. from the Institute of Automation, Chinese Academy of Sciences, Zhihong began working in the Human-Computer Intelligent Interaction research initiative at Beckman. He studies multimodal emotion assessment in naturally occurring settings toward advancing the human-computer interaction experience.

Q: Has your research gone as expected when you first applied for the appointment, or has it changed in some ways?

A: In some ways I have to say that my current research is a little different from what I expected because I have a better understanding of my research problem, and found it was more difficult than what I expected. I think that I am lucky to work at the Beckman Institute because it enables me to have immediate access to expertise in the related areas. I always get encouragement from the faculty here (Thomas Huang, Steven Levinson, and Dan Roth) and from Glen Roisman from the Psychology Department. That is the reason why I can still make progress even though it is a challenging problem.

Q: Where do you see yourself in 5 years?

A: I hope that I will still be here after the Fellows appointment ends because I like working here and enjoy Beckman's research environment atmosphere. The other aspect is where will I be in the research field. Automatic emotion recognition is a challenging and largely unexplored problem. I believe that in five years we will have a better understanding of human emotion expression and perception, and the advances in techniques will enable us to apply this understanding in automatic emotion recognition. At that time I expect that most of the current work, which focuses on recognizing pre-segmented, posed, and basic emotions by using a multimodal approach, should allow us to build a multimodal, continuous, spontaneous emotion recognition system. This system will contribute to a new paradigm for human computer interaction, and make emotion analysis more efficient and objective, thereby contributing to some related areas of research.

Chandramallika Basak

Chandramallika's Ph.D. in Experimental Psychology from Syracuse University prepared her well for working with groups in the Biological Intelligence research initiative. Her research looks at using cognitive training to mediate the effects of aging, as well as modeling of memory, and other topics related to cognition.

Q: Has your research gone as expected when you first applied for the appointment, or has it changed in some ways?

A: Part of the answer is yes, it has gone as expected because many of the projects that I wrote in my proposal are either on their way, or are commencing this semester. But my research has also changed in some ways. When I came to the Beckman Institute, I didn't know that I would get involved in a particular area of research called cognitive training. It was a part of my proposal but now it has developed into one of my primary research interests, which it was not during my dissertation. It is an exciting shift. Moreover, I'm learning new techniques, such as brain imaging and eye-movement capture, a primary reason why I wanted to be at Beckman. This first year was spent mostly learning new techniques, but now I have the green signal to do what I wrote in my research proposal from my advisor. So next semester I'll be doing two more projects which are part of my research proposal.

Q: Where do you see yourself in 5 years?

A: Hopefully I would be in an academic institution, preferably a research university, although I do like teaching. I think the cognitive training aspect is going to take a bigger part of my research compared to what I did before. I predominantly did research on aging before I came here, that is, how older people's cognitive abilities differ from that of younger people; this gives me another opportunity to look into the plasticity of the aging brain. How can you make older people perform better, what kind of interventions can you use, and what kind of interventions are plausible? I'm interested in aging and cognition, so this is great.

Emma Falck

Emma joined the Molecular and Electronic Nanostructures research initiative after earning a Ph.D. in Physics from the Helsinki University of Technology. She works with the Theoretical and Computational Biophysics group, focusing on computational modeling of cellular structures such as the ribosome and cellular membranes.

Q: Has your research gone as expected when you first applied for the appointment, or has it changed in some ways?

A: Certainly the approach and the central themes are the same. I use the tools of computational physics to study biological phenomena. However, instead of studying individual molecules, e.g., individual proteins, I have actually been studying systems consisting of biological molecules. Sometimes such systems can be very large, consisting of tens of biomolecules; the ribosome is a good example. This has actually been very interesting, and sometimes quite challenging. These systems are really taking us toward systems biology.

Q: Where do you see yourself in 5 years?

A: I see myself pursuing a career that is challenging and interesting, and where I get to, in equal measure, apply problem-solving and analytical skills, people skills, and communication skills. In five years, I will probably be in the industry.

Beckman Connections Help Griffin Start Career

Zenzi Griffin is a Professor of Psychology at Georgia Tech who maintains collaborations with Beckman researchers that began during her graduate school days.

Zenzi Griffin spent many late nights at the Beckman Institute, poring over eye movement and speech data in Kay Bock's laboratory as part of a pioneering language production study. The experience proved more than academic.

"The Beckman at night has a very interesting atmosphere," said Griffin, now a Professor of Psychology at Georgia Tech. "On the one hand, it is darker and emptier than during the day, but unlike most other academic buildings, you get the sense that there are many people hidden away working all the time. I discovered that the delivery people at Papa John's Pizza knew the Beckman Institute very well."

Griffin left the University of Illinois and the Beckman Institute in 1998 with a Ph.D. in Psychology, an impressive research resume to kick-start her professional academic career and, perhaps most importantly, meaningful connections that continue to this day.

Griffin's research accomplishments include the first experiment to suggest a strong relationship between when people look at objects in a scene and when they prepare words for them. She was among the first researchers to use eye-tracking technology to explore issues surrounding planned speech production. All of the research was carried out at Beckman and contributed to a doctoral dissertation and a paper with Bock for *Psychological Science* in 2000.

After earning her undergraduate degree from Michigan State, Griffin was accepted for graduate school at MIT but instead chose Illinois, thanks to some lobbying from Bock and the opportunities offered at Beckman.

"I should probably mention that the Beckman Institute also played a role in Kay's recruiting me to Illinois for grad school," Griffin said. "I have to admit that Illinois was my first choice anyway, even after being accepted to MIT, but as I was leaving recruitment weekend, I told Kay that I would come to Illinois if I could do research in the Beckman Institute."

Griffin made good use of the laboratory resources at Beckman, from the eye-tracking equipment in Art Kramer's lab, to software developed by Neal Cohen's lab to process the eye movement data from memory experiments with amnesics, to the monitoring expertise of eye-tracking pioneer George McConkie. Griffin also came away with some lasting professional and personal relationships, especially those with Cognitive Science group members Bock and Gary Dell.

"One of the most important things I learned from them is how to do collaborative research—that is, how to allow multiple people to contribute to a project and make sure everyone feels that their contribution is val-

ued and properly acknowledged," Griffin said. "Of course, they are both my role models for mentoring students and promoting their careers."

The personal connections and professional collaborations Griffin formed at Beckman are ones she still maintains.

"I find myself consulting Gary Dell now and then," Griffin said. "Most recently I was working on a review chapter and asked him to read a draft to make sure it was relatively comprehensive, accurate, and fair. Gary provides great feedback on writing, and with amazing speed. He is so generous with his time that I have to make an effort not to ask him for feedback too often. One of my goals is to be as supportive and responsive to my students (and former students) as Gary is."

Her lab's Web page at Georgia Tech describes the fun aspects of Griffin's research. In addition to being a mentor, Griffin said that Bock makes research an enjoyable experience.

"She is a lot of fun to work with," Griffin said. "She has a secret, or maybe not-so-secret, goofy side. However, I can't think of a good printable anecdote to back that up."

Bock and Griffin are currently collaborating on a decade-long project that is nearing completion. Griffin said the results suggest that even when people know words very well, they continue to get better at generating them each time they use them.

"Earlier studies showed that people are faster to name an object, e.g., call a hook "hook", if they previously said the object name as a sentence completion, e.g., "The fisherman attached the worm to the _____", compared to cases where they completed sentences unrelated to the objects," Griffin said. "Our project showed that for uncommon words like "hook", this decrease in the amount of time it takes to label an object can last up to 16 weeks!"

One of the most important things I learned from (Gary Dell and Kay Bock) is how to do collaborative research - that is, how to allow multiple people to contribute to a project and make sure everyone feels that their contribution is valued and properly acknowledged. - ***Zenzi Griffin***

Her work with Bock that led to the paper in *Psychological Science* (Griffin, Z. M., & Bock, K. (2000) What the eyes say about speaking. Psychological Science, 11, 274-279) focused on the subject of when people look at objects in a scene and when they then prepare words for the objects. It showed that when people describe a scene without any time pressure, they look at each object that they mention for about one second before saying each object's name. Griffin said the eye-tracking technology was invaluable in expanding the boundaries of the research in this area.

"Insofar as we can infer aspects of language planning from eye movements, monitoring eye movements provides an incredibly rich source of information about when people plan parts of an utterance," she said. "Importantly, eye movement monitoring allows us to make inferences about what is being planned after speech begins and even when it is perfectly fluent and without introducing weird manipulations to see if or when they disrupt speech."

The research was the first studying eye movements and speaking to go past the first spoken word in an utterance.

After leaving Illinois, Griffin joined the faculty at Stanford for three years. She came to Georgia Tech as an Assistant Professor in 2001 and was promoted to Associate Professor in 2005. She runs the Cognition and Communication Laboratory at Georgia Tech, where her current work focuses on the timing of speech production.

Research results from the lab show that people usually make last-second decisions about what words to use, and that fluency is often a matter of luck, not a matter of advanced planning on the part of the speaker.

Eye-tracking studies and computational modeling of speech production are part of her research there, just as they were for her at Beckman. While the methodology, technology, and research followed Griffin to Georgia Tech, one aspect of Beckman research hasn't been transplanted so far: the interdisciplinary approach.

"Not as much as I would like it to be— yet," Griffin said.


Dr. Michael F. Roizen

Save the Date!

Sunday, April 29 at 2 p.m.
Krannert Center for the Performing Arts
Foellinger Great Hall

The Center for Healthy Minds presents an afternoon with Dr. Michael F. Roizen, MD, co-author of the *New York Times* bestsellers, **"YOU: On a Diet" and "YOU: The Owner's Manual."** The Cleveland Clinic anesthesiologist is 59 years old, according to his birth certificate, but his RealAge is 41.2. How? RealAge is a formula, developed by Dr. Roizen, that measures the biological age of your body, based on lifestyle, genetics, and medical history. Dr. Roizen's lecture, "Real Age: Are you as Young as You Can Be?" explores how we can slow the aging process and make our RealAges younger. Roizen's RealAge theory is particularly relevant to research by Center for Healthy Minds investigators, who focus on the conditions and interventions that maintain cognitive health in late adulthood. For more information on the Center, go to www.centerforhealthyminds.org.

Book signing will follow.

This event is free and open to the public. Tickets will be available beginning March 15 with a limit of four tickets per person. For tickets, please call the Krannert box office at ***217.333.6280 or 800.527.2849, or visit http://kcpa.uiuc.edu.***

FACULTY PROFILE

Chasiotis Brings Novel Approach to NEMS/MEMS Research

Ioannis Chasiotis has been at the University of Illinois for only two years, but he's already become a key member of an important new center located at the Beckman Institute.

Chasiotis came to Illinois from the University of Virginia to continue and expand his research on thin films made for micro-electromechanical systems (MEMS).

Chasiotis, a member of Beckman's Autonomous Material Systems group, is an assistant professor in the Department of Aerospace Engineering, where his research looks at the mechanical behavior, failure, and reliability of films fabricated for micro-machines. Chasiotis said his work is experimental and, among other topics, seeks to improve the performance and reliability of micro-electromechanical systems such as radio frequency switches and thermal sensors.

"My goal is to understand the fundamental mechanics of the materials involved in micro-machines and improve their long term performance and durability," Chasiotis said. "So a large part of my research involves the development of tools to determine the mechanical behavior of very small components or very small volumes of materials, such as nanofibers and nanowires."

Along with four other Beckman faculty members, Chasiotis is part of a new multi-university center for the development of micro- and nano-electromechanical systems (MEMS and NEMS) for very large system integration (VLSI). Chasiotis' role in the IMPACT Center for the Advancement of MEMS/NEMS VLSI is in determining the physical mechanisms that affect the long-term electromechanical reliability of MEMS/NEMS devices at both the microscale and the nanoscale.

"An important condition for the success of MEMS/NEMS technologies is the long-term electromechanical stability of the metallic films that are used in these systems," Chasiotis said. "We want to relate the grain structure of the thin film materials to their mechanical behavior and ultimately their failure after billions of cycles of operation. These problems have been looked at in the past but at the continuum scale, that is, several microns, often ignoring the contribution of the local microstructure."

Work done by Chasiotis on the mechanics of structures at the microscale is novel, as evidenced by his presentation at the 6th International Symposium on MEMS and Nanotechnology last year that earned the Best Research Paper Award at the annual meeting of the Society for Experimental Mechanics.

"We developed a method in which we were able to measure the local mechanical strain in inhomogeneous and anisotropic materials, which wasn't available before." Chasiotis said.

Chasiotis said he was drawn to Illinois and Beckman for a couple of reasons. One is the expertise found here in disciplines such as engineering, chemistry, and physics.

"The large number of accomplished people who work in my area and complementary areas are very well known, which really creates an environment for innovation," Chasiotis said. "This is probably one of a couple of public universities in the country where one finds such diversity and at the same time excellence in almost any field of modern research."

Collaborating with researchers at Beckman is Chasiotis' first experience working at an interdisciplinary research center.

"The Beckman Institute helps to develop synergistic research activities in quite an effortless manner," Chasiotis said. "In micro and nanoscale research, phenomena are coupled, and one could hardly say that one discipline is sufficient. The Beckman Institute brings researchers together in one location, so one has the opportunity to meet with people with very different background in a very casual environment, without the formality of setting up meetings."

A SAMPLING OF BECKMAN INSTITUTE RESEARCH RECEIVING NATIONAL MEDIA ATTENTION:

EXERCISE AND COGNITION

January 30—A review of 40 years of data conducted by U. of I. researchers including Arthur Kramer (Beckman faculty member), Kirk Erickson (Beckman postdoc) and Stanley Colcombe, shows that physical exercise can have a positive influence on cognitive and brain functions in older animal and human subjects.

Senior Journal

OUT-OF-FOCUS IMAGES MADE CLEAR

January 22—"We had this preconceived notion that what we imaged had to be in the focal plane," says Stephen Boppart, a physician and professor of bioengineering and of electrical and computer engineering at Illinois. "Now we can collect 3-D volumes of data that have the same resolution as previously available only at the focus," said Boppart, who is affiliated with the U. of I.'s Beckman Institute for Advanced Science and Technology.

Scientific American

DANCE OF THE HONEYBEE

January 22—Researchers have identified a brain chemical that could account for the elaborate dance of the honeybee, one of the most complex behaviors in the invertebrate world. Bees returning to the hive from a successful foraging trip will begin to do what's known as a 'waggle dance,' a ritual boogie that passes on the location of a promising food source to other bees embarking on a foraging flight of their own. Treating foragers with the biogenic amine octopamine makes them dance more, says Gene Robinson, a Beckman affiliate and professor of entomology and of neuroscience at Illinois.

NPR (Science Friday)

EXERCISE YOUR BRAIN ON CBS EVENING NEWS

January 18—In his first report for the broadcast, CBS Evening News contributor Dr. Sanjay Gupta examines the revolutionary new

field of neuroplasticity - the brain's ability to reorganize itself by creating new brain cells through mental and physical exercises. Art Kramer, Beckman faculty member and Director of the Biomedical Imaging Center, discusses his research on how exercise impacts the brain. Video Clips: "Exercise Your Brain" "Walking Benefits Brain"
CBS Evening News

Water Theory is Watertight

January 17, 2007—The behavior of water when placed in contact with hydrophobic (water-repellent) surfaces, such as raincoats and freshly waxed cars, has puzzled scientists for a long time. According to a controversial theoretical prediction, water near a hydrophobic surface will pull away and leave a thin layer of depleted water at the surface - that is, water molecules at the interface will pack less tightly than usual. Now, a team of research-ers that includes Steve Granick, a Beckman affiliate, has resolved the controversy.
U of I News Bureau

Nanomedicine May Lead to Cancer Therapies

January 17, 2007—U.S. scientists are working with Pakistani researchers to develop nanotechnologies that could identify potential cancer therapies using medicinal plants. "The Indo-Pakistan subcontinent is rich in such remedial sources, most of which remain untouched," says Kenneth Watkin, Beckman researcher and co-director of and lead principal investigator for the Nanomedicine for Cancer research project at the U. of I.
UPI

Aggressive Scrabble Program

January 16, 2007—Beckman affiliate and U. of I. computer science professor Eyal Amir says a computer program he developed along with graduate assistant Mark Richards can do more than beat its rivals at playing Scrabble. This program has gone one better by playing dirty.
New Scientist

Keeping the Aging Brain in Shape

January 12, 2007—Denise Park, Beckman researcher and the director of the Center for Healthy Minds, which studies cognitive function and aging, offers this advice for older people trying to keep their minds sharp: "Travel, go to the theater, go to museums, take a dance class."
Lindsay Daily Post

The Echo Maker

January 12, 2007—A columnist picks "The Echo Maker," by Richard Powers, a member of the Beckman Institute Cognitive Neuroscience group and U. of I. English professor, as one of her six favorite books of 2006
The Wall Street Journal

How to Speak a Book

January 12, 2007—Richard Powers, a member of Beckman Institute Cognitive Neuroscience group and a winner of a National Book Award, reflects on the writing process, including his own.
The New York Times

Bugscope

January 12, 2007—Thanks to "Bugscope," an electron scanning microscope at the Beckman Institute, students all over Illinois and almost anywhere else can peek at extreme close-up views of the insect world at their school computer labs - for free.
Belleville News-Democrat

Exercise Boosts Teen Brainpower

January 3, 2007—Charles Hillman, Beckman Affiliate and a U. of I. professor of kinesiology and of community health, has found that exercise may be beneficial to cognition during early and middle periods of life and protect against age-related loss of cognitive function during older adulthood.
UPI

Exercise and Aging

December 31, 2006—A recent study by Beckman researcher and U. of I. psychology professor Art Kramer shows that walking for an hour three times a week at a moderate pace not only improves physical health but also actually increases brain volume in older adults.
The Charlotte Observer

Printable Flexible Electronics

December 22, 2006—Researchers have devised an improved method of creating bendable circuitry by slicing a thin, floppy piece of material from one surface and stamping it onto another. The technique combines multiple types of semiconductors into the same device with ease, its developers report. Mixing and matching materials this way may pave the way to brighter displays for cell phones and handheld games, spherical light-sensitive "eyes" that take in a wide field of view, and flexible communications devices that can be folded and stuffed into a backpack, says Beckman researcher and U. of I. materials science professor John Rogers. "It's a very straightforward path to making flexible displays," he says.
Scientific American

Mental Stimulation and Aging

December 22, 2006 - Just as regular exercise can keep you at the top of your game physically, flexing your brain muscles can help ward off age-related loss of mental agility, results show. Elizabeth Stine-Morrow, a professor of educational psychology at the Beckman Institute, said she found the study's findings that mental exercise can ward off cognitive decline over a five-year period "a stunning result."
Gainesville Sun

Cell and Structural Biology

December 21, 2006—Scientists at Illinois say they've determined a protein known to kill cells also plays an important role in memory formation. When activated, the enzyme caspase-3 triggers a synaptic process essential for memory storage, according to predoctoral fellow Graham Huesmann and David Clayton, a Beckman researcher and professor of cell and structural biology at Illinois.
UPI

Exercise and the Young

December 21, 2006—Charles Hillman, a Beckman affiliate and U. of I. professor of kinesiology and of community health, has found that exercise may be beneficial to cognition during early and middle periods of life and protect against age-related loss of cognitive function during older adulthood.
Science Daily

John Rogers and Semprius

December 20, 2006—Semprius Inc., a start-up company based in Chapel Hill, N.C., won a 2006 Wall Street Journal Technology Innovation Award for a process for making large-scale, high-performance electronic circuits that can be applied to any surface. The technology was developed by along with a team of researchers at Illinois led by Beckman researcher and U. of I. materials science and engineering professor John Rogers, who is the company's president and co-founder.
UPI

Capping and Targeting Quantum Dots

December 19, 2006—Beckman affiliate and U. of I. chemical and biomolecular engineering professor Michael Strano and colleagues at Illinois have discovered that they can combine

capping and targeting in a simple step, producing water-soluble lead sulfide quantum dots that emit bright near-infrared light.
News-Medical.net

Mechanoluminescence

December 19, 2006—"What we have here is just like lightning," says U. of I. chemistry graduate student Nathan Eddingsaas. Eddingsaas and his adviser, Beckman researcher and U. of I. chemistry professor Kenneth Suslick, have found that ultrasonic bubbles cause crystals to flash 1,000 times more brightly than if the crystals were just crushed.
St. Louis Post-Dispatch

Making Nanoelectronics for Displays

December 19, 2006—Beckman researcher and U. of I. materials science professor John Rogers and his colleagues have developed a printing technique that allows them to combine a wide variety of inorganic structures, such as single-walled carbon nanotubes, assorted nanoscale wires, and ribbons made of gallium arsenide or silicon, to create multilayered, high-performance optical and electronic devices.
Technology Review

Stamping Electronics

December 18, 2006—Two recent advances in device fabrication could help move transistors off silicon wafers and onto flexible plastic substrates. There, they could be made into bendable electronic paper and skin-conforming sensors. Beckman researcher and U. of I. materials science professor John A. Rogers and colleagues have been able to put a wide variety of materials onto flexible plastic by stamping.
Chemical & Engineering News

Richard Powers and The Echo Maker

December 15, 2006—When Richard Powers, a member of the Beckman Institute's Cognitive Neuroscience group and a U. of I. English professor, turned from programmer to novelist, he just couldn't leave science behind. The Independent's John Freeman talks to the winner of this year's National Book Award win for fiction.
The Independent

John Rogers on New Semiconductor Technology

December 15, 2006—U. of I. researchers report developing technology that allows the integration of dissimilar classes of semiconductor devices on a single substrate. "Important new types of electronic systems will rely on the ability to mix and match wide ranging classes of devices in three dimensional configurations on unusual substrates," says Beckman researcher and U. of I. materials science and engineering professor John Rogers.
UPI

Cloning Nanotubes

December 14, 2006—Rice University chemistry professor James Tour and his colleagues have demonstrated a way to make multiple copies of a single nanotube. "They have proof now that they've been able to grow (a nanotube copy) from a seed," says Michael Strano, a U. of I. professor of chemistry and of biomolecular engineering. "If Jim Tour is ultimately successful, he'll be able to grow large amounts of just one type of carbon nanotube, and so this will make that one type, or any type, very cheap and affordable." He adds, "It's a long road ahead. But it's an important step forward."
Technology Review

ITG Wins Award at MRS Film Festival

December 4,, 2006—An entry from the Beckman Institute's Imaging Technology Group won third place at the Materials Research Society Film Festival held last week as part of the MRS 2006 Fall meeting in Boston. The file titled "Stretchable Silicon", done for the John Rogers group, won third place in the Professional category of the inaugural MRS Film Festival.

Nanotechnology

November, 29, 2006—A miniature pump that beats spontaneously has been constructed by Japanese nanotechnologists at the University of Tokyo. The device, 5 millimeters in diameter, uses heart muscle cells, which contract and extend spontaneously, to provide the power rather than an external energy source, making it of potential value in medical implants. Paul Kenis, a Beckman researcher and professor of chemical and biomolecular engineering at Illinois, said that the device could be useful for many medical situations where pump and power source cannot be easily combined.
Chemistry World

Exercise Shown to Reverse Brain Deterioration Brought on by Aging

November 20, 2006—The wait for an anti-aging treatment is over, according to cognitive neuroscientists and kinesiologists at the University of Illinois at Urbana-Champaign. While not as effortless as popping a pill, the treatment - in the form of moderate exercise - may be a simple and effective way to reverse age-related brain deterioration.
U of I News Bureau

Powers wins National Book Award for Fiction

November 16, 2006—Richard Powers won the 2006 National Book Award for Fiction Wednesday night for his novel, The Echo Maker. Powers is a critically acclaimed author of nine novels and a member of the Beckman Institute's Cognitive Neuroscience group.

Exercise and the Brain

November 16, 2006—A number of studies have shown that elderly people who take up aerobic exercise show improved cognitive function after a few months, says Beckman researcher and U. of I. psychology professor Arthur Kramer.
The Wall Street Journal

Beckman Institute Open House Scheduled for March 9-10

Visitors get an inside look at cutting-edge research and technology

What is it like to get an MRI? What are researchers learning from a colony of the tiny trap-jaw ants? What does "brain on a chip" mean? These are just a few of the questions that inquiring minds can get answered at the Beckman Institute Open House March 9-10, 2007.

The Beckman Institute Open House is a biennial event, held in conjunction with the University of Illinois' College of Engineering Open House. The exhibits and demonstrations will be presented by Beckman Institute faculty, staff and students and are designed to give visitors a hands-on, inside look at some of the research and projects being conducted at the Beckman Institute. The exhibits will be open on Friday, March 9 from 9 a.m. to 4 p.m.; on Saturday, March 10 from 9 a.m. to 3 p.m. A list of the exhibits is now posted on www.beckman.uiuc.edu.

The Beckman Institute is located on the University of Illinois campus at 405 North Mathews Avenue in Urbana, at the intersection of Mathews and University Avenue. Metered parking available in the parking deck across from the Institute. Meters are enforced on Friday, but parking is free on Saturday. Schools, clubs, and other large groups are welcome.

For more information, please contact: Sue Johnson, External Relations Manager: 217-244-7114; e-mail: johnso16@uiuc.edu