

# SYNERGY

BECKMAN INSTITUTE FOR ADVANCED SCIENCE AND TECHNOLOGY

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## Citizen Scientists! page 2



**John Wang is a neurosurgeon who is making research an integral part of his practice at Carle Hospital.**

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**Alumni Profile: Devorah Klein did postdoctoral work at the Beckman Institute but these days is creating products and services at one of the top design firms in the country.**

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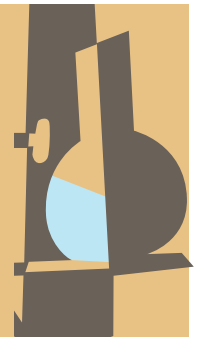
**Fellows Corner: Learn how Beckman Institute Postdoctoral Fellow Kyle Mathewson took advantage of a research opportunity that seemingly came out of nowhere.**

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# Citizen Scientists!

Program Lets Older Adults Experience Scientific Research Firsthand



It's become a staple of reality TV: CEOs spend time undercover as a regular employee, celebrities switch places with average Joes bearing the same name, and housewives take a turn at running each other's households. The phenomenon of walking a mile in someone else's shoes seems to be a prevalent cultural theme in 2011, so why not try it in the science lab too?

That's essentially what Beckman Institute Director Art Kramer wondered a couple of years ago, anyway, along with Institute of Genomic Biology Director Gene Robinson, and Kathleen Holden, Director of the Osher Lifelong Learning Institute (OLLI) the University of Illinois. And now, it looks like their idea just might take off.

A dozen older adults from the Illinois chapter of OLLI, a national organization, took part in a pilot program called Citizen Scientist that placed them in campus research laboratories. And the reaction to the pilot is that the program is a go for another season.

"To our knowledge no one has a program where citizens actually go into the lab," Holden said. "At OLLI we are always looking at new ways to intellectually stimulate older adults. We started out with courses that grew into study groups, which have been very popular, there are lunchtime lectures, and we've had trips with faculty accompanying OLLI members. So this is really an extension of that whole desire to find new and interesting things to make people's brains more active."

Kramer and Robinson are two Illinois faculty members who have been involved with OLLI, and for Kramer the citizen scientist concept dovetails with his work in the area of cognitive aging. But this is no research project. The older adults aren't being tested for their brain function after exercise or for the effects of social engagement on their cognitive abilities (two areas Kramer and other Beckman researchers investigate); rather they are being trained to work alongside faculty and student researchers doing many of the same tasks they do, including working with older adults in labs like the one Kramer directs.

"I have no doubt that our OLLI members can learn; that is

certainly the case, but this gives them something that is challenging and meaningful," Kramer said. "This isn't stuffing envelopes in a business or charity; it is actually doing research with human subjects or animals."

Kramer said the thinking behind starting the Citizen Scientist program is related to his work with older adults and maintaining cognitive health across the lifespan.

"I work with older people so I'm interested in how we can maintain high levels of cognition and brain function among older people," he said. "One of the ways we know we can do that from the literature is to keep them intellectually stimulated. And what's more stimulating than trying to learn an area you don't know about when you are 60- to 70-years-old?"

And, most importantly for this fledgling program, it also dovetails with the mission of OLLI which states that "learning has no age limits. Through a rich array of lifelong learning opportunities, members are inspired to take a fresh look at themselves, their world, and the possibilities that await them."

What awaited the budding citizen scientists in the labs were everything from clownfish in Beckman researcher Justin Rhodes' lab to the driving simulator in the Institute's Illinois Simulator Laboratory. Some also worked with the Neuroscience

Program and at the Institute for Genomic Biology. They went through the same types of training, including institutional review board training, that is required of every lab member, and they met right alongside the students and professors in their regular group meetings.

## Bringing Citizen Scientists into the Lab

Kramer and Robinson, who had given talks at the OLLI's south campus facility in the past, talked over their idea with Holden a couple of years ago and a trial program with two members working in Kramer's lab was tried.

"I have known Kathleen for many years and she is a great



**"I was amazed at what I learned in that class and amazed to realize the advances that had been made in brain research," Porter said. "And all of that was brought out with the MRIs. I was shown an MRI and explained how it works as part of my training, and I thought that was really fascinating."**

*— Pat Porter, citizen scientist*

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resource,” Kramer said. “Gene and I both thought she would be a great partner and she has been. It is public service we are happy to do.

“Right now it’s community outreach, it’s an attempt to give retired people who have a wealth of experience and knowledge an opportunity to apply that in a meaningful situation. This is one of many meaningful experiences they can apply their knowledge and experience to, and learn something new. That is what OLLI is all about.”

To get the program started, they had to recruit faculty, so a letter was sent out stating that “the experiences of both the senior citizen scientists and lab members at Beckman have been mutually beneficial – with the citizen scientists learning how science works in practice and about substantive research areas and the host lab receiving assistance from the senior scientists in conducting research.”

Next, they set about selecting what they called the “novice research assistants” by publicizing the program to OLLI’s more than 800 members in the community, an effort that drew a large number of responses. A graduate student, Geena Skariah, who works with Beckman researcher Stephanie Ceman, was chosen to run the Citizen Scientist program. Skariah did a presentation that included faculty profiles and their research, and applicants were asked to list their preferences and interests to help match them up with labs. Eventually 14 Citizen Scientists were selected and Skariah said 12 of them stuck it out.

“The funny thing is they’re still working, they wanted to work through summer, so it’s still going on,” Skariah said. “It’s really been a success.”

It wasn’t necessarily a success at first, however, for the newbie lab members.

“It was definitely overwhelming, that was the term that came up when I had my first meeting after they started in the labs,” Skariah said. “It was like ‘Oh my God. There’s a lot of information here and we don’t know how to get around it.’ But at the same time they said the labs were so friendly and receptive, and they were willing to explain things to them.”

### **Benefits to Researchers and the Public**

Skariah said the experience has also helped her as a young scientist, and thinks it will benefit students in the participating labs.

“This was my first experience working with senior citizens and science outreach, and it is going to help me a lot professionally,” she said. “I think you don’t meet just people of your own age as you progress through science and your research. Explaining science in layman terms has been the challenge here. I had to explain my work and the work the lab does. I had to really break it down for the citizen scientists and that’s something I wanted to learn in this experience.”

One of the Citizen Scientists, James Caspary, agreed.

“They need to be able to express what they’re trying to do, on their own terms to someone who doesn’t necessarily understand,” Caspary said. “It’s not so easy to work with someone like me who just has a curiosity. I’ll ask questions, some of which are good and some of which are probably not very informed. But they have to field those questions regardless of what they are.”

Holden said the program has components that go beyond the benefits to OLLI participants.



*James Caspary (at right) works with a test subject during an experiment in the driving simulator at the Beckman Institute’s Illinois Simulator Laboratory. Photo courtesy Geena Skariah.*

“Another element was the intergenerational part: the graduate students learning from the older adults, particularly if they were doing research on older adults. The other was to bring the campus and community closer together. To help people understand the wonderful things that are going on here at this university.

“One of the most important things, besides giving our OLLI members more intellectual stimulation, is helping the public understand the depth and quality of research that goes on at this university. Most people don’t know about that. They hear about it but when they went into the labs and saw the dedication of the faculty and the students, they were all impressed with that.”

### **Benefits to the Citizen Scientists**

Caspary, who might be called the poster boy for the OLLI program, was certainly impressed by his Citizen Scientist experience. A mostly retired bank president, Caspary and his wife tried the retire-to-a-golf course lifestyle before deciding they wanted something more challenging out of their golden years.

“My wife and I actually moved to Champaign a couple years ago with the primary reason being I wanted to check out the University of Illinois, maybe take a few classes,” Caspary said. “Then I came across the OLLI program and just kind of fell in with that. And then they were trying this pilot program, which just seemed like something that would be very interesting. OLLI was just exactly what I was looking for, but I had no idea it existed before I came here.”

Caspary, who doesn’t have a background in science, worked in Kramer’s Human Perception and Performance group with student John Gaspar in experiments testing multitasking among older adults. He helped with experiments in the driving simulator and took part in group meetings at Beckman, where students presented the projects they were working on.

“To me that was probably one of the best parts of the program,” Caspary said. “So not only did I get to get some involvement in the project that John had, but I also then got to listen to probably 15 or 16 other projects and how they were coming along, and then to the comments and questions that the other people in the group had.”

Pat Porter took her involvement in the Citizen Scientists program

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*Tauby Shimkin worked in the lab of Beckman researcher Justin Rhodes as part of the Citizen Scientist project. Photo courtesy Geena Skariah.*

a step further. She worked in the lab of Beckman researchers Gabriele Gratton and Monica Fabiani but also sat in on a class Fabiani taught on the psychology of aging.

“I was amazed at what I learned in that class and amazed to realize the advances that had been made in brain research,” Porter said. “And all of that was brought out with the MRIs. I was shown an MRI and explained how it works as part of my training, and I thought that was really fascinating.”

Porter is a retired teacher of 40 years who works as a house mother at a sorority on campus. Like Caspary, she said working in a lab and learning about the science practiced there has been an enriching experience.

“I’ve really enjoyed meeting the people, both the nice group of people who work here, and I’ve enjoyed meeting with my subjects and identifying with them in my own way,” she said. “I like having the satisfaction of doing something that in some small way helps others.”

Caspary thinks the program could be improved by letting the

citizen scientists have more involvement.

“I think it worked fine for the OLLI participants but it probably wasn’t as involved as we thought it would be,” he said. “But you know, again for people who like me have a curiosity, it’s an absolutely tremendous opportunity.”

Holden said the people who run the program also gained insight from the pilot into how they could improve the experience for everyone involved.

“One of the things we learned was that it’s really important for the citizen scientists to be proactive; they tend to want to hang back and wait for someone to ask them something,” she said. “The ones who said ‘OK, what can I do?’ or ‘let me look at this part of your research and see if I can help’ – those were the ones who did much better. That’s part of the training for us.

“Also, we will be meeting with faculty to talk about how best to use people in their labs. So it’s been a great learning experience for all of us.”

Thanks to what she has learned from the research, Porter is now an advocate for older adults adhering to an exercise schedule.

“I’ve always realized and known that exercise is good for you, and I’ve always exercised. I’m from a very athletic family,” she said. “But now there’s proof that 30 minutes of walking every day helps keep your brain more cognizant.

“I have a line from the textbook I was given: what do you want to do, add years to your life or life to your years? And I thought ‘wow, that’s really profound to me because I’ve known people who are just adding years to their life and they’re leaving out the fun part of adding life to their years.’

Porter also was inspired by what she learned from the Arnold Beckman exhibit in the rotunda of the Institute, and by his “Rules that Govern My Life”.

“I did know about him, but I was fascinated reading that, and I was also given a book about him by Monica,” Porter said. “What a remarkable person. I’ve added him as one of my heroes. He also had his code to live by and I loved that. I put it up on my refrigerator and try to remember it and be honest, and it’s a sure way to a happy life. And I’ve been honored to be a tiny, even insignificant part of the Beckman Institute.”



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# A Research Practice

*John Wang is a Neurosurgeon who makes Research Part of Being a Physician*



**D**oing research can sometimes be a full-time job, even for Beckman Institute faculty members who already have teaching and other duties. So how does a doctor who sees patients and performs surgery sometimes on a daily basis decide to add research to his list of duties?

For Dr. Huan (John) Wang, there was no other choice. Major life decisions for this neurosurgeon come not from his head but from his heart. They guided his switch from cardiology to neurosurgery in medical school, his choice of a spouse, and his decision to build a research line that is integrated with his practice.

“It’s not a *decision*,” Wang says with passion. “I did *not* have a choice. Sometimes you do certain things because it’s a logical decision. This has nothing to do with logic. This is something that I want to do, period. I don’t think whether this is practical, whether or not it’s logical, this is what I want to do.”

The decision in medical school came as two separate, unexpected realizations in the operating room.

“I started out wanting to be a cardiothoracic surgeon. The first time I tagged along with the cardiovascular team they opened the chest, and they encouraged me to hold the heart,” Wang said. “It did nothing for me. I felt *nothing*. I said ‘you know what? This is not for me.’ So then I was lost. I didn’t know what to do.”

Wang’s voice softens as he describes the epiphany he experienced during brain surgery.

“I was under the microscope looking at the brain and that moment did it,” he said. “That moment defined what my career choice was going to be because that mesmerized my entire being. Everything became so clear: this is it.”

The same was true with his choice of a spouse.

“I met my wife the same way. The moment I saw her, I knew she was going to be my wife,” Wang said.

“She never said she agrees with that,” he added with a laugh, “but she has been my wife for 18 years. You just happen to meet the right woman and you know it and there you go, 18 years already.”

“For my career, it was the same thing. I was just fortunate enough to have that moment and that moment was right for me. That just defined my entire future career.”

Wang’s decision to pursue research in the new field of thermal neuroscience is also informed by his passion – one for making the most out of his role as a physician.

“Through the clinical care of patients, that gives me research perspectives and insights and also provides me with motivation and inspiration,” he said.

Wang’s choices have led him to a place that few inhabit: a neurosurgeon at Carle Foundation Hospital and a Beckman Institute researcher who is mapping out new territory in a field he terms thermal neuroscience. In addition to his appointment in Neurosurgery, Neurosciences at Carle, Wang is on the faculty at the College of Medicine at the University of Illinois, a member of Beckman’s Bioimaging Science and Technology group, and directs the Thermal Neuroscience Laboratory at the Institute.

As all those titles indicate, Wang’s day is full. He sees patients, performs brain and spinal

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surgeries – both scheduled and sometimes in the middle of the night following a gunfight – and has ongoing and planned research projects that would test someone whose days were built simply around research. Wang might seem to be a hybrid, both doctor and researcher, but for him, it is all one thing.

“It’s altogether in the sense that when I’m taking care of patients, that helps my research,” he said. “Now, one day a week, I’m sort of having an academic day; like today is my academic day but I did two procedures. It’s not like I clock in and today is my academic day and I don’t see patients. Patients, if they have needs, they can’t wait. You take care of them.

“It’s the sort of lifestyle that we’ve chosen for ourselves. So that by itself does not diminish my quality of life; it’s something that I knew I was about to get into.”

Wang’s wife likely understands, since she just graduated from the University of Illinois Medical School, and is a first-year internal medicine resident here. They have an 11-year-old boy and 9-year-old girl.

“In terms of do I need and have family time? Yes, I do,” he said. “Would I would like to have more family time? Yes, I would. But it’s all about quality and I’m hoping that’s true and I am not delusional in thinking that.”

Again, Wang returns to his calling.

“Yesterday morning, I got woken up way before dawn; a young man put a bullet in his neck,” he said. “I don’t think ‘ok, I need to arrange for my kids to go do this and eat breakfast’. I just dropped everything and here I am, let’s get that taken care of. It’s just that a certain breed of people have chosen that kind of lifestyle for a reason.”

Yet Wang has chosen to make research an integral part of his practice. He says that’s because his work as a physician underlies the research endeavors.

“Seeing the head traumas, taking care of them, seeing them back in the office, you realize they have a lot of problems after the head trauma is treated,” he said. “What about their quality of life afterward?”

“So you start to see deficiencies, you start to see areas of disappointments for the patients, how they’re not going on with their life, despite the fact that they are alive. You start to have a real feeling of what they are going through and that motivates you.”

Wang’s motivation is simply better health outcomes for his patients and for those who someday may benefit from his research, which is multifaceted and innovative. A prototype of a cooling helmet for the brain will soon be tested in Beckman’s Biomedical Imaging Center (BIC) and in the field in ambulances.

Wang also hopes to someday create injury centers that could address some of those deficiencies he talked about arising from brain trauma, such as subsequent loss of memory. He says the research is about improving the

healthcare model for people suffering from brain injuries and disorders, not toward making him a better surgeon.

“I’ve been using chopsticks since I was a child, but I’m not a better chopstick user than when I was 11 because repetition by itself doesn’t make it any better,” he said. “It maintains the skill but it doesn’t take you to a different level. The research perspective takes you to a different level because it takes on a different perspective; it’s a different, inquisitive pathway in order to further the clinical outcome, and you may dramatically improve the outcome for your patients.”

At his Thermal Neuroscience Laboratory the focus is on the study of brain temperature, its physiological understanding, and its therapeutic implications. Wang said research into the potential therapeutic benefits of taking thermal properties into account when treating brain injuries is something that’s been needed for a long time but has been lacking because of the lack of easy access to the brain.

In order to address these issues Wang is involved in or starting several research projects. His current research focus on developing a cooling helmet – in essence a head cover that will be placed on patients who have suffered a brain injury or stroke, and could be used in the future for diverse treatments such as for people with brain disorders like schizophrenia – that is ready for the testing phase. The helmet will be evaluated this fall at Beckman’s Biomedical Imaging Center and tested with brain injury patients who are being taken by ambulance or by air to



*A cooling helmet developed as a spin-off from NASA technology will soon be ready for experimental testing at Beckman’s Biomedical Imaging Center and in the field. Image courtesy John Wang.*

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# Fellows, Scholarship Recipients Announced

The spring and summer brought good news for a select few students and postdoctoral researchers as new Beckman Institute Fellows, as well as the recipients of new scholarship programs, were chosen. Selections were made for the new classes of Postdoctoral Fellows and Graduate Fellows, as well as a Carle Foundation Hospital – Beckman Institute Fellow.

The Beckman Institute Postdoctoral Fellows program marked its 20<sup>th</sup> year with the announcement of this year's new class of Fellows. Begun in 1991, the program has annually attracted top young scientists from around the world for the opportunity it offers for a post-Ph.D. appointment for up to three years doing independent, interdisciplinary research free of teaching or other duties. The 2011 Postdoctoral Fellows continue that tradition with outstanding credentials from the areas of neuroscience, materials science, and imaging. This year saw the second-most applicants ever, with 58 applying and these four chosen as the 2011 Beckman Institute Postdoctoral Fellows: Kyle Mathewson, Meredith Silberstein, Joseph Toscano, and Thomas van Dijk.

The Beckman Institute Graduate Fellows for 2011 were selected based on the quality of their proposed work, the likelihood that the work would lead to important new results in their field, and the relevance of the proposed project to existing Beckman research. The 2011 Graduate Fellows are Sumit Ashtekar, Jessie Chin, Amy Maduram, Feng Xiong, and Yue Zhuo.

This year also saw the selection of the second Carle Foundation Hospital – Beckman Institute Fellow, a postdoctoral position started in 2008 as a three-year appointment for a recent Ph.D. or M.D./Ph.D. interested in conducting oncology-related research at the Beckman Institute. Jongsick Kim was chosen as the new Carle Foundation – Beckman Institute Fellow, succeeding Michael Walsh, who will remain at Beckman as a researcher.

In addition, the first recipients of new scholarship funds at Beckman were announced. The funds have been created to support undergraduate, graduate, and postdoctoral researchers. The Nadine Barrie Smith Memorial Fund supports women engineers in medical imaging, with Yue Wang and Cac Nguyen chosen as the first recipients of this award. The Erik Haferkamp Memorial Fund supports undergraduate research in neuroscience, with Shi Chen selected as the first recipient in 2011.



Photo by Vanda Bidwell, *The News-Gazette*.

Carle's Emergency Department.

The cooling helmet was developed at WELkins – a company headed by former NASA scientist William Elkins that uses spin-off technology from the space agency – with modifications done for Wang's project. The concept for the helmet lies in benefits such as reducing swelling that can come from safely lowering the temperature of the brain. It is the same theory behind icing down injuries such as muscle pulls, but without lowering overall body temperature and causing potential problems elsewhere, such as in the heart.

The project is funded by the Department of Defense, with evaluations on the helmet's performance beginning in the magnetic resonance imaging facilities at BIC.

"The starting point is having a non-invasive MRI protocol to evaluate brain temperature," Wang said. "And the project's first goal using MRI – chosen for its non-invasive and high resolution qualities – will be to understand thermal properties in normal states of the brain, then move on to pathological states. So we are actually coming up with a MRI compatible cooling helmet that we are going to study inside the scanner."

The helmets will also be included in ground and air ambulances and employed by emergency responders who have been trained in their use for head trauma and stroke patients. Wang foresees it also being used in the hospital for surgeries and eventually for treating brain disorders and follow-up treatment for brain injury.

"I also want to explore the cooling therapy in an ambulatory setting in that a patient, would be able to wear it at home for a given frequency and time and would it improve their cognitive ability," Wang said. "In a patient with coronary artery bypass, we'll use this to protect the brain when the heart is stopped for the surgery. We will also use it for people who have a lot of post-concussion, post-traumatic stress disorder to see if chronic application of this will sort of alleviate some of the long term consequences."

Some of those long-term consequences Wang hopes to deal with through the creation of injury centers that would address specific aspects of brain injury, such as stroke, concussion, or memory-related issues. This project is currently in the proposal stage and would include collaboration between the University of Illinois and Carle Hospital.



**"I was under the microscope looking at the brain and that moment did it. That moment defined what my career choice was going to be because that mesmerized my entire being. Everything became so clear: this is it."**

**– John Wang**

Wang also helped lead an effort at Carle to create a Primary Stroke Center that was certified in 2010 for cerebrovascular and stroke interventions. He works at Carle with Dr. William Olivero, a fellow neurosurgeon and Beckman faculty member who Wang says has served as his mentor, and who recruited him to Illinois.

"He was heavily influential in my growth," Wang said. "He's been mentoring me, encouraging me, inspiring me, and he's always been there for me."

As if all the research and physician's work weren't enough, Wang also teaches. Wang, who earned his M.D. at the University of Kentucky and served his internship at the University of Illinois College of Medicine in Peoria, is an Assistant Professor here in the College of Medicine.

The myriad of endeavors are geared toward one goal, Wang said.

"What happens is that if we simply help individual patients, it makes a huge difference for that given individual, but we are not making any difference in public health," Wang said. "But if you ever come up with an effective treatment protocol, a structure, even an infrastructure that's meaningful for head trauma patients, then that can be replicated elsewhere, as long as you have proven efficacy for that given population. That will change public health."

# ALUMNI PROFILE



**And for me one of the things that I have taken from that experience that I really highly value now is that basic concept of multidisciplinary collisions. So the more people you have who are different in their tools but similar in their curiosity in close proximity, the better.**

**– Devorah Klein**

*Photo courtesy of Continuum.*

As a Ph.D. student at the Beckman Institute Devorah Klein studied how people store meaning for language production. In her present-day job at a global firm known for innovations in everything from healthcare to furniture, she is a principal leader of a design team of up to 20 people. Despite the seeming differences, Klein says Beckman was the perfect training ground for her current position.

“I loved the Beckman. I really cannot say that enough. I thought it was such a great place to do research,” she said. “And for me one of the things that I have taken from that experience that I really highly value now is that basic concept of multidisciplinary collisions. So the more people you have who are different in their tools but similar in their curiosity in close proximity, the better.”

Safe to say there are plenty of colleagues with diverse skill sets nearby in Klein’s current work environment. She is a principal design team leader at Continuum,

a “global innovation design company” that works with companies in fields such as healthcare and consumer products, creating everything from eco-friendly toothbrushes to home furnishings while offering an array of business services.

At Continuum Klein has worked on projects like the Insulet OmniPod diabetes pump, and the creation of mental models of people’s approaches to weight-loss. She is also involved in design solutions in the area of medication adherence.

“I guess I’m really interested in thinking about the intersection between medication adherence, behavior change, and design,” she said. “I think there are a lot of people working exclusively on one side or the other: a lot of research academics doing research on behavior change, and lots of people with great technology trying to think about how they can design solutions.

“But there’s not a lot of people who are in that middle area, who are thinking about tools for design and not just coming at it

with a technology solution already in place. I want to push that far because I think medication adherence and behavior change are huge challenges and I’d love to think that I can help.”

Klein’s Ph.D. at the University of Illinois was in Cognitive Psychology, and she worked at Beckman with former faculty member Greg Murphy, as well as with current faculty Kay Bock and Gary Dell. Her doctoral research was in the area of polysemy.

“It was really about how people store meaning and resolve ambiguity, so it was within the psycholinguistics of meaning,” Klein said. “There are a lot of people at the Beckman who research how you produce language, and a lot of people who research how you comprehend language. I was right in between the two, about how you store meaning.”

So if the interdisciplinary environment at Beckman prepared Klein for her current occupation, then does her work with

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polysemous words also apply at Continuum?

"I can answer that one of two ways," Klein said, adding with a laugh, "One way is 'no' it really doesn't apply at all and the other way is 'absolutely, it applies.'"

"For me, what design is, is trying to understand and resolve ambiguity and there are things that I learned that I still use, it's just that I use them in a much more abstract way."

While she doesn't keep up on current research in her Ph.D. area, Klein is still devoted to her work at Illinois and Beckman.

"I am still really passionate about my research on language, and what I really loved about Illinois and the Beckman was that there were multiple faculty members doing research and it all seemed really interesting," she said. "For me it was a rich community of research going on and not just one person."

"My mom is also a professor and she says the worst thing that you want is to go to a school and to go with one person and then God forbid they leave, or it doesn't work out; you don't want to get yourself stuck. That was something that was a big draw. I felt like there were a lot of people doing research that was intriguing."

Klein, who grew up in a small town in Ohio and earned her undergraduate degree from Wellesley, has been a guest online lecturer for a psychology class in Minnesota taught by one of her classmates from Illinois.

"I think it's helpful for them to have that perspective of what it is going to look like to graduate with a psychology background and not stay in academic psychology," Klein said.

When asked to give advice to today's students who are following a similar path to what she did, this former researcher and currently successful designer said to diversify.

"I think for me, I always felt like a little bit of a black sheep because I had multiple interests," Klein said. "But I think if you do have multiple interests, make sure you explore lots of them because the more paths you have, the better."



# HONORS & AWARDS

## SWEEDLER ELECTED FELLOW OF AMERICAN CHEMICAL SOCIETY



*Sweedler*

Jonathan Sweedler of the Beckman Institute's NeuroTech group is one of four professors from the Department of Chemistry at the University of Illinois who have been elected fellows of the American Chemical Society. Joining Sweedler in the honor are Thom Dunning, Ralph Nuzzo, and Catherine Murphy, a Beckman affiliate faculty member.

## ROGERS AWARDED LEMELSON-MIT PRIZE

Beckman Institute researcher John Rogers has been awarded the Lemelson-MIT Prize for Health and Energy Innovations. In awarding the \$500,000 prize, the Lemelson-MIT program stated that Rogers's work proves that "technological entrepreneurship can have groundbreaking impact when inventive concepts stretch across disparate fields."

## REDDY EARNS FATELEY AWARD

Rohith Krishna Reddy, a Ph.D. student in the Department of Bioengineering who works with Beckman Institute faculty members Rohit Bhargava and Scott Carney, was chosen by the Coblenz Society to receive the Fateley Award. The award is given to a student who most closely embodies

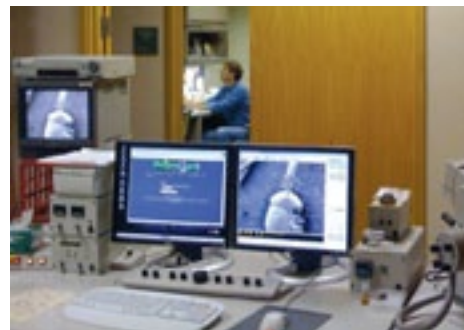


*Reddy*

the spirit of the late William Fateley's desire to promote the science and society of spectroscopy. The award consists of a \$1,000 prize to help offset the costs of attending the National Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies in Reno in October. The award will be presented at the conference.

## BUGSCOPE WINS PRESTIGIOUS SPORE AWARD FROM SCIENCE

The Beckman Institute's free educational outreach program, Bugscope, has been awarded a prestigious SPORE Award from *Science* magazine. The award is based on the essay "Facilitating Scientific Investigations



and Training Data Scientists," which was authored by Michele Korb (California State University East Bay) and Umesh Thakkar, a senior research scientist who has been with Bugscope since the beginning. The authors discuss how a successful online learning environment, such as Bugscope, can be used to facilitate scientific inquiry and discovery. Bugscope provides free interactive access to a scanning electron microscope (SEM) that students around the world can access to explore the microscopic world of insects.

**SYNERGY** is a publication of the Communications Office of the Beckman Institute for Advanced Science and Technology at the University of Illinois at Urbana-Champaign. Each issue spotlights the people and science that make the Institute one of the premier facilities for interdisciplinary research in the world.

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# FELLOWS CORNER



## KYLE MATHEWSON

*Chance, said one of history's most famous scientists, favors the prepared mind. Kyle Mathewson, a young scientist and member of the newest class of Beckman Institute Fellows, illustrates the point.*

Mathewson came to the University of Illinois to earn a Ph.D. in Psychology and work at the Beckman Institute with some of the country's top neuroscience researchers in their state-of-the-art neuroimaging labs. The study of event-related brain potentials (ERPs) and neuroscience in general fascinated Mathewson while working in the lab of Illinois alumnus Clay Holyrod at the University of Victoria in his native Canada. While earning a doctorate, he wanted to continue and expand imaging-based brain research at Illinois in labs such as the Cognitive Neuroimaging Laboratory (CNL) of Beckman faculty members Gabriele Gratton and Monica Fabiani.

"I had been using electrophysiology (at Victoria), doing ERP research, so Beckman was a good place for me," Mathewson said. "It was also the only place where you could do optical imaging, the type of optical imaging that Monica and Gabriele do; this was *the* place to come to."

It was a place, as Louis Pasteur would say, that quickly turned into a once-in-a-lifetime chance for a young, prepared grad student like Mathewson – an opportunity that he,

Gratton, Fabiani, and their collaborators soon took advantage of with a groundbreaking research line. Soon after he joined the CNL, Mathewson discovered a phenomenon called a "pulsed inhibition" brain mechanism that explained how the visual system often fails to perceive stimuli from the environment that at other times would be readily detectable. Imaging data showed the existence of the mechanism and gave credence to a theory of visual awareness that had been lacking experimental proof.

Mathewson was lead author on the paper reporting the research in the *Journal of Neuroscience*, joining four faculty members on the report. The discovery led to more papers and a new way of thinking about the human visual system.

"We were really lucky to find that phenomenon, and we found it right at a place and time when the field was ripe for that," Mathewson said. "We didn't set out looking for that so it was a really lucky opportunity, and that there were the resources and people here to keep pushing it forward. And I had the freedom that I wasn't bogged down on some other project and could focus on that."

Those resources and people were why Mathewson came to Illinois and Beckman. The type of freedom he enjoyed while pursuing research in the CNL was also on his mind when he decided to apply to the Beckman Institute Postdoctoral Fellows program. Fellows aren't required to teach or assume other duties; they

are left to pursue interdisciplinary research goals with Beckman faculty.

"It means the freedom to do the research that you want, and to do interdisciplinary research," Mathewson said. "There's no expectation as a Beckman Fellow about what my role is just because I'm a cognitive neuroscientist. It seems that you are open to do whatever you want."

However, his research success as an undergrad did not guarantee his acceptance into the 2011 class of Beckman Postdoctoral Fellows. For a decade after the first class of Beckman Institute Postdoctoral Fellows was named in 1992, there were none selected from the University of Illinois at Urbana-Champaign for this coveted program, and only five since 2002. This year, Mathewson became the sixth.

"I knew it was a rare thing to be from Illinois and get in," Mathewson said. "I also was warned when I was applying that it likely wouldn't happen. I feel really honored and thankful that they gave me the opportunity."

As a Fellow, Mathewson continues to work in the Cognitive Neuroimaging Laboratory and also works with Beckman researcher Dan Simons. But he is also expanding his research through proposed projects involving materials science and animal models, which should make for a truly interdisciplinary research resume by the time his Beckman Fellows days are done.

"The fact that Beckman values interdisciplinary so much and that you're not expected to work specifically with one faculty really makes for a good opportunity to be an independent researcher," Mathewson said. "And also you can push the field in ways that haven't been done before. If you're doing what your advisor does, you're never going to make connections across fields that your advisor isn't in."

It was in the classes and lab of his advisor Holyrod – who himself worked in a lab at Beckman – that Mathewson first took advantage of opportunity.

"Psychology, I sometimes felt, was a little in the clouds but neuroscience was a way to tie it down to physical phenomenon," Mathewson said. "I saw in a psychology class that Clay was teaching that there were biological explanations for many of the things that psychologists had been explaining just by observing. They had tracked down the molecular pathways by which learning can occur. When I saw that was possible, that was kind of a snap moment for me."

# RECENT BECKMAN INSTITUTE RESEARCH IN THE NEWS



## **SOFT ELECTRONICS SET TO REVOLUTIONIZE HEALTHCARE**

August 25 – Beckman Institute researcher John Rogers co-authored an article that describes the potential of so-called soft electronics, a technology that he has been a leader in developing. Rogers and his co-author write that the technology is set to “completely change the old paradigms” when it comes to future electronics applications, especially in the area of healthcare.

*CNN.com*

## **RESEARCH GIVES POINTERS FOR A SUCCESSFUL EXERCISE PROGRAM**

August 15 – New Research from Edward McAuley of the Human Perception and Performance group shows that by applying certain strategies that enhance self-efficacy – what he calls “situation-specific self-confidence” – people can increase their chances of successfully starting and staying with an exercise program. Beckman Institute Director Art Kramer and graduate student Michelle Voss collaborated with McAuley on the study.

*U of I News Bureau*

## **SMART SKIN ELECTRONICS**

August 11 – A skin-like, electronically functional patch that is as comfortable and flexible as a temporary tattoo has been developed by Beckman Institute and Mechanical Science and Engineering faculty member John Rogers and a multi-university team that included former Beckman researcher Todd Coleman and Beckman Postdoctoral Fellow Nanshu Lu. The device, which mounts directly on the skin, has potential applications in medical diagnostics, communications, and human-machine interfaces. The researchers reported their development in *Science*.

*U of I News Bureau*

## **MISTAKEN BELIEFS ABOUT MEMORY**

August 2 – Using what he says is the “first large-scale, nationally representative survey

of the U.S. population to measure intuitive beliefs about how memory works” Beckman Institute researcher Daniel Simons, along with his collaborator Chris Chabris, report that large segments of the general public misunderstand basic properties of memory. Simons said the survey results are in line with what his research experiments such as the famous “Invisible Gorilla” study have shown: “People tend to place greater faith in the accuracy, completeness and vividness of their memories than they probably should.”

*U of I News Bureau*

## **BENEFICIAL EFFECTS OF EXERCISE ON BRAIN, COGNITION**

July 26 – Graduate student Michelle Voss was lead author and Beckman Institute Director Art Kramer a co-author on a review paper for the *Journal of Applied Physiology* on the current evidence for the relationships between physical activity and exercise and the brain and cognition throughout the lifespan in non-pathological populations.

*e! Science News*

## **PORTABLE, INEXPENSIVE GLUCOSE METER DEVELOPED**

July 25 – Beckman Institute researcher Yi Lu and his collaborators have developed a simple, inexpensive, and portable glucose meter that has a wide range of applications for detecting target molecules in blood, water, or food.

*U of I News Bureau*

## **VASCULAR COMPOSITES ENABLE DYNAMIC STRUCTURAL MATERIALS**

July 25 – Researchers Scott White, Jeff Moore, and Nancy Sottos of the Beckman Institute’s Autonomous Materials Systems group developed structural composites that use the vascular circulatory systems found in nature as a blueprint. In a paper in *Advanced Materials*, they report on a new class of vascular materials that are scalable, lightweight and strong, and perfect for manufacturing purposes such as in self-

healing and self-cooling applications

*U of I News Bureau*

## **BREAKTHROUGH 3-D PHOTONIC CRYSTAL DEVELOPED**

July 24 – Paul Braun of the 3-D Micro- and Nanosystems group led a team that has demonstrated the first optoelectronically active 3-D photonic crystal. “We’ve discovered a way to change the three-dimensional structure of a well-established semiconductor material to enable new optical properties while maintaining its very attractive electrical properties,” Braun said.

*U of I News Bureau*

## **FABRICATING NANOSTRUCTURES ON PLASTIC SUBSTRATES**

July 22 – Technology from Beckman Institute faculty member William King undergirds a nanolithography technique for fabricating nanostructures on plastic substrates.

*e! Science News*

## **BATTERY TECHNOLOGY DEAL SIGNED**

July 22 – The University of Illinois at Urbana-Champaign announced it has entered into a licensing agreement with Xerion Advanced Battery Corp. under which Xerion has the exclusive right to bring the University’s StructurePore battery-charging technology to the market. The StructurePore technology was developed by Beckman Institute faculty member Paul Braun, of the Department of Materials Science and Engineering.

*Nanowerk News*

## **GAMES THAT EXPAND YOUR BRAIN**

July 18 – The research of Beckman Institute Director Art Kramer and postdoctoral researcher Chandramallika Basak – which showed that some vital cognitive skills improved in older adults trained in a strategic video game called Rise of Nations – was featured as the seventh slide in an article on the impact that playing video games can have on the human brain.

*PC World*

*more on page 12*

## **MICRORNAs IN THE SONGBIRD BRAIN RESPOND TO NEW SONGS**

June 30 – David Clayton of the Beckman Institute's NeuroTech group led a study that found that microRNAs in the brain of the zebra finch songbird – a model organism for studying changes in the brain – go up or down after it hears a new song. The findings show for the first time that microRNAs are a contributor to the process by which the brain responds to its environment. The paper reporting their discovery is available online.

*U of I News Bureau*

## **RESEARCHERS RECORD TWO-STATE DYNAMICS IN GLASSY SILICON**

June 14 – Martin Gruebele, a member of the Beckman Institute's Nanoelectronics and Nanomaterials group, led a collaboration that, for the first time, observed that the semiconductor amorphous silicon used in many device applications is a glass – until hydrogen is added.

*U of I News Bureau*

## **ROGERS AWARDED LEMELSON-MIT PRIZE**

June 14 – Beckman Institute researcher John Rogers has been awarded the Lemelson-MIT Prize for Health and Energy Innovations. In awarding the \$500,000 prize, the Lemelson-MIT program stated that Rogers's work proves that "technological entrepreneurship can have groundbreaking impact when inventive concepts stretch across disparate fields."

*U of I News Bureau*

## **PRACTICAL METHOD FOR MAKING INVISIBILITY CLOAKS CREATED**

June 13 – Research led by John Rogers of the Beckman Institute created a printing method that now makes it possible to fabricate superlenses and invisibility cloaks in a practical way.

*Technology Review*

## **NEURONS TAKE SIX MONTHS TO MATURE**

June 7 – William Greenough of the Beckman Institute's NeuroTech group is part of a team that found that new neurons take more than six months to mature in monkeys, and likely even longer in humans.

*University of Pittsburgh*

## **ILLINOIS RESEARCHERS SOLVE BLOOD-CLOTTING MYSTERY**

May 31 – In a project partly led by Beckman Institute faculty member Emad Tajkhorshid, researchers at the University of Illinois were

able to use supercomputer simulations and other methods to paint an atomistic picture of a chemical interaction critical to blood clotting, and answer for the first time questions about the process.

*U of I News Bureau*

## **HARNESSING THE POWER OF THE MIND**

May 20 – The work of Beckman Institute faculty member Tim Bretl is highlighted in a story about research into brain-machine interfaces. Bretl is a member of Beckman's Artificial Intelligence group.

*Medill Reports*

## **SIMONS COMMENTS ON PARKING APP**

May 9 – Beckman Institute researcher Dan Simons comments on the potential dangers of a new phone app for drivers in San Francisco that displays information about available parking spaces.

*New York Times*

## **LOW-COST SENSOR QUICKLY**

### **IDENTIFIES INFECTIOUS BACTERIA**

April 28 – Beckman faculty member Ken Suslick developed an artificial "nose" that can diagnose bacterial infections in only a few hours.

*U of I News Bureau*

## **INCREASING COMPUTER POWER**

April 13 – A story about advancements in the computing power of cell phones and other personal electronics focuses on the work of Eric Pop of the Beckman Institute's Nanoelectronics and Nanomaterials group.

*Christian Science Monitor*

## **NEW METHOD PROVIDES RAPID, HIGH-DEFINITION IMAGING**

March 23 – Rohit Bhargava of the Beckman Institute's Bioimaging Science and Technology group and Carle Foundation/Beckman Fellow Michael Walsh are part of a multi-university collaboration that developed a new synchrotron-based imaging technique that produces high-resolution, high-quality pictures of the molecular composition of tissues with unprecedented speed. They reported their results in the journal *Nature Methods*.

*U of I News Bureau*

## **HOW SPORTS MAY FOCUS THE BRAIN**

March 23 – Beckman Institute Director Art Kramer and Laura Chaddock from his research group are the focus of a *New York Times* article that focuses on their study

comparing athletes and non-athletes when it came to performing the task of crossing a virtual street. Their study suggests that the better performance for the athletes in the study was due to their superior information processing power rather than their athletic superiority.

*New York Times*

## **INNOVATIVE TECHNOLOGY FOR BATTERIES**

March 23 – Beckman Institute researcher Paul Braun and his group have developed a self-assembling three-dimensional nanostructure for battery cathodes that enables extremely quick charging and discharging without sacrificing energy storage capacity. The new technology, reported on in the journal *Nature Nanotechnology*, is compatible with current manufacturing methods and ideal for use in consumer electronics, electric vehicles, and medical devices, among other applications.

*U of I News Bureau*

## **NANOINK PRINTING PROCESS GREATLY ENHANCES CELL PHONE RECEPTION**

March 18 – Beckman researcher Jennifer Lewis, Jennifer Bernhard and postdoc researcher Jacob Adams designed a unique nanoink printing process that advances small antenna design for devices including cell phones and airplane antennas. The research is included in the March 18, 2011 issue of *Advanced Materials*.

*Engineering at Illinois*

## **MULTI-TASKING IMPAIRS STREET CROSSING PERFORMANCE OF OLDER ADULTS**

March 16 – A new study conducted by Beckman Institute researchers found that older pedestrians who talk on a cell phone significantly impair their ability to perform the most challenging aspects of crossing a street. The study was done by Beckman postdoctoral researcher Mark Neider and Institute Director Art Kramer.

*U of I News Bureau*