

Spring 2013

# Iowa's innovators

*Jacob Elkins' research on hip implants wins  
finalist award for nation's top dissertation*

GRADUATE EDUCATION at

# IOWA

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## ON THE COVER



Jacob Elkins, M.D./Ph.D. candidate in biomedical engineering. Elkins has been recognized as one of two finalists in his field at CGS' recent annual meeting. His dissertation, "Biomechanics of Failure Modalities in Total Hip Arthroplasty," details his research on the failure of total hip implants due to impingement and/or dislocation. Photo by UI Photo Services.

## Graduate Education at Iowa

Published each fall and spring  
by the Graduate College at the University of Iowa

Online at [www.grad.uiowa.edu](http://www.grad.uiowa.edu)

Jennifer Masada—editor, designer, writer, photos  
John Riehl—writer, photos

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Printed by UI Printing Department, job #W04766



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# IOWA

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# Outstanding mentors

Award-winning faculty help launch students' careers

**Students gain better career preparation through mentors who integrate students into every aspect of the research.**

**T**he University of Iowa Graduate College awarded K.K. Choi, Witold Krajewski, and Sara Mitchell top recognition excellence in mentoring graduate students.

Choi, professor of mechanical engineering, and Krajewski, professor of civil and environmental engineering, are co-winners of the 2012 Graduate College Outstanding Faculty Mentor Award in mathematical and physical sciences and engineering. Mitchell, professor of political science in the College of Liberal Arts and Sciences, received the 2012 Graduate College Outstanding Faculty Mentor Award in social sciences.

The professors were nominated for the award by their students and colleagues and honored during a ceremony Nov. 27, 2012, at the Levitt Center for University Advancement.

"Teaching, researching, and mentoring are all integrated processes," Mitchell says. "Your research is better when you integrate it to your classroom and have students involved in your projects. They push you in directions that you didn't anticipate."

## K.K. Choi

As a young professor in the College of Engineering, Choi endeavored to keep up with all the details of his students' research. However, he soon realized that he could be a "ceiling" to his students' potential research achievements.

In 1994, Choi and his research team received \$1 million from Ford Motor Company to develop software that would optimize the car body, making it as light as possible and without vibration. Much to his disappointment, Choi learned that his car was too expensive to build due to the precise thickness of the steel required for his computer-engineered design.

"This car is just a dream. It's not going to be on the road. I felt like someone hit me with a hammer," Choi recalls. "I had been doing science, not engineering. Science is like math; everything is on a piece of paper or a computer program. It's not the reality; it's not real engineering."

After that experience, Choi changed his research area from "design sensitivity analysis and design optimization of mechanical systems" to "mechanical systems design under uncertainty."

This shift had a big impact on how he mentored

his graduate students.

"I am learning as much as the students are learning, because this is a new area," says Choi, also faculty in the Interdisciplinary Graduate Program of Applied Mathematical and Computational Sciences. "With my experience, I can guide them to be an expert in their field. If you don't guide your students properly, they will run around in all different directions and become very inefficient. I make them be very clear about their objective."

This approach works well with his students.

"Professor Choi is respectful, humble, and honest with his students and others as well," writes doctoral student Nicholas Gaul in his nomination letter on Choi's behalf. "He pushes us hard, in a good but not overbearing way, because he wants us to become as successful in our careers as he has been in his."

## Witold Krajewski

Krajewski's mentoring goal is to learn from his students. He accomplishes this with a coaching approach, drawing on his athletic background of training and competing nationally in judo.

"The coaches I appreciated the most were able to balance direct criticism of my skills with encouragement and trust in my abilities," says Krajewski, director of the Iowa Flood Center and chair of water resources engineering. "I pride myself in bringing in three-star recruits and developing them into high-level professionals."

Eight of his doctoral students have received the prestigious NASA Global Change Fellowship. Application materials included a detailed research proposal developed under Krajewski's guidance.

Krajewski and his colleagues also initiated an annual legislative breakfast at the Iowa State Capitol at which UI faculty and students affiliated with the Iowa Flood Center communicate their accomplishments to state representatives.

"Professor Witold creates avenues for his students to appreciate the impact of our research in the real world," writes doctoral student Tibebe Ayalew in his nomination letter on Krajewski's behalf. "I had the opportunity of presenting my research results at the 2012 Iowa Legislative Breakfast. My challenge was to prepare a poster and be able to effectively communicate my research findings to the general public. He was very helpful throughout the process."





2012 GRADUATE COLLEGE OUTSTANDING MENTOR AWARD WINNERS. From left: K. K. Choi, Sara Mitchell, Graduate College Dean John Keller, and Witold Krajewski.

Krajewski sees mentoring as part of learning alongside his students.

“We learn together. I want to learn more from what they are doing,” Krajewski says. “The research we do is trying to figure out nature, so there are plenty of surprises and plenty of complexities.”

### Sara Mitchell

Mitchell believes good mentors are candid with their students. She chooses to tell her students what they need to hear, not just what they want to hear.

This straightforward approach has earned Mitchell the respect of her students.

“When a student does something well, I tell them that. When they do something that is not very good, I try to be honest with them,” says Mitchell. “I would say honesty is the best policy, which, amazingly in our field, is kind of rare.”

Clayton Thyne, who earned his doctorate at the UI in 2007, illustrated Mitchell’s tough-love philosophy in the nomination letter he wrote on his mentor’s behalf.

Thyne recalls his lackluster effort in helping out with a conference that Mitchell held at the UI.

“Sara sent early and consistent signals that she would accept nothing but excellence in all facets of my development, and this is what she eventually got,” says Thyne, associate professor of political

science at the University of Kentucky. “Regarding the ‘love’ part, Sara is quick to give credit where credit is due, though she will never give praise when it is not fully warranted. This means that one can take her praise to heart, knowing that it is completely genuine.

“Put simply, when Sara speaks, people listen, and her tough-love approach is well known beyond Iowa.”

As a female scholar, Mitchell is passionate about providing mentoring opportunities to underrepresented groups, especially female scholars in her research area of international conflict—traditionally a male dominated field.

In 2001, Mitchell helped create an informal mentoring group for Women in Conflict Studies (WICS). Starting with just four faculty members, the national group has grown to over 90 faculty and 100 students.

The primary goal of WICS is to help integrate women into the profession early, providing them with an additional source of contacts working in the same general research area with whom they can collaborate and exchange feedback on their work.

“We work in a field that is pretty male dominated. The basic idea is to create a network for women,” Mitchell says.

# Perceptions of pain

Staja Booker studies under-managed pain in older African Americans



**R**esearch shows that African Americans generally have a higher pain tolerance than most people. Moreover, many are under-treated for chronic and acute pain, causing their health to decline. Staja Booker wants to find ways to help African Americans receive better chronic pain care.

Booker, a Ph.D. student in the College of Nursing at the University of Iowa, believes that providing quality pain management for African Americans requires gaining an understanding of their unique cultural perceptions and life experiences related to pain. Such information will be important, Booker says, in helping patients and their medical practitioners make good pain management decisions.

In her research, Booker will follow the medical progress of older African Americans who don't seek regular pain care, examining factors that affect these patients' preferences in the treatment of pain.

Booker asks, "What is really needed to ensure that their treatment plan is effective for their individual pain needs?"

"This includes educating patients on the various treatment

strategies and the effects of under-managed pain," Booker says. "In addition, there is a need to educate health care providers, especially primary care providers who most likely are not skilled, according to current best evidence, about effective pain assessment and treatment in diverse populations or on the effect of culture and health literacy on informed decision-making and pain perception and processing."

Booker, a Dean's Graduate Research Fellow, is pursuing her Ph.D. under the mentorship of Professor Keela Herr, co-director of the Hartford Center for Geriatric Nursing Excellence.

As a master's student at Penn State University, Booker began to focus more on the pain experience in African Americans.

In clinical practice, she observed differences in how African Americans express, communicate, and seek treatment for pain. She verified this observation with previous research, showing that African Americans attribute different meanings to and causes for pain. They also experience greater pain severity and duration.

Older African Americans are at a higher risk than most



people of receiving inadequate pain management, which leads to further health complications and declines in physical function, emotional and cognitive status, and social life.

But many of the factors that contribute to disparities in pain management in older African Americans are under-researched.

“Although pain is one of the top reasons why people seek medical care, there is significant under-utilization of pain care services by African Americans,” Booker says. “This leads to under-management and mismanagement of pain, resulting in huge personal and ethical issues and economic costs. This is why long-term, cost-effective strategies to reduce pain disparities in older African Americans are highly needed.”

This fall, Booker presented her research at four conferences: the Council for the Advancement of Nursing Science, the Gerontological Society of America, the National Gerontological Nurses Association, and the

NIH-NIMHD sponsored Science of Eliminating Health Disparities Summit.

“(Booker) was very active in her master’s program and was already doing scholarly activities that early doctoral students are doing,” Herr says. “She is definitely on the fast track to build her area of expertise and be recognized in her field. I was very impressed by her initiative and experiences and her approach to thinking about what she could do next.”

“I hope that my research as a Ph.D. student can help advance my long-term goal of identifying more culturally-appropriate and acceptable pain treatment practices and strategies for older African Americans,” says Booker. “I hope it will improve quality of life in ethnogeriatrics.”

*Booker’s research has been supported by the Graduate College’s Dean Graduate Research Fellowship Program and a Graduate Student Senate Travel Grant.*



DEAN'S GRADUATE RESEARCH FELLOW STAJA BOOKER is poised to take on a leadership role in the field of pain management. In the past year, she has presented her research at four major conferences across the nation.

## A special bond

Staja Booker credits her 104-year-old grandmother, Clara Henderson, for inspiring her interest to work as a geriatric nurse. Starting at age five, Booker and her grandmother always have “clicked.”

“We shared a special bond despite our huge age difference,” Booker says. They were next-door neighbors in Jonesboro, La., until Booker’s high school years, when her grandmother moved to Arizona.

As a child, Staja played outside while her grandmother was gardening. They talked all the time about such topics as her grandmother’s childhood, religion, and future goals. Booker even helped her grandmother manage her diabetes by monitoring her glucose, giving her insulin shots, and planning her meals.

“Pain isn’t a normal part of aging; no one should experience unrelenting pain in their final years of life. My grandmother is 104 and she neither verbalizes nor shows any pain,” Booker says. “I’ve watched her age every year, but she’s still in good health. She’s a rare person. She has had diabetes for over 30 years, and for the most part it’s been under control.

“She was an active gardener, and I think working outside helped her health. She has a positive attitude about everything, and I think that is a prime reason why she is still with us today.”

Is mindfulness relaxation training an effective strategy for pain management?

“A positive attitude helps people in the development of disease, prevention of disease, and management of disease,” Herr says. “Successful pain management is heavily influenced by what you bring to the experience mentally, emotionally, and physically, and a positive attitude does make a big difference.”

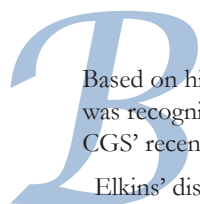






# *Prize-winning* **research**

Elkins named finalist for national dissertation award



Based on his excellence in doctoral research, Elkins, who satisfied his Ph.D. requirements in January 2012, was recognized as one of two finalists in the field of Mathematics, Physical Sciences and Engineering at CGS' recent annual meeting.

Elkins' dissertation first won recognition at the University of Iowa when the Graduate College awarded him the prestigious D.C. Spriestersbach Dissertation Prize in mathematics/physical sciences/engineering.

"This prize validates the hard work, and I am proud of it," says Elkins, who will complete his M.D. in May 2013. "To be recognized for this research motivates me to do it better."

The Spriestersbach Prize is named for Duane C. Spriestersbach, who served as Graduate College dean from 1965 to 1989. When the prize was founded over 30 years ago, Spriestersbach hoped it would "serve as tangible evidence—as 'gold standards'—of the outstanding work of which graduate students are capable and to which all others should aspire."

Winners of the Spriestersbach Prize are the UI's nominees for the Council of Graduate Schools (CGS)/University Microfilms International (UMI) Distinguished Dissertation Award. This national award is the most prestigious dissertation prize in the country.

Iowa has had five national winners, more than any other public institution. Thirteen more Iowa nominees have been finalists in the national competition. CGS has presented 45 awards across disciplines, and Iowa students have been finalists or winners in over 40 percent of the awards.

**“Iowa has had five  
national dissertation  
winners, more than  
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# Calculating

**“Elkins’ dissertation will have a lasting impact on how medical implants are designed and how we treat patients with orthopaedic disorders.”**

—Joseph Reinhardt,  
professor of biomedical  
engineering

**F**or two years, Jacob Elkins worked as a surgical technician at the Reno (Nev.) Veterans Hospital. He witnessed many hip and knee replacement surgeries and quickly learned that these implants can fail.

“When they fail, it’s horrible for the patients,” Elkins says. “Sometimes, they need multiple revision surgeries, increasing the risk of vascular injury, neurological injury, infection, and even limb loss.”

Motivated to make a difference, Elkins enrolled in the University of Iowa’s M.D./Ph.D. Program in Biomedical Engineering in 2005 and developed the first computational model that simulates the hip dislocation process as it actually occurs in the human body. It took Elkins a full year and a half to develop the model, which became the centerpiece of his doctoral dissertation. Elkins’ research has garnered interest in his field, resulting in eight published/accepted papers and thirty-five conference presentations.

Elkins’ dissertation, “Biomechanics of Failure Modalities in Total Hip Arthroplasty,” details his research on the failure of total hip implants due to impingement and/or dislocation.

“Jake’s dissertation research has broken new ground in the area of computational biomechanics and finite-element modeling as applied to orthopaedics,” says Joseph Reinhardt, professor of biomedical engineering and member of Elkins’ dissertation review committee. “His dissertation will have a lasting impact on how medical implants are designed and how we treat patients with orthopaedic disorders.”

## **Model of normal hip function**

The first portion of Elkins’ thesis outlines the overall model formulation, with particular emphasis on the hip capsule—a thick jacket of ligamentous tissue that surrounds the joint.

“He kept getting slapped down by the algorithm for the model and he kept bouncing back up,” says Thomas Brown, Richard and Janice Johnston

Chair of Orthopaedic Biomechanics and Elkins’ dissertation advisor. “I really love the guy’s perseverance. He is a warrior. His capsule model isn’t something for the faint-hearted. From a biomechanics standpoint, it’s been so difficult to quantify.”

## **Problems with metal implants**

The second section focuses on implant problems that occur due to impingement, which is caused by a lack of room or clearance between the neck of the femur and the rim of the hip socket.

This work has several potential applications, including solutions for impingement problems that occur in metal-on-metal implant designs, currently a pressing clinical concern due to large numbers of early failures of this class of implants.

“I started looking at metal-on-metal, because these things were failing at astronomical rates, but they shouldn’t have,” Elkins says. “From an engineering perspective, metal-on-metal bearings are superior to anything else out there, but when you put them in a patient, they weren’t working. The bottom line is the actual design of the implant was sub-optimal. People designing the implant didn’t look at various factors that we’re able to explore readily with this model.”

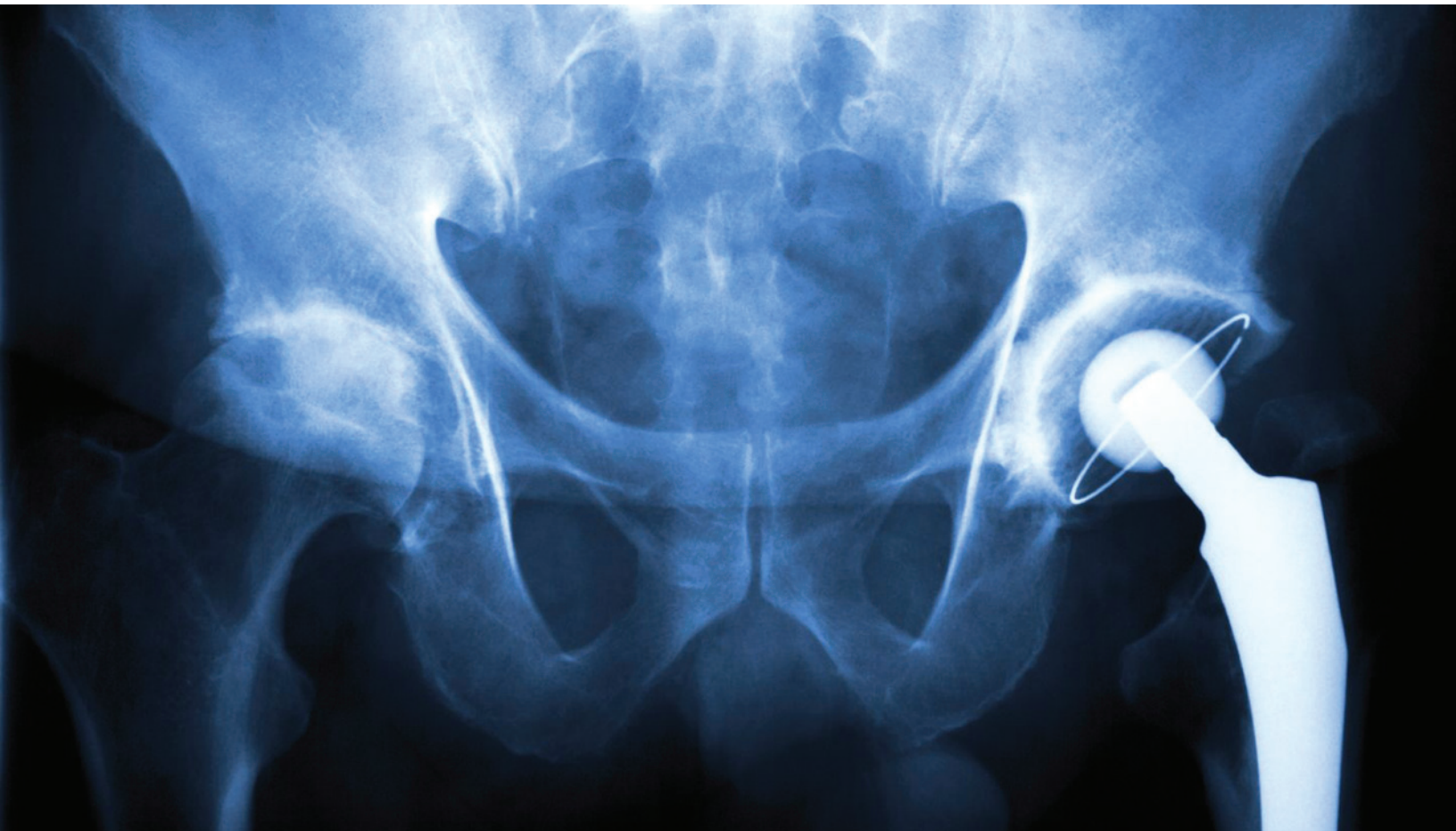
One factor implicated in implant failure is edge-loading, which occurs when too much pressure is placed between the edge of the metal cup and the ball. Such pressure dramatically increases the rate at which the replacement joint deteriorates. The tiny metal particles that wear off the joint through edge-loading can lead to loosening in the joint. The particles can also inflame surrounding flesh and enter the bloodstream, causing illness or injuries elsewhere in the body.

## **Problems with ceramic implants**

Next, Elkins’ dissertation describes fractures that can occur in ceramic total hip implant designs, which serve as an alternate to metal-on-polyethylene and metal-on-metal bearings. Ceramic implant fractures are rare, but when



# a better hip



X-RAY of hip implant. Photo from iStockphoto.

they happen the result is disastrous. Elkins approaches this issue computationally, since many ceramic fractures occur due to impingement.

“My favorite part of his dissertation is the fracture work,” Brown says. “To simulate that computationally, which is very desirable from a design standpoint, was a bear. Jake picked that up beautifully.”

## Award-winning research

In addition to winning the UI Spriestersbach Prize and placing among the top dissertations in the national competition, Elkins received the prestigious William H. Harris, MD Award from the Orthopaedic Research Society in 2011. This award, sponsored by

the Harris Fellows Club, honors an individual based on the quality and scientific merit of a paper submitted to members of the Orthopaedic Research Society Special Projects Committee.

Elkins also was honored by his faculty mentor.

When Brown received the Orthopaedic Research and Education Foundation’s Clinical Research Award in 2012, he recognized Elkins as a co-author on the winning project, “Impingement and Dislocation in Total Hip Arthroplasty: Mechanisms and Consequences.”

“We’ve done a lot of research in this lab through the years,” Brown says. “On Jake’s watch, the research was beautifully brought to closure. It was sheer hard work; he put in huge hours.”



**A**s technology shrinks the world, our neighbors in developing countries seek sustainable solutions to their educational, socioeconomic, and health care issues.

Graduate and professional students at the University of Iowa are working on the ground in remote locations abroad, forging multidisciplinary research projects that create safer and healthier societies.

There is no substitute for the positive impact of one-on-one personal interactions, and these Iowa scholars make that happen in villages, family homes, and farms all over the world.

UI students promote the Ponseti Method as an effective treatment for clubfoot in southeastern Brazil and Peru; they teach people to boil water as a method of household water treatment in India; they assist with a successful polio eradication program in Senegal. This is just a snapshot of their outreach efforts.

Students presented their work on these and many other projects at the first Iowa Graduate Global Health Symposium Nov. 7, 2012 at the College of Public Health. UI graduate/professional students and faculty delivered poster presentations and submitted photographs for a photography contest, illustrating their original research projects.

The Executive Council for Graduate and Professional Students (ECGPS) organized the symposium to increase collaboration and improve networking between students, faculty, and staff who participate in global health activities at the UI.

*—Continued on the next page*



# Global Outreach





**POST-DISASTER WATER SANITATION.** Photo by Luke Juran (pictured in the center), who travelled in India to conduct research in post-disaster water sanitation through a Fulbright grant. The area of India he studied was severely impacted by the Indian Ocean tsunami in 2004. Juran visited over 25 post-disaster settlements and spoke with the affected populations, trying to identify the most important problems they were facing. What he learned was that access to water, quantity and quality of water, and issues with toilet and sewage infrastructure were the root causes behind many of the larger issues in these settlements. With this in mind, Juran decided to investigate the problem of water quality further by closely studying 14 settlements in two separate states. He interviewed members of the community, tested water quality, and spoke with government officials on why these problems were occurring and how they might be averted in the future.

In addition to his dissertation research, Juran strove to engage in person-to-person diplomacy and to give back to the communities with which he was working. One way he was able to do this was through the identification and referral of children with cleft-lip and cleft-palates, and 27 of those cases received free remedial surgeries. He also arranged the donation of 21 goats to the local community.





**LIGHTING THE WAY TO HEALTH.** Photo by Lindy Carr, College of Public Health, Department of Occupational and Environmental Health. January 2011. A clean and sustainable source of light promotes good health. Here we see solar lamps charging in a rural village near Chitrakoot, Madhya Pradesh. These lamps prevent hazardous indoor air exposures, encourage reading, and reveal nighttime hazards.

“This is a grassroots effort by students who are trying to improve the lives of people somewhere else,” says Jonathan Schultz, symposium organizer and UI second-year medical student. “The disparity you see in developing countries is so utterly different than here in every aspect of life. It’s just not fair for them. It’s about social justice: the right to health care, the right to sanitation, the right to hygiene.”

Rene Genadry, M.D., UI clinical professor of obstetrics and gynecology, presented a poster at the symposium about the quality of life of women with obstetric fistula in Bangladesh. He is impressed by the quality, scope, and amount of global health research Iowa students conduct.

“It is refreshing to see these talented students, through their enthusiastic engagement on the ground, spearheading the effort to widen and deepen the exposure and commitment of their fellow students and faculty in the field of global health,” Genadry says. “They have understood

the importance of partnering with a variety of disciplines to bring about the best solutions to common problems with differing implications to culture and environment.”

### **Luke Juran**

Luke Juran, who earned his Ph.D. in geography in November 2012, says the only way you can make a difference in the developing world is by spending time with the people and gaining an understanding of their problems.

Juran conducts most of his research in India, Sri Lanka, and Bangladesh, looking at how to improve reconstruction outcomes following natural disasters. Juran specializes in research on the best ways to rebuild safe water supplies.

“We live in an interconnected world, and there’s no going back from that,” says Juran, who recently conducted research on post-disaster water sanitation in India through a Fulbright grant.



“Disasters will continue to impact every corner of the globe. We learn lessons for reconstruction after each disaster, and we want to improve that process because it is going to be replicated across different disasters and across different cultures. I perceive issues surrounding water and disasters as universal, but their solutions are determined locally.”

### Erin Reynolds

Erin Reynolds says it's not easy to witness poverty and public health concerns that pervade an entire population. Reynolds, who earned her Ph.D. in epidemiology in October 2012, worked in the rural community of Tamil Nadu, India, developing an educational intervention for chikungunya fever—a mosquito-borne disease characterized by severe joint pain.

“We can turn on any faucet and not have to worry if the water is clean or not,” Reynolds says.

“We can turn on any faucet and not have to worry if the water is clean or not. Problems globally versus domestically are so much more acute in the low-income countries. Those are the people who need us the most.”

—Erin Reynolds, Ph.D. epidemiology



ELIMINATING MOSQUITO-BORNE DISEASE. Photo by Erin Reynolds, College of Public Health, Epidemiology. Tamil Nadu, India. October 2012. Chikungunya fever is a devastating but preventable mosquito-borne disease characterized by severe joint pain. Reynolds worked in local communities to share educational programs on how to prevent the problem.



“Problems globally versus domestically are so much more acute in low-income countries. Those are the people who need us most. The things we need help on are obesity and nutritious food; we’re not really looking at a lack of food, period,” says Reynolds.

Such international problems are multi-layered, with interacting factors that include social, environmental, economic, and political complications. Understanding these complexities is critical to adapting solutions to specific circumstances.

“We want safer societies, we want healthier societies, and we want people to get along,” Juran says. “Real goals are being worked toward by people at the University of Iowa. Not everything is theory, not everything is stuffy. There are things happening on the ground that have real implications to help people.”

There is no shortage of projects on the students’ plates. “The developing world is hungry for what Iowa can provide, not only in food, but in talent and well-thought-out solutions,” Genadry says.



BARRED FROM QUALITY. Photo by Piotr Starosta, Physician Assistant Program, Carver College of Medicine. Gashonyi, Rwanda. January 2011.

Bars at the only window in a small, un-lit obstetrics room at a rural clinic do nothing to prevent flies from entering as air flows over a small basin of hand-washed hemostats recently used for the delivery of a baby. This clinic in Gashonyi, Rwanda serves as the only source of medical care for a large population of subsistence farmers whose only means to get to clinic is by walking over thousand-foot mountain passes. A new clinic project supported by locals and Engineers Without Borders will improve medical services, access, and education for these hard-working Rwandans.





**SPECTACLES.** Jaime Butler-Dawson, College of Public Health, Department of Occupational and Environmental Health. Beka, Burkina Faso. 2006.

This woman purchased these spectacles in the local village market, where many villagers go to find cheap solutions to health issues such as substandard antimalarial or diarrhea drugs. The market is the only place for this woman can find and afford eyeglasses. The glasses are probably not the right prescription or be the solution but might help a little bit so that she can continue coming to the market to sell her products.

“We live in an interconnected world, and there’s no going back from that. We learn lessons for reconstruction after each disaster, and we want to improve that process because it is going to be replicated across different disasters and across different cultures.”

—Luke Juran, Ph.D. in geography

## Investing in global research

Part of the mission at the University of Iowa is to provide educational training and experiences that broaden perspectives. Many of Iowa’s graduate students have found ways not only to pursue their research, but also to reach populations in need around the world. The result is a win-win.

The Graduate College invests in international professional development and research with the T. Anne Cleary International Dissertation Research Fellowship. This award provides funds for select UI doctoral candidates to conduct dissertation research outside of North America, and is available to all disciplinary areas.

# LOST and FOUND

## Artifacts reveal details about daily life

*This is a morning of careful preparation. Dressing for the day demands extra attention when going to the public bath house.*

*And so the woman chooses the tunic reserved for such occasions, but is careful to select an undergarment that shows appropriate modesty. She examines the beadwork to be sure it looks well cared for—just enough decoration to be treated with respect without appearing too rich. She must walk through the local market on her way, and vendors always press toward those who look wealthy enough to pay for extra trinkets. No, today she can't afford delay.*

*She gathers other things she'll need at the baths—a little food and her best needle work to occupy her time productively. Her hand pauses as she thinks about the day. A ring. She should wear her mother's ring. It will help show her social standing, which could pave the way to fruitful negotiations with the military officer's wife.*

*As she prepares, she thinks of the fate of her small family: her soldier husband, young son, and unborn child. Although they cannot legally marry according to military code, their lives are tolerable in the outskirts near the fort. But she seeks more security and comfort for her growing family. The officer's wife is an acquaintance who just might have connections to broker a move into the fort's more comfortable, safer quarters.*



*That was the day the woman lost her mother's ring. It slipped from her finger, having never been properly resized for her hand. Could this be the ring found, centuries later, in a drain excavated at the site of an ancient Roman bath?*

**A**lthough this story is fiction, the facts of ancient life hold interest for us today. **Alissa Whitmore**, Ph.D. candidate in anthropology, studies artifacts found in the drains of ancient Roman baths from the 2nd century BCE to the 4th century CE.

Her work breaks new ground, analyzing objects discovered in archaeological excavations of ancient bath structures to verify and expand upon information found in ancient texts about the baths.

Much scholarship about the baths exists, based in part on texts written at the time. Such texts discuss the architecture and social life in the baths, but were written primarily by upper class males, providing a narrow view of the baths. Less is known about how women and children used the baths. Ancient texts often leave out details about common activities and objects that were not considered noteworthy. Whitmore studies these items to fill in missing

details about normal life in ancient times.

Artifacts lost in the drains reveal that baths were used for a variety of purposes by a variety of people. Men, women, and children of various social standing frequented public bath houses, which were multifunctional spaces.

"Not only did people bath there, but there's evidence that they also ate, played games, and did craft work. Baths were an important hub where people networked. A few baths even have evidence that suggests medical procedures took place there," says Whitmore.

Artifacts Whitmore examines include beads, jewelry, hairpins, and needlework tools. These findings provide tangible evidence of ancient bath activities.

### Creating a research method

To conduct this research, Whitmore needed to draw upon the research methods of scholars in related disciplines.





Photo credit: Alissa Whitmore, with permission of the Weißenburg in Bayern Römermuseum.

*This photo shows a drain in the Weissenburg baths, which are located in the community (vicus) surrounding a military fort. Artifacts found in this drain include hairpins, an earring, tableware, oil and perfume flasks, and toilet and surgical implements, including a scalpel.*

*“Since only the most wealthy had baths in their own homes, a large spectrum of Roman society used the public baths. These baths in Roman society became major social, as well as hygienic, centers, and understanding this social environment can provide a window into larger Roman society.*

*“The artifacts found in baths, which are typically lost or discarded possessions of the bathers, can provide information on the social identity of the bathers, including categories such as gender, age, and social status. These artifacts also represent a variety of activities that bathers were performing in the baths, including eating/drinking, grooming, playing games, and craft activities. My sample of bath artifacts includes baths from Italy and the UK, as well as baths associated with towns and military sites, so my dissertation will compare artifacts from these sites to investigate if, and to what degree, bathers and activities varied over time, location, and bath type,” says Whitmore.*

“Since few people have focused on artifacts in baths, I looked at how archaeologists examine small artifacts and social groups, primarily women and children, in other settings, including Greek, Roman, Mesoamerican, and Middle Eastern houses and Roman military forts. I also used Roman texts, art, and grave goods in burials to connect different types of artifacts with men, women, children, and the upper and lower classes. This allowed me to understand and interpret the artifacts found in the drains.”

Since some Roman baths had separate spaces for men and women, she also studied ethnographic and sociological works that focus on how spaces are divided according to gender in other historic and modern cultures, including houses in the Middle East and South Asia, and Turkish and Japanese public baths.

Whitmore’s research is a unique combination of disciplines—classical languages (Greek and Latin), anthropology, archaeology, and ethnographic studies of the social use of space. These give her a rich and broad context within which to examine ancient literature, inscriptions, medical texts, and artifacts that create a more full picture of social life in the Roman public baths.

## Reflecting on our own culture

“Most Americans consider bathing to be a private activity, so ancient bathers and their activities are an interesting topic,” says Whitmore. “It is often easier, however, to explore and critically examine aspects of other cultures than to recognize these same traits in our own. Just like the Romans, we use

material culture, such as jewelry, to express our identities and to affect how other individuals perceive us. Physical spaces also greatly impact our lives, and are not merely a setting for the things we do, but, together with culture, impact or govern the things which are and are not acceptable in a given situation.

“Within Roman baths, ancient children learned culture, not only which behaviors and activities are appropriate in specific spaces, but also what it is to be Roman. Similarly, public spaces beyond the school room are often significant settings in which modern children learn the social lessons which allow them to become part of a community.”

Whitmore’s research helps us look at our own culture with a new eye, while shedding light on aspects of ancient times that don’t appear in the writings of the day. Although it may be hard to imagine that objects floating around our bath drains might be important, to Whitmore, they are a treasure trove of data. “Things we leave behind say a lot more [than texts] about who we are, what we are doing, and what we think is important.”

Whitmore (pictured here) received the following funding: Graduate College Ballard and Seashore Dissertation Year Fellowship, Graduate College T. Anne Cleary International Dissertation Research Fellowship and Graduate College Summer Fellowship; International Programs Stanley Graduate Award for International Research; research grants from the Executive Council of Graduate and Professional Students and the Department of Anthropology.





“Ancient texts are helpful, but the things we leave behind say a lot more about who we are, what we are doing, and what we think is important.”

—Alissa Whitmore on the importance of artifacts.  
Ph.D. candidate in anthropology at the UI



**PALESTRA OF CENTRAL BATHS**, Pompeii, Italy. This photo from the Palaestra, or exercise area, looks into the main bathing spaces of the Central Baths (the Caldarium can be seen through these large windows). Ancient texts suggest that the Palaestra would be an important activity area, in which bathers could play ball games, stroll, or meet with friends before bathing. Photo credit: Alissa Whitmore

**THE GREAT BATH** at Bath, England. This is the largest of the thermal pools at Bath, which is surrounded by impressive architecture and was fed by a hot spring. The baths, and the spring that fed them, were believed by the Romans to have healing properties. Photo credit: Alissa Whitmore





MEN'S CALDARIUM OF THE FORUM BATHS, Pompeii, Italy. The Caldarium is one of the hottest rooms in Roman baths, and is often equipped with a labrum, a pedestaled stone basin, which provides bathers with water to splash on their face and body. Opposite of the labrum (and out of the picture) is a hot water pool in which bathers could sit. Since the baths of Pompeii have two sets of bathing rooms, it is believed by some that one side was for men and the other for women. Photo credit: Alissa Whitmore







ANDREW SHEPHERD researches a mechanism underlying the regulation of neuronal excitability, survival, and death, which are processes central to such diseases as epilepsy, neuro-HIV, and stroke.

**A**ndrew Shepherd sees basic scientific research as something special on the path toward scientific discovery.

“To begin to fit all the pieces of the puzzle together, a lot of basic research like ours must happen first,” says Shepherd, a postdoctoral scholar in the Department of Pharmacology in the University of Iowa’s Carver College of Medicine. “I consider our lab fortunate that we were able to take these existing ideas and observations and fit them into a clinically relevant context. That’s the single most exciting aspect about basic research to me.”

Shepherd’s most recent research endeavor involved uncovering a mechanism underlying the regulation of neuronal excitability, survival, and death—processes central to such diseases as epilepsy, neuro-HIV, and stroke.

In a study published in the *Journal of Neuroscience* in December, Shepherd and his colleagues examined the release of a cell-signaling protein molecule, an inflammatory mediator called SDF-1alpha. Certain disease states prompt an abnormal release of SDF-1alpha molecules, which send signals telling cells to open the flood gates that control aspects of cellular voltage flow.

### **Kv2.1’s role in cell death**

In such cases, Kv2.1 is over-activated. Kv2.1 is a protein that holds the key to opening voltage-gated potassium channels. These channels regulate many body functions, including neurotransmitter release, heart rate, insulin secretion, neuronal excitability, electrolyte transport, smooth muscle contraction, and cell volume.

In healthy cells, the right amount of potassium



# Live or die?

## Postdoc Shepherd researches factors affecting cell life and death

helps maintain cell function. When the balance of potassium is disturbed, cell death may occur.

“In the acute phase, such over-activation of Kv2.1 is a good thing. It seems to be keeping the neurons alive when they otherwise would die from overwhelming stimulation,” says Shepherd, first author of the study. “What seems to go wrong is over-activation of this potassium channel, which persists for several hours and initiates cell death. The cells keep on losing potassium to the point where they can no longer function properly.”

Shepherd and his colleagues observed this change in neuronal excitability and cell death in rat hippocampal neurons due to modifications in this potassium channel. But how is the over-activation of Kv2.1 causing cell death?

“We think that the sustained loss of potassium from the cell compromises its ability to generate energy,” says Shepherd, who earned his Ph.D. in life sciences from the University of Manchester (England). “If your cell’s power producers aren’t functioning well anymore because of a lack of potassium, the cell can’t generate the required energy to survive. In order to function normally, neurons need that energy to keep lots of potassium inside with very little potassium outside.”

The Kv2.1 channel plays a central role, both in keeping neurons alive during altered cellular excitability and in letting potassium flow out of the neurons, which causes cell death.

“These research findings are highly significant to our basic understanding of the precise regulation of neuronal excitability and survival-death dynamics of mammalian brain neurons under a variety of neuropathological conditions,” says D.P. Mohapatra, principal investigator of this study, assistant professor in pharmacology and anesthesia, and faculty member in the Interdisciplinary Graduate Program in Neuroscience.

Mohapatra adds that Shepherd’s well-planned experiments and careful analysis of results led to

this important research finding, which could be key in designing a strategy for treating multiple neurological disease conditions in the future.

This work was funded by the UI Office of the Vice President for Research, an Epilepsy Foundation and American Epilepsy Society Research Grant, and a National Institutes of Health/National Institute of Neurological Disorders and Stroke Grant.

### Shepherd’s academic journey

Shepherd has grown as a scientist since joining Mohapatra’s laboratory in 2008.

“I’ve gained valuable insight into what setting up your own lab and research projects entails, rather than being ‘parachuted’ into an established lab and established projects,” Shepherd says. “It’s an experience that a lot of postdocs don’t necessarily get, and it wasn’t without moments of pressure and doubt, but I feel like that effort that we all made in those early years is now starting to bear fruit.”

The University of Iowa has been a great place for Shepherd to work.

“The fact that the Carver College of Medicine is so closely associated with the UI Hospital and Clinics is a great advantage for researchers like us,” says Shepherd, whose appointment at the UI will end in 2014. “It’s invaluable in creating the kind of collaborative environment and translational projects that are vital for coming up with new ideas and making important discoveries.”

Shepherd became interested in basic research as an undergraduate at the University of Manchester (England).

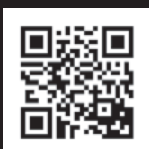
“I always remember being particularly interested in those lecture topics that had a clear, direct relevance to human diseases, and what we could do to further our understanding and eventually develop improved treatments,” Shepherd says. “Sadly, I think all of us are familiar in one way or another with at least one person afflicted with a debilitating neurodegenerative condition.”

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## **Calvin Carter**

Dean's Graduate Research Fellow  
Candidate for the Ph.D. in Neuroscience

*"The Dean's Fellowship has provided me with the resources to learn more about neuroscience and Bardet-Biedl Syndrome (BBS). As a Dean's Fellow, I am excited to contribute new knowledge to science and society and, most meaningful to me, to improve the quality of life of those suffering with this devastating condition."*

*"Bardet-Biedl Syndrome is a devastating genetic disorder that affects tiny hair-like structures called cilia. Cilia are vital for humans to function normally and when they are damaged or missing, affected individuals have impaired vision, obesity, cognitive impairments, hydrocephalus (a disease which can result in swelling of the head), respiratory problems, infertility, kidney disease, and many other abnormalities."*

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