

Perspectives

Spring 2015

Kavitha Penugonda



For the sake of our state

Graduate research projects focus on improving Kansas

Two Kansas State University graduate students are turning to research — from the Hessian fly to sorghum-based foods — to help Kansas.

Ryan Schmid



The two students — Kavitha Penugonda, doctoral student in human nutrition, from India, and Ryan Schmid, doctoral student in entomology, from Kingsley, Iowa — recently were chosen as winners at the 12th Capitol Graduate Research Summit.

The Capitol Graduate Research Summit at the State Capitol building in Topeka is a statewide event that features current Kansas-related research of graduate students at Kansas State University, the University of Kansas, the University of Kansas Medical Center, Wichita State University, Fort Hays State University and Pittsburg State University. University professors and industry representatives judged the students' posters and presentations.

The top presenters from each university received scholarships. Penugonda and Schmid each received a \$500 scholarship from the Kansas State University Graduate School. Penugonda also received a \$500 scholarship from BioKansas.

Kavitha Penugonda

Penugonda is assessing the iron bioavailability of sorghum-based fortified blended foods and comparing them with traditional corn-soy fortified blended foods. Her faculty mentor is Brian Lindshield, associate professor of human nutrition.

Sorghum is a gluten-free, nongenetically modified grain that is drought-tolerant and cost-effective. While both sorghum and cowpea are rich in iron, the presence of antinutrients gives sorghum poor iron bioavailability.

Penugonda used extrusion-cooked sorghum, soybean and cowpea fortified blended foods. She studied 14 different fortified blended foods, including two white varieties and one red variety of sorghum, and compared them with traditional fortified blended foods. By comparing different blends, Penugonda found that the bioavailability of extruded sorghum-cowpea and sorghum-soy fortified blended foods was comparable to traditional corn-soy fortified blended foods.

"Kansas has been the top producer of sorghum for many years and is contributing around 50 percent of the national sorghum production," Penugonda said. "Our study has found that equal iron bioavailability of sorghum-based fortified blended foods compared to corn-soybean fortified blended foods may mean that sorghum can be used in these products, which may increase the demand for Kansas-grown sorghum."

Ryan Schmid

Schmid is researching the Hessian fly, a major pest of wheat in Kansas. His faculty mentor is Brian McCornack, associate professor of entomology.

Schmid's research aims to examine trap design, deployment strategies and reporting systems to develop economical and efficient devices to monitor for the Hessian fly. He examined Hessian fly attraction to light-emitting diodes, or LEDs, of different colors, including blue, green, amber and red.

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FACULTY EXCELLENCE

Kansas State University faculty members continue to be recognized for excellence, earning a variety of fellowships and national awards in their fields. Here is a snapshot of honors awarded since September 2014.

Receiving fellowships are the following faculty members:

- **Anil Pahwa**, Logan-Fetterhoof chair and professor of electrical and computer engineering, is one of 13 individuals chosen nationwide as a prestigious Jefferson Science Fellow. Pahwa is spending the 2014-2015 school year at the U.S. Department of State in Washington, D.C.
- **Wendy Ornelas**, professor of architecture, has received the Richard Upjohn Fellowship from the American Institute of Architects.
- The National Academy of Inventors honored **Karen Burg**, Kansas State University's vice president for research and professor of chemical engineering, as a fellow of the academy. Burg, among the 170 academic innovators and inventors earning the honor, was recognized for her leadership and innovation in bioengineering research.
- **Kimberly Kramer**, G.E. Johnson construction science chair and professor of architectural engineering and construction science, was elected a fellow of the American Concrete Institute in recognition of her contributions to the professional organization.
- **Matthew Sanderson**, associate professor of sociology, was appointed visiting research fellow at the Australian Population and Migration Research Centre. The fellowship was awarded in recognition of his research record on migration, development and globalization.
- **Jane Mertz Garcia**, the Jack M. and Ruth C. Rice distinguished professor of family studies and human services, has been elected a fellow of the American Speech-Language-Hearing Association for outstanding contributions to the discipline of communication sciences and disorders.
- **Vara Prasad**, professor of crop ecophysiology, was named a fellow of American Society of Agronomy.
- **Curtis Thompson**, professor of agronomy, was named a fellow of American Society of Agronomy.
- **Kun Yan Zhu**, professor of entomology, was named a fellow of the Entomological Society of America.
- **C. Mike Smith**, professor of entomology, was named a fellow of the American Association for the Advancement of Science.
- **Chris Sorensen**, Cortelyou-Rust distinguished professor of physics, was named a fellow of the American Association for the Advancement of Science.

The following faculty members have received national awards:

- **Ray Buyle**, Tointon construction management chair and associate professor of architectural engineering and construction science, is the recipient of the Associated General Contractors of America 2015 Outstanding Educator Award.
- **Dan Thomson**, Jones professor of epidemiology and production medicine, and director of the Beef Cattle Institute, is the 2015 National Beef Quality Assurance Educator of the Year.
- **Stefan H. Bossmann**, professor of chemistry, received the title of Highest Honored International Expert by a panel of scientific advisers to the Chinese State Administration of Foreign Experts Affairs.
- **Gurpreet Singh**, associate professor of mechanical and nuclear engineering, received a \$500,000 National Science Foundation CAREER award for his proposal, "Scalable liquid exfoliation processing of ultrathin two-dimensional metal dichalcogenides nanosheets for energy storage devices."
- **Amanda R. Morales**, assistant professor of curriculum and instruction and diversity coordinator for the College of Education, received the Mid-America Association of Educational Opportunity Program Personnel's 2014 TRIO Achiever Award for her outstanding personal and professional accomplishments.
- The Kansas World Language Association named **Chuck Thorpe**, instructor for the SVS Spanish program through K-State Global Campus, the 2014 Kansas World Language Teacher of the Year.
- **Fred Hasler**, associate professor of architectural engineering and construction science, received a Presidential Award from the Illuminating Engineering Society in recognition of his exemplary efforts in support of the society.
- **Uwe Thumm**, professor of physics, was chosen as one of the 100 researchers internationally to receive the prestigious Humboldt Research Award for his lifetime research achievements in atomic, molecular and optical physics.
- **María-Teresa DePaoli**, associate professor of modern languages, received the 2014 Nueva Latina Estrella Award in the education category.
- **DeAnn Presley**, associate professor of agronomy, received the 2014 Young Scholar Award from the Soil Science Society of America Soil and Water Management Division.
- **Dorivar Ruiz Diaz**, associate professor of agronomy, received the Soil Science Society of America Early Career Award.
- **Cathie Lavis**, associate professor of horticulture, forestry and recreation resources, received the International Society of Arboriculture Alex L. Shigo Award for Excellence in Arboricultural Education.
- **Steve Keeley**, professor of horticulture, forestry and recreation resources, received the Crop Science Society of America Teaching Award.
- **Cheryl Boyer**, associate professor of horticulture, forestry and recreation resources, received the American Society for Horticultural Science Southern Region's 2014 John E. Hutchison Extension Award for Young Professionals.
- **Karen Burg**, vice president for research and professor of chemical engineering, was named one of six IEEE Engineering in Medicine and Biology Society 2015-2016 Distinguished Lecturers.
- **Jeff Zacharkis**, professor of educational leadership, received the Association for Continuing Higher Education's 2014 Leadership Award.
- **Royce Ann Collins**, associate professor of educational leadership, received the inaugural Council for Accelerated Programs in Higher Education's lifetime award. The award goes to someone who has exemplified the mission and vision of the council, which includes being an advocate for adult learners in higher education and instrumental in consulting and educating professionals and institutions about quality accelerated programs.

Finding their passion

Research leads to new opportunities for talented undergraduates

From cancer research to stream ecology, undergraduate researchers at Kansas State University are tackling some of today's most pressing concerns — and proving they are valuable members of research teams, say some of the university's top faculty researchers.

Involving undergraduates in research is important to Mark Weiss, professor of anatomy and physiology.

"Our mission at Kansas State University is teaching, research and service. Having undergraduates in the laboratory serves the missions of teaching and research," said Weiss.

Weiss has four undergraduates working in his lab during the spring 2015 semester:

- Thuan "Daniel" Quach, senior in biochemistry, from Garden City, Kansas, is finishing a project that he worked on for almost two years. He is determining methods for cryopreservation of rat sperm that produce the most viable sperm.
- Jenny Delzeit, junior in biology, from Dodge City, Kansas, is developing methods to measure the number of senescent cells that she grows for cell therapy. Her project involves expansion of cells on microcarriers and evaluation of the effect of 2-D versus 3-D culture on senescence.
- Michael Zuniga, sophomore in biology, from Dodge City, Kansas, is measuring the cytokines produced by the cells lab growing for cell therapy. Researchers want to see if they can manipulate what the cells produce to make the cells more effective for one type of treatment or another.
- Natalie Powell, junior in pre-medicine, from Springfield, Missouri, has just started her project to evaluate the self-renewal potential of cells using a classic assay called the colony forming unit fibroblast assay.

Quach, Delzeit and Zuniga are all members of the university's Developing Scholars Program, which provides underrepresented students opportunities to research projects with a faculty mentor.

"Life is about finding your passion and then pursuing it. When people are doing something they love, then it shows in performance," Weiss said. "The students find out if research floats their boat."

That's what Margaret Spangler, senior in biological systems engineering, from Overland Park, Kansas, has discovered. She has been working in the lab of Walter Dodds, university distinguished professor of biology, since 2013. Dodds specializes in water quality. Spangler's current project looks at the effect of rising atmospheric carbon dioxide levels on cyanobacteria blooms.

"I was really interested in aquatic research as a potential career, and working in Dr. Dodds' lab has really helped me realize that I want to pursue a career in research," Spangler said. "I want to earn my doctorate in ecological or environmental engineering and become a research/teaching professor. My undergraduate research experience has introduced me to a wide breadth of aquatic problems and diverse approaches to solving these problems."

Dodds says involving undergraduates in research is a win-win situation.

"I was an undergraduate researcher, and this is one way to pay it forward. Plus, I really like research and interacting with students. It is the perfect mix — and a successful one," he said.

Undergraduate research opened Mary Cain's eyes to a new career path. Cain, now a professor of psychological sciences, was planning on going to medical school when, as

a college junior, she was given the opportunity to conduct independent research in a field she didn't know existed: behavioral neuroscience.

"It completely changed my career plans and also gave me the opportunity to apply the information I was learning in my classes to my research," Cain said. "I try to involve undergraduates at all levels of the research process so they have the same opportunity I had. Watching a student develop as a researcher, learn how to apply the information they are learning in their courses and develop their confidence in their abilities is the most rewarding aspect of my job."

One of Cain's youngest undergraduate researchers is Keiteyana Parks. A freshman in pre-medicine from Lincoln, Nebraska, Parks also is a sprinter on K-State's track and field team — and she isn't running away from the challenge of juggling research with athletics. She's assisting Cain and a graduate student with a project examining the effect the rearing environment has on learning in stressful situations and related brain activities. A member of the Developing Scholars Program, Parks spends about seven hours a week in the lab working on this project and others.

"Though my ultimate career goal is to progress to medical school and specialize in pediatrics, specifically neonatology, I am also very interested in continuing my education in psychological sciences," Parks said. "I believe that I will benefit from this experience greatly, and I'm excited to continue learning and furthering my knowledge in psychology."

— Beth Bohn

Much 'kneed'-ed research



Sherrill Cropper, doctoral student in grain science and industry, from Russellville, Ohio, is mixing her love of chemistry and food ingredients by looking at how

native wheat compounds function inside the molecular structures of bread and dough.

Cropper bakes loaves of bread with defatted flour and fractionated lipids and then uses C-Cell imaging and X-ray microtomography to look at the bread's internal structure.

"This gives us a better understanding of how amphiphilic wheat molecules serve as emulsifiers, which are used as ingredients in all different types of products," Cropper said. "How the natural emulsifiers in the system work influence the product's structure and whether the final loaf is big or small in volume."

Her advisers are grain science and industry's Jon Faubion, Singleton endowed professor, and Hulya Dogan, Ross endowed associate professor.

Proteins, DNA and disease



Damien Downes, doctoral candidate in genetics, from Australia, is working with Richard Todd, assistant professor of plant pathology, to research how proteins interact with

DNA: either directly by binding to DNA or indirectly via a protein-protein binding.

DNA-binding proteins are involved in regulating genes and play a role in diseases of plants and animals caused by fungal pathogens. Specifically, Downes is investigating a class of proteins that was previously thought to only act by directly binding to DNA, but Todd's lab discovered that this class of proteins has a second mechanism that uses protein-protein binding.

"Our understanding of this new mechanism in a model fungus can now be applied not only to its pathogen relatives, but also in human disease research as well," Downes said. "Therefore, we are building a foundation for future translational research."

Chemistry magic for cancer



Christine Spartz, a senior in chemistry, from Ellington, Connecticut, is working with Christer Aakeröy, university distinguished professor of

chemistry, to alter the physical properties of the cancer drug 5-fluorouracil without changing its chemical properties or efficacy.

The drug is administered intravenously because it has low water solubility. Spartz and Aakeröy are trying to change the properties to see if could be delivered as an oral tablet or capsule. Introducing the drug to a cocrystal lattice — a 3-D molecular structure with another molecule — could help the drug to dissolve in water, which could allow the drug to be administered in pill form.

"This project is so important because there are thousands of drug molecules that are eliminated from the pharmaceutical pipeline every day just because of undesirable physical properties such as melting point, solubility or dissolution rate," Spartz said.

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Schmid found that the Hessian fly prefers green light produced by an LED significantly more than any of the other colors. His research also shows that female Hessian flies are significantly more attracted to LED-produced light than male flies. Schmid will incorporate these results into new trap designs to improve trap attractiveness

and effectiveness at monitoring changes in Hessian fly populations.

"This research benefits Kansas by taking a proactive approach to controlling Hessian fly outbreaks," Schmid said. "Monitoring for this pest across Kansas with traps will allow wheat producers to use real-time information

to make management decisions, thus protecting the valuable commodity of wheat and livelihood of much of rural Kansas."

The Plant Biosecurity Cooperative Research Centre and Kansas State University have funded the research.

— Jennifer Tidball