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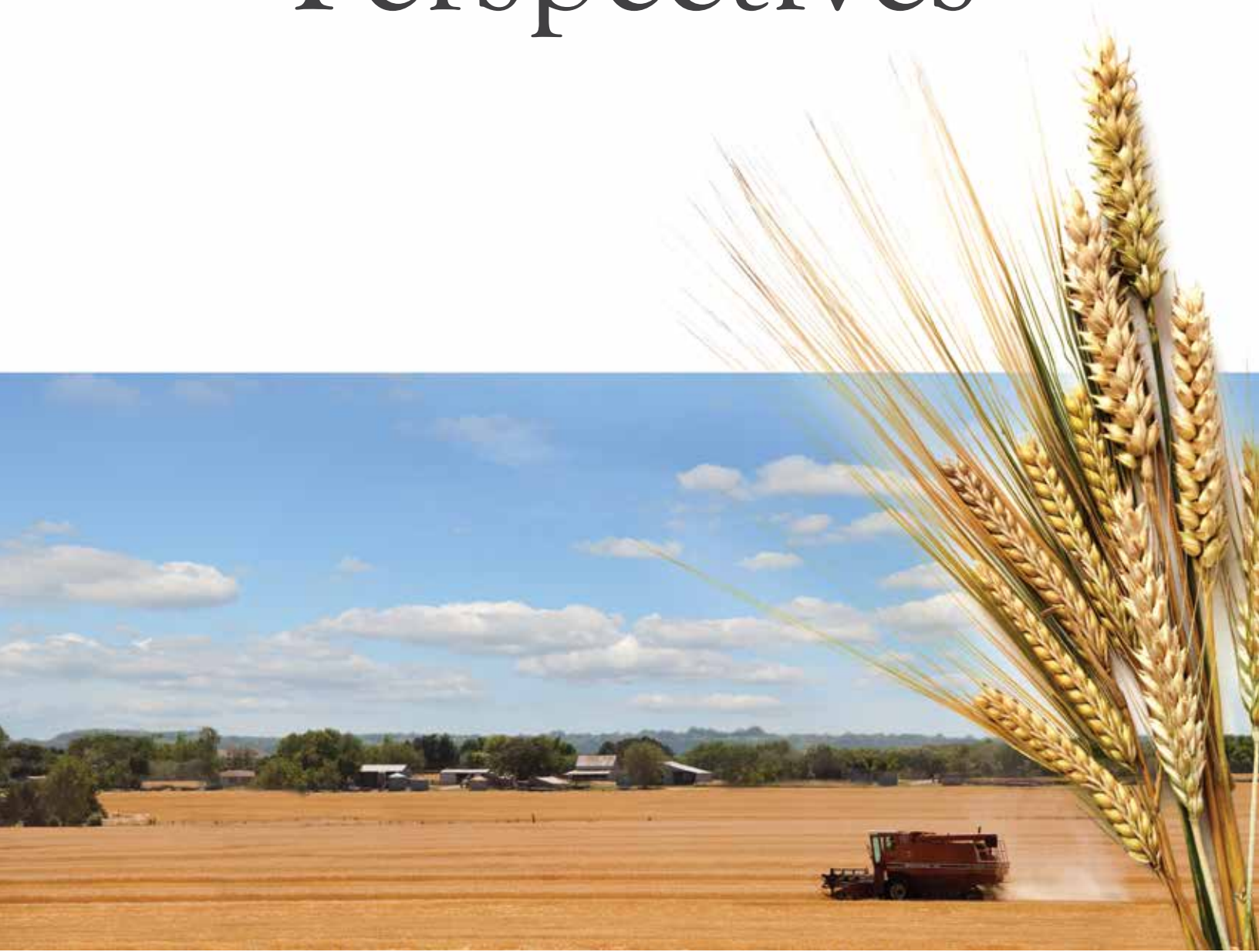
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Perspectives



W i n t e r 2 0 1 4

Message from President Kirk Schulz and Vice President for Research Ron Trewyn



As one of the more than 100 land-grant colleges and universities, Kansas State University's mission

includes a significant service component to benefit the people of Kansas, the nation and the world. The university has campuses in Manhattan, Salina and Olathe, each with a different focus.

With the launch of the Olathe campus in 2011, the university expanded its capabilities to better serve the community and businesses in the Greater Kansas City area with education, research and services that address workforce and economic development priorities not offered before in the area.

In August 2013, the U.S. Economic Development Administration designated Kansas State University Olathe as part of its University Center Economic Development Program. The university will receive a \$250,000 grant annually over the next five years to support the creation and infrastructure of the Innovation Accelerator, which will increase university-industry partnerships in developing and expanding products and technologies that will have a positive economic impact in the region.

Additionally, the Olathe campus is also expanding global linkages through the U.S.-China Center for Animal Health to increase mutually beneficial training programs and trade opportunities. Another Olathe initiative aims to improve animal health in China with a new program to train Chinese veterinarians at Kansas State University and six partnering veterinary colleges.

The Federal Aviation Administration is turning to Kansas State University Salina to test certification standards for

small unmanned aircraft systems, or UAS. Under a memorandum of agreement signed by the university and the FAA on Aug. 29, researchers on the Salina campus will validate industry standards for small unmanned aircraft systems — systems typically weighing 55 pounds or less — set by the F38 technical committee of ASTM International. The Salina researchers will either design a new system or use the university's own unmanned aircraft systems using the standards to apply for airworthiness certification. The agreement between Kansas State University and the FAA is the first of its kind, and the project will be a test to determine where the F38 standards need further development or may be overly prescriptive.

Salina is the ideal location to test the standards because of the university's expertise with unmanned aircraft systems; its close proximity to the Small Airplane Directorate in Kansas City and the Wichita Aircraft Certification Office; and K-State Salina's involvement with ASTM's F38 technical committee. The university also will work closely with the National Institute for Aviation Research at Wichita State University throughout the project.

On the campus in Manhattan, civil engineer Dave Steward and colleagues in several colleges have spent the past four years completing a study on "Tapping unsustainable groundwater stores for agricultural production in the High Plains Aquifer of Kansas, projections to 2110." The study appears in the scientific journal *Proceedings of the National Academy of Sciences of the United States of America*, or *PNAS*. The study was funded by the National Science Foundation, the U.S. Department of Agriculture and Kansas State University's Rural Transportation Institute. It investigates future availability of groundwater in the High Plains Aquifer — also called the Ogallala Aquifer — and how reducing use would affect cattle and crops. The aquifer supplies 30 percent of the nation's irrigated groundwater and serves as the most agriculturally important irrigation in Kansas.

These are just a few examples of the impactful work at each of our three campuses, helping us progress toward our goal of making Kansas State University a Top 50 public research university by 2025.



A handwritten signature in black ink, appearing to read "Kirk Schulz".

President:
Kirk Schulz

A handwritten signature in black ink, appearing to read "Ron Trewyn".

Vice President for Research:
Ron Trewyn

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Water woes

Researchers find
vast U.S. aquifer being tapped out



Kansas is one of the nation's leading agricultural states. But its future success may have more to do with what happens under the fields than in them, as an important natural irrigation source is nearing 70 percent depletion.

An interdisciplinary team of researchers at Kansas State University recently published a study that predicted a future timeline for the depletion and natural recharge rate of the Ogallala Aquifer, as well as its effects on future crop production and cattle in Kansas. The Ogallala Aquifer spans eight states and produces roughly 30 percent of all of the irrigation for agriculture in the U.S.

“When you look at a topic like the Ogallala, it’s about more than just the groundwater,” said David Steward, professor of civil engineering at Kansas State University. “The groundwater in Kansas is not blue, it’s green, meaning that there are a lot of economics tied up in it.”

Using past and present measurements of groundwater levels, Steward and colleagues developed a statistical model that projected groundwater declines in western Kansas for the next 100 years and the effect they will have on cattle and crops — key components in the state’s agricultural economy.

They found that if current irrigation trends continue, 69 percent of the groundwater stored in the Ogallala Aquifer will be depleted in 50 years. Immediately reducing water use could extend the aquifer’s lifetime and increase net agricultural production through the year 2110.

Similarly, their model estimated that 3 percent of the aquifer’s water had been

used by 1960. By 2010, 30 percent had been tapped. An additional 39 percent is projected to be used by 2060 — resulting in the 69 percent loss given current use. Once depleted, the aquifer could take an average of 500-1,300 years to completely refill.

“My colleagues and I wrote the paper for the family farmer who wants to pass his land on to his grandchildren knowing that they will have the same opportunities that farmers do today,” Steward said.

But the study has resonated with a broader audience. It was covered by The Wall Street Journal, NBC News, Fox News, NPR, the Discovery Channel, USA Today, Scientific American and The Economist magazine among others, and has generated numerous editorials and letters to the editor in newspapers.

Similarly, it attracted the attention of Kansas Gov. Sam Brownback, who cited the study’s findings at his Council of Economic Advisers, a consortium of business executives from across the state.

“One of the key issues for this region — for the state — is water,” Brownback said at the August meeting. “[The Ogallala] is an enormous gift that has been given to this region of the world. But it is finite.”

Steward said complete depletion of the Ogallala Aquifer doesn’t have to be in Kansas’ future, however.

Water use efficiencies have increased about 2 percent a year in Kansas, resulting in about 2 percent more crop for each unit of water. While water use will peak around 2025, the current trend of increased efficiencies will result in corn and cattle production peaking around 2040. What happens next largely depends on decisions in the near future.

“At some point we will need to use less water,” Steward said. “We’re on this trajectory, but there are still things we can do to change it. That path and the final outcome from it are not preordained. As a society, we have an opportunity to make some important decisions that will have consequences for future generations.”

The study also was conducted by Kansas State University’s Michael Apley, professor of clinical sciences and an expert in cattle production; Stephen Welch, professor of agronomy who helped with a statistics method called bootstrapping; and Scott Staggenborg, adjunct professor in agronomy who helped with agricultural production methods.

It was published in the scientific journal Proceedings of the National Academy of Sciences, or PNAS. It took four years to complete and was funded by the National Science Foundation, the U.S. Department of Agriculture and the university’s Rural Transportation Institute.

By Greg Tammen, Communications and Marketing

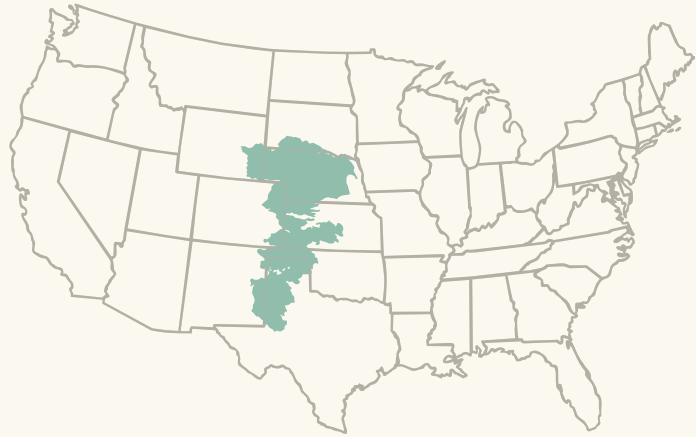
By 1960, **3%**
of groundwater had been used.

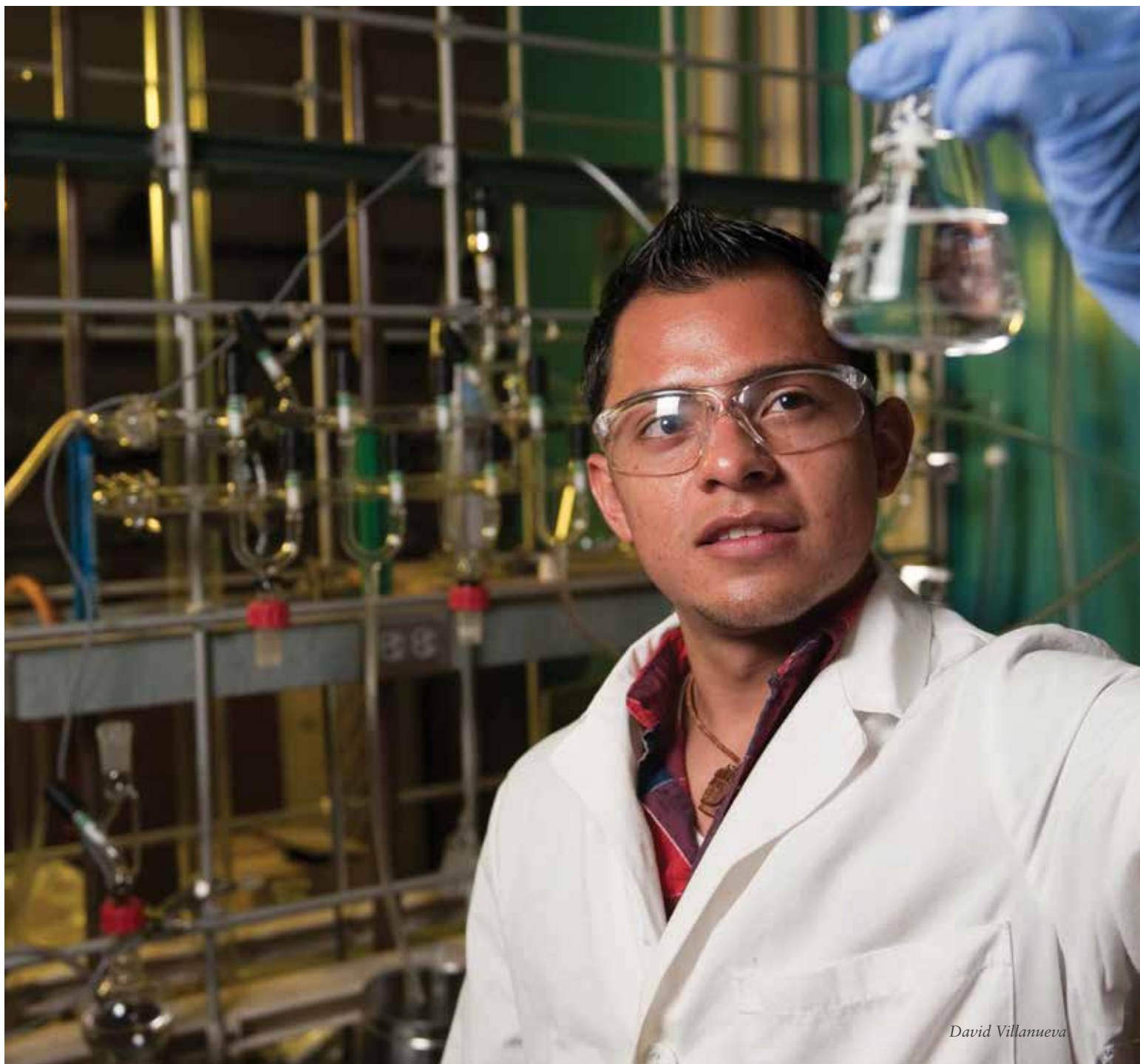
By 2010, **30%** of groundwater had been used.

By 2060, **69%** of the
groundwater will be depleted.

Once DEPLETED, the aquifer could take
500-1,300 years to completely refill.

The Ogallala Aquifer supplies nearly **30%**
of the total irrigation for U.S. agriculture.





David Villanueva

FILLING A DEEPER

A national grant will help develop capable students to fill an expanding need in the state

TALENT POOL

A prestigious national grant will ensure Kansas State University students find success in science, technology, engineering and math — or STEM — careers, regardless of their race, ethnicity or economic status.

A team of faculty and administrators from the colleges of Arts and Sciences, Education and Engineering drafted a proposal that led to the university being named the lead organization for a \$2.5 million five-year grant from the National Science Foundation's Louis Stokes Alliances for Minority Participation, or LSAMP.

“One of the exciting aspects of this project is that it will develop an innovative pathway for diverse students in STEM programs that addresses regional and state workforce needs,” said university Provost and Senior Vice President April Mason, principal investigator of the project.

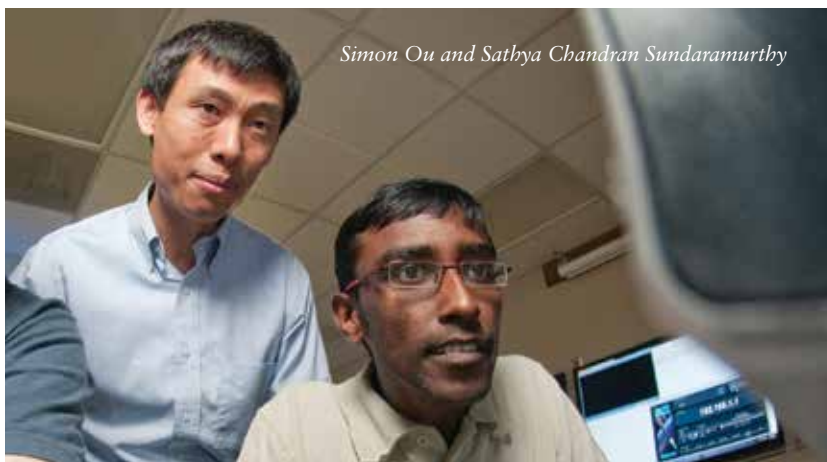
Linda Thurston is an associate dean for research and external funding in the College of Education and a co-principal investigator. She said Kansas' LSAMP project, Kansas Pathways to STEM, will positively influence future workforce diversity in the region by developing sustainable STEM pathways for underrepresented minority students.

“The LSAMP award provides us with a tremendous opportunity to strengthen the STEM talent pool in the state,” Thurston said. “It is the first and only LSAMP award in Kansas and, with our partners, we will provide an innovative and successful pathway from high school to STEM bachelor's degrees for young Kansans.”

Developing recruitment and retention strategies and experiences is accomplished mainly through partnerships with two- and four-year partner institutions. Kansas State University's partner institutions are four Hispanic-serving institutions, specifically Dodge City Community College, Seward County Community College/Area Technical School, Garden City Community College and Donnelly College in Kansas City, Kan. The project went into effect at Kansas State University and partner institutions in September 2013.

Kansas State University will work with its partners to help increase their underrepresented minority student recruitment, retention and ultimate transfer to the university. Thurston said these partnerships will help the university reach its goal of doubling the number of underrepresented minority students graduating with STEM bachelor's degrees.

“Among the 42 LSAMP programs in the country, ours stands out because all our partners are Hispanic-serving institutions,” Thurston said. “We are building on some already strong and successful recruitment and retention programs at Kansas State University.”



Simon Ou and Sathya Chandran Sundaramurthy

Pathways to STEM will partner with university offices such as admissions and developing scholars, as well as the STEM departments in the four partner institutions. Both Kansas State University and its LSAMP partners have developed initiatives that complement those already in place. These initiatives include:

- Focused and enhanced recruiting
- Development of detailed transfer guides
- Training for admissions personnel and academic advisers
- Student enhancement programs such as research opportunities and internships

Beth Montelone, associate dean in the College of Arts and Sciences and a co-principal investigator, said the Kansas Pathways to STEM LSAMP program is aligned with the Kansas Board of Regents' strategic plan, Foresight 2020, which has set a goal of 60 percent of Kansans achieving a postsecondary education by 2020.

“One of the keys to accomplishing this goal is increasing postsecondary participation from first-generation college students,” Montelone said. “Particularly, we're focusing on students from groups that have not been historically represented in higher education, particularly in STEM fields.”

The National Science Foundation's LSAMP program was established by Congress in 1991 in recognition of Louis Stokes, an African-American congressman from Ohio. The program's goal is to increase the quality and quantity of minorities who successfully complete bachelor's degrees in STEM majors.

In addition to Montelone and Thurston, the project's co-principle investigators are Bette Grauer, assistant dean in the College of Engineering, and Zelia Wiley, assistant dean in the College of Agriculture.

By Megan Saunders, Communications and Marketing



One of the exciting aspects of this project is that it will develop an innovative pathway for diverse students in STEM programs that addresses regional and state workforce needs.

— April Mason

COOPERATIVE INNOVATION

Partnerships among the university, industry and entrepreneurs come together in the Greater Kansas City metro area





Kansas State University is a three-campus system, and K-State Olathe, which officially opened April 26, 2011, is the newest member of the family. Complementing the campuses in Manhattan and Salina, the Olathe campus is the academic research presence within the Kansas Bioscience Park, leveraging K-State's broad capabilities and its many resources on the Manhattan campus.

Innovative thinking and community support brought Kansas State University to Olathe and continue to be hallmarks of the university's third and newest campus, which opened in April 2011.

"In late August, the U.S. Economic Development Administration designated Kansas State University Olathe as part of its University Center Economic Development Program," said Prema Arasu, vice provost and Olathe campus CEO. She said the university will receive a \$250,000 grant annually over the next five years to support the creation and infrastructure of the Kansas State University Olathe Innovation Accelerator.

"The Innovation Accelerator is designed to work closely with private industry to understand their technical or business limitations and then identify resources to assist in overcoming them," said Jeff Tucker, executive director of the Advanced Manufacturing Institute. "This may be in the form of technical expertise, such as scientific or engineering assistance, or conducting market research into potential new areas of businesses for an organization."

The center is a collaborative effort of the university's Advanced Manufacturing Institute, Institute for Commercialization, office of corporate engagement and the Olathe campus to assist industry in developing and expanding products and technologies that will have a positive economic impact in the region.



The goal of the Kansas State University Olathe campus is to teach students but also be a place where professionals come to continue their learning. It is home to graduate-level students as they prepare for careers in the biosciences and biotechnology, with opportunities to work with faculty from Kansas State as well as industry scientists.

The Innovation Accelerator is initially targeting specific industry clusters around animal health and food safety to take advantage of the university's technical expertise and extended network connections.

"Partnerships with government, industry and academic partners in the Greater Kansas City area promote technology-based economic development in Johnson County and the state of Kansas," said Debbie Kirchhoff, director of corporate and foundation relations on the Olathe campus. "Close collaborations between researchers, educational programs and companies ensure that the technology being developed is what businesses in the industry are demanding. This also means that our graduate students are being trained on the leading edge of new technologies and meeting the needs of their employers."

Graduate education, as well as training and outreach to elementary and high school students, are also part of the Olathe mission.

"We are offering the master's in veterinary biomedical sciences specifically for use with major animal health companies in the Greater Kansas City area," said Arasu, a veterinarian and Ph.D., who took over leadership of the Olathe campus in October 2013. "Many animal health companies have employees who would like to gain more knowledge of the science involved in animal health and treatment. This degree is designed to meet their needs. We also have a range of programs to introduce K-12 students to the animal health and food safety-related sectors."

Olathe's newest degree program is a master's in biological and agricultural engineering starting in January 2014. The focus of the program is examining the production of ethanol; testing methods designed to improve the efficiency of conversion, and doing scaling up tests to determine whether industry can use those methods. Assistant Professor Yu Deng is based in Olathe to work with students in the program. He holds a U.S. patent for engineering microorganisms to increase ethanol production by metabolic redirection. He also holds two Chinese patents.

"Our largest program is adult education offering a master's, Ph.D., and Ed.D.," said Jackie Spears, a professor of curriculum and instruction and director of the Center for Science Education in the College of Education at Kansas State University Manhattan. She started serving as interim associate dean at the Olathe campus in November 2012 and as interim CEO from July through September 2013. "The adult education program has been in the Kansas City area for more than 20 years," said Spears, who commuted from Manhattan to teach some of those courses in the 1990s.

"Students in the adult education program come from many different backgrounds — the military, through a long relationship with Fort Leavenworth; police officers; community college teachers; and nonprofit and community development staffers. It's a great program for those who want to engage adults more effectively in responding to workforce and community needs," Spears said.

Additional graduate degrees available on the Olathe campus include a master's in horticulture with an emphasis in urban food systems, a master's in food science, and a master's in agribusiness with an animal health focus.

The 100,000-square-foot LEED (Leadership in Energy and Environment Design) Silver-certified Olathe facility houses 10 research laboratories; a commercial-grade kitchen facility for use in food safety research and education; classrooms; and office space for faculty and graduate students.

The Olathe campus is in the Kansas Bioscience Park, and provides a direct link to the university's broad capabilities and the many resources across the three-campus K-State system. Education, research and entrepreneurship are integrated with a focus on animal health and food safety and security.

By Cheryl May, Communications and Marketing



International Impact

The U.S.-China Center for Animal Health at Kansas State University's Olathe campus provides a research and training center for the improvement of U.S.-Chinese collaboration on animal health and education

“We have an international partnership linking governments, universities and industries,” said Jishu Shi, a veterinarian and Ph.D. who leads the U.S.-China Center for Animal Health at Kansas State University Olathe. He said the center assists animal health companies to access markets in both the U.S. and China.

“A primary part of the center’s mission is to work with the U.S. Department of Agriculture, the Food and Drug Administration and the China Ministry of Agriculture to assist both Chinese and U.S. animal health companies in obtaining product registration and approval for exports,” Shi said.

Research is another important component. “The U.S.-China Center’s research programs focus on the development of novel vaccine technologies for infectious diseases of animals,” Shi said.

The center also seeks to collaborate in animal health education, research, and regulatory and industrial workforce opportunities in China.

An agreement for a U.S.-China joint D.V.M. program was formalized by the China Scholarship Council, the Chinese Veterinary Medical Association, the International Veterinary Collaboration for China and the U.S.-China Center for Animal Health.

“At present, Chinese veterinarians do not receive as much hands-on clinical training as those in Canada or the United States,” said Ralph Richardson, dean of Kansas State’s College of Veterinary Medicine.

This academic year, three Chinese students are enrolled for one-year pre-veterinary studies with full scholarships (tuition and living expenses) through the grant to the U.S.-China Center for Animal Health and four are enrolled in veterinary school (three at Kansas State University and one at the University of Minnesota). Next year, the pre-veterinary students have additional choices and may be admitted to the D.V.M. program in one of six partnering veterinary colleges in the United States. Chinese students enrolled in a veterinary college receive full scholarships (tuition and living expenses) from the China Scholarship Council.

“The result,” Shi said, “will contribute to improved animal health and veterinary care in China and collaborations with U.S. veterinarians and researchers when these students graduate and return to their home country.”

By Cheryl May, Communications and Marketing



Jishu Shi (middle)



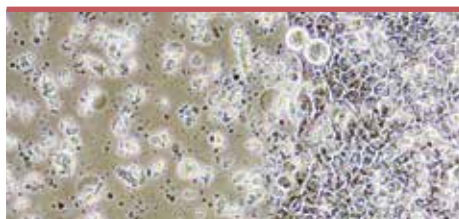


Anna Zolkiewska



Thinking **PINK**

Researcher turns to biochemistry to improve breast cancer survival rates



For Kansas State University biochemist Anna Zolkiewska, the battle against breast cancer starts in the laboratory.

By studying breast cancer stem cells, Zolkiewska is working to prevent cancer recurrence and metastasis — the major causes of death among breast cancer patients. Around 40,000 U.S. women die from breast cancer every year, according to the American Cancer Society.

Zolkiewska, associate professor of biochemistry and molecular biophysics, is using a four-year \$1.245 million grant from the National Cancer Institute — at the National Institutes of Health — to study a promising breast cancer marker called ADAM12 and its role in breast tumor-initiating cells, or BTICs. Her research also has received support from the university's Johnson Cancer Research Center, which is a team of multidisciplinary faculty scientists who perform basic cancer research.

Breast tumor-initiating cells — known as cancer stem cells — drive breast tumor progression and tumor recurrence or metastasis. Zolkiewska's research can provide clinicians with better diagnostic tools, new cancer prevention strategies and improved treatment options.

“Our studies strive to produce new research and diagnostic tools for detection of breast tumor-initiating cells and to develop new therapies to target these cells,” Zolkiewska said.

While current treatments for breast cancer — such as surgery, chemotherapy and radiation therapy — can destroy the majority of tumor cells, these treatments cannot eradicate cancer stem cells. Current treatments also have many negative side effects.

“The problem is that cancer stem cells are present in very low amounts,” Zolkiewska said. “They are difficult to detect. But we know that they exist and they are practically resistant to chemotherapy and radiation therapy.”

Even when chemotherapy appears to work, breast tumor-initiating cells can cause tumors to re-emerge or metastasize to bones, lungs or the brain.

“Once metastasis occurs, the chances to cure the patient decrease dramatically,” Zolkiewska said. “It is absolutely critical to be able to identify cancer stem cells and to find more effective treatments against them.”

Zolkiewska is focusing on ADAM12, which is a member of the ADAM family of cell-surface disintegrin-metalloproteases. Unlike other current cancer markers — which are found in both healthy and cancerous tissues — ADAM 12 is not expressed in healthy human mammary glands.

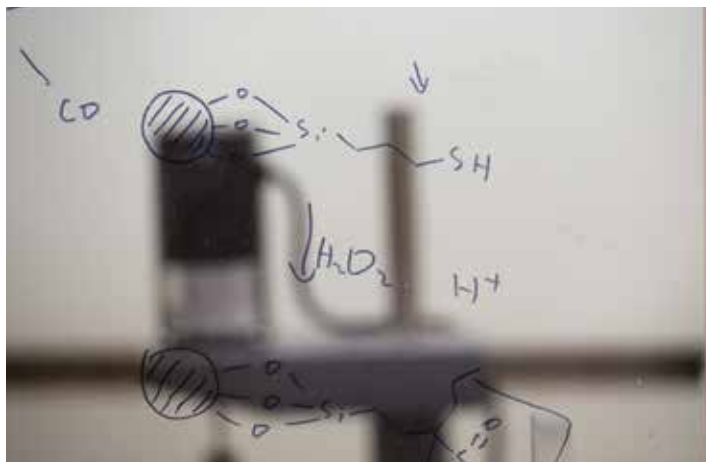
Zolkiewska’s work suggests that ADAM12 is induced precisely in breast cancer stem cells. ADAM12 can be used with existing markers for improved detection, isolation and characterization of breast tumor-initiating cells in the laboratory.

Long term, Zolkiewska wants to understand exactly how ADAM12 functions in cancer stem cells at the molecular level. She also wants to know how breast tumor-initiating cells differ from other breast tumor cells.

“We might be able to use ADAM12 to develop targeted therapies to eradicate cancer stem cells with fewer side effects, which is of great importance,” Zolkiewska said. “Ultimately, we hope we can improve the quality of life for breast cancer patients.”

Zolkiewska also is completing a three-year \$444,000 grant from the National Institutes of Health for research on mutations in the ADAM12 gene. Her research team includes Hui Li, postdoctoral researcher; Sara Duhachek Muggy, doctoral student in biochemistry; and Yue Qi, doctoral student in biochemistry.

By Jennifer Tidball, Communications and Marketing





Growing knowledge

Using lipid analysis, a biologist is helping us understand how plants respond to the environment



Ruth Welti is helping scientists around the world develop better crops that can withstand environmental stress.

Welti, Kansas State University distinguished professor of biology, directs the Kansas Lipidomics Research Center and recently used a collaborative \$440,000 National Science Foundation Major Research Instrumentation grant to purchase the most advanced mass spectrometer for the center.

The spectrometer is helping Welti and collaborators study plant responses to heat and cold stress and plant infection by pathogens. They also are researching the development of plants and seeds, including seed oil production.

“We are trying to understand the basis for the way plants respond to stresses so the information can be used to improve crop plants,” Welti said. “We want to obtain global information on plant responses and see how it relates to plant genotype.”

The new mass spectrometer is enabling university researchers and collaborators to better identify and quantify lipids, which are nonwater-soluble compounds found in all living cells. Lipids form cell membranes, store energy and serve as messengers.

The center, which was founded in 2003, recently renovated space for the new spectrometer, which is being used for ongoing research from 15 laboratories in eight U.S. states and three countries. The spectrometer is helping state, national and international scientific organizations with biochemical research and other projects aimed at increasing agricultural production and understanding animal and human physiology. The spectrometer also is advancing the training of numerous postdoctoral trainees, graduate students and undergraduates.

A model crop species

For one of the spectrometer’s major projects, the scientists are studying *Arabidopsis thaliana*, a plant species that is a good model for a number of crop species, particularly closely related species such as canola.

“The information we gather in *Arabidopsis* can be translated into crop plants,” Welti said. “We want to be able to improve plants so they can better withstand environmental stresses. That way, when we have a summer with a lot of extra heat, crops will be better able to withstand it.”

The researchers are studying a broad range of plant stresses, including heat, cold, freezing, salinity, bacterial pathogen infection and fungal pathogen infection. The scientists also are looking at how plants respond to mechanical wounding, such as insect biting or animal grazing.

“We are looking at how these stresses affect plants’ abilities to continue growing and living,” Welti said. “We are assessing how long they can endure stress and assessing their responses to stress in relation to their genetic makeup. Genetic changes can affect lipid composition, and we think the lipid changes are signals within and between plants as they respond to stress.”

To assess the changes in lipids, the researchers are measuring more than 380 lipid compounds in more than 17,000 plant samples. They also are comparing wild-type plants with plants that have altered genes to see how each responds.

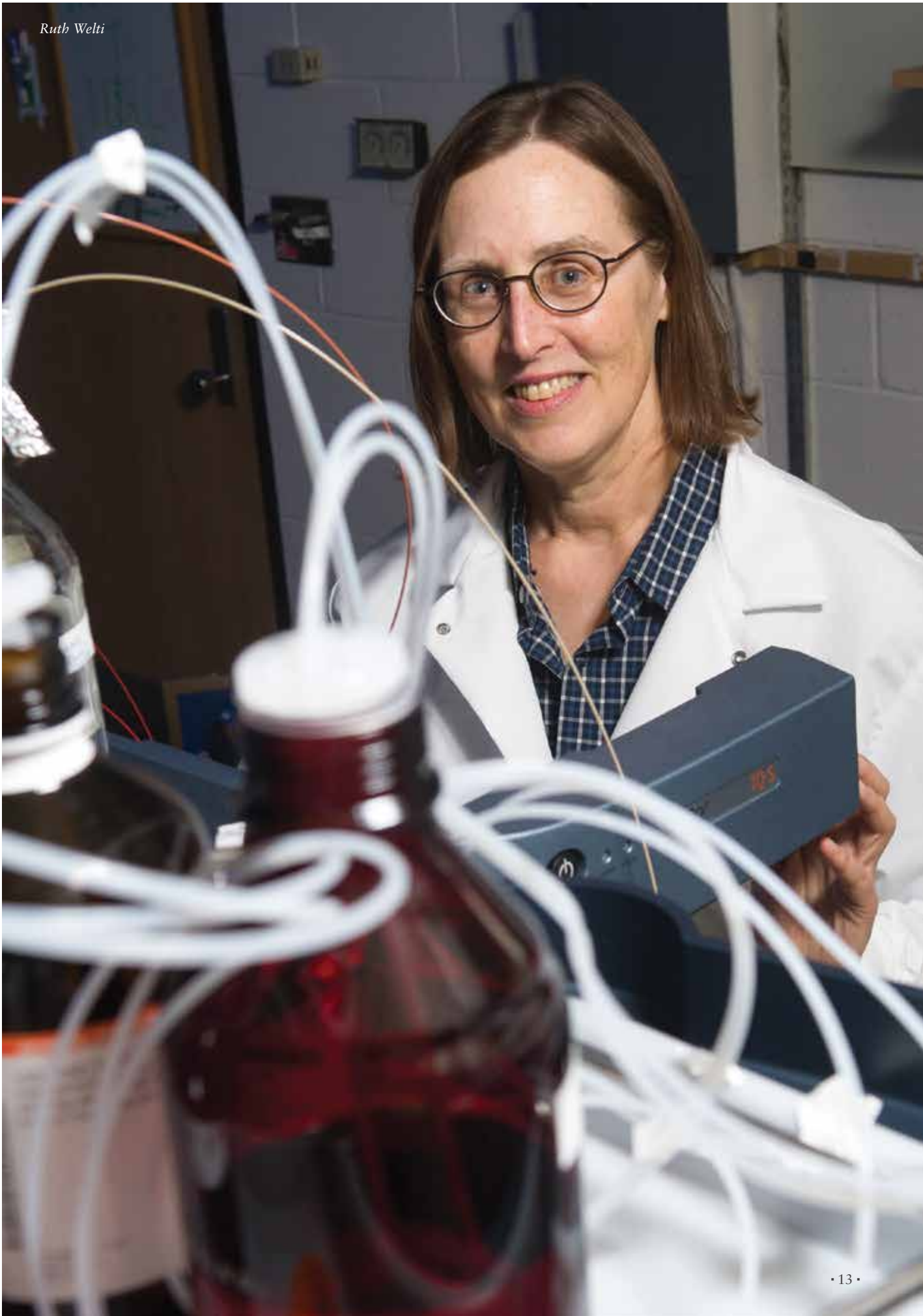
“The advantage of doing this in a model plant species is that it is easy to understand genetic changes, which is really important,” Welti said.

Co-principal investigators at Kansas State University include Kathrin Schrick, assistant professor of biology, and Timothy Durrett, assistant professor of biochemistry. Mary Roth, analytical laboratory manager for the Kansas Lipidomics Research Center, is the coordinator for the mass spectrometer.

Other collaborative researchers include Jyoti Shah at the University of North Texas; Xuemin Wang at the University of Missouri, St. Louis; and Charmaine Naidoo at Langston University.

By Jennifer Tidball, Communications and Marketing

Ruth Welti



The compassion component

A researcher uses client interaction videos to strengthen the communication skills of future veterinarians



He obviously had other places he wanted to be. Eyes downcast, the client flipped through a magazine, showing little interest in his conversation with the student veterinarian. All it took was the student sitting down and petting the dog for the client's body language to change. Turning toward the student, the client began to open up and share stories about his beloved pet.

These types of verbal and nonverbal communication skills are crucial to building rapport and showing compassion to clients, according to a Kansas State University researcher. McArthur Hafen, therapist and clinical instructor at the College of Veterinary Medicine, has been using video clips to increase the communication skills in third- and fourth-year veterinary students.

“Not many other veterinary medical schools are doing this,” Hafen said. “The medical information our students receive tends to mainly focus on the biomedical, but adding in compassion and communication makes for a better experience for the veterinarian, the client and the pet.”

Over several years and with client permission, Hafen has been videotaping selected client interactions. He found that reviewing these interactions allows students to enter into their veterinary careers with stronger communication skills and awareness.

Once clients agree to be videotaped, their initial interactions with the students are filmed during the pet health history review and physical exam. Then, students review the footage with Hafen, who completes a pretest.

McArthur Hafen



Lindsey Blevins and Mary Ellen Mathews



“We look for what they’re doing well and what they can work on,” he said. “By the third week, we film the students again with different clients and see how well they implemented the suggestions. Then I complete a post-test for each student.”

Hafen said he looks for how well students are connecting with their clients, including eye contact and where they position themselves relative to the clients. Additionally, he watches for whether a student is asking open-ended questions, being responsive and showing empathy when appropriate.

Reviewing and practicing their skills on tape helps the fourth-year students enter into their veterinary careers more prepared. Additionally, video clips from the interactions are used in a third-year communications course to demonstrate the importance of communicating with clients.

“The clips for the third-year students are designed based on trends we’ve discovered in our fourth-year research,” Hafen said. “We used to highlight the need for more eye contact. As third-year students have watched

the client interaction clips, it’s much less often we make that suggestion in their fourth year. It has given students a different point of entry for their final year.”

Among third-year students who rated themselves as having little interest in client communication, Hafen found that more than 50 percent rated themselves as moderately to very interested in these skills following their participation in the communication course.

“Clients want competence, but they also want compassionate care,” he said. “Once clients feel as though they’re not just another number, treatment adherence will improve. Having confidence in a veterinarian’s recommendations will help the animal.”

Hafen’s research with the fourth-year pretest and post-test will appear in the *Journal of Veterinary Medicine*. His research with the third-year video reviews is being submitted to the same journal.

By Megan Saunders, Communications and Marketing



Cooperating in containment

Two Kansas State University research institutes are collaborating with industry to advance the science of biological hazard containment.

The Institute for Environmental Research and the Biosecurity Research Institute are combining their expertise and leading facilities with Merrick and Co. to support the transition of the National Bio- and Agro-Defense Facility to Manhattan, Kan. Merrick is a global leader in biocontainment design and function, said Scott Rusk, director of Pat Roberts Hall, which houses the Biosecurity Research Institute at Kansas State University.

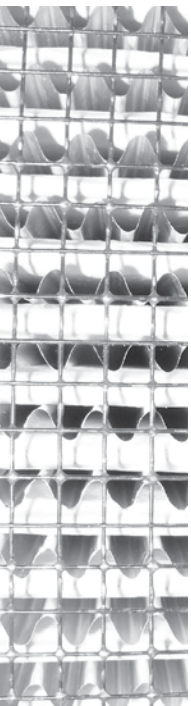
The collaboration's goal is the creation and operation of the first High-Efficiency Particulate Air — or HEPA — filter Biological Containment Assessment and Education Center. The project will span three years and will support and enhance national biosecurity defense priorities, develop critically required capabilities and advance both the applied and fundamental basis for the safe design and operation of advanced filtration systems for biological containment, said Steven Eckels, professor of mechanical and nuclear engineering and director of the Institute for Environmental Research.

The center's first project is examining a novel commercial biosafety technology called AutoScan. It uses computer analysis to test and verify the performance of HEPA filters automatically. Currently, the industry standard for filter performance is manual verification. AutoScan is poised to save man-hours through its automation and provide superior test accuracy and cost savings.

HEPA filters are used in hospitals and surgical wards, as well as various technical industries, including infectious disease research, nuclear facilities, vaccine manufacturing and microelectronics manufacturing.

“A primary feature of higher levels of biocontainment is the ability to filter air that passes through the laboratories and animal spaces and to capture any potential infectious material in those filters, cleansing the air before it is released into the atmosphere,” Rusk said.

The Biosecurity Research Institute is a biosafety level-3 agriculture facility for research on infectious plant and animal diseases. The building uses 175 HEPA filters for its 31,000 square feet of lab, animal holding and support space. The filters are manually tested and certified each year. To protect maintenance personnel before performing tests on each filter, the filters and their housings must be decontaminated — a time-consuming process.



Two university centers partner with industry to research performance and safety of new air filter verification technology

“A safe and accurate automated verification system that could be used without decontaminating the filter housing could greatly enhance operations,” Rusk said.

Eckels is leading a team working with Rusk and others to evaluate performance and operation of the AutoScan. The Institute for Environmental Research team has expertise in designing and conducting unique test and evaluation protocols for novel problems involving airflow, filtration and particulate distribution.

Their findings could help AutoScan become the verification standard for the biocontainment industry.

The Department of Homeland Security also has an interest in how the AutoScan technology performs and supports research and training opportunities. The agency has provided a letter of support for the project.

Two test rigs are being designed for the Biosecurity Research Institute. Once installed, researchers will conduct a series of comprehensive tests to evaluate AutoScan. Eckels’ team has designed a custom test apparatus and will use an extensive number of industry-standard HEPA performance measures in evaluation.

Kansas State University will be the first third party to integrate performance evaluation with procedural and educational development for AutoScan.

“The overall idea behind this effort is that the more basic and applied science we can bring to this technological innovation, the better we can understand how to use this technology and operate it safely,” Eckels said.

The Institute for Environmental Research and the Biosecurity Research Institute are combining their expertise and leading facilities with Merrick and Co. to support the transition of the National Bio- and Agro-Defense Facility to Manhattan, Kan.

The collaboration's goal is the creation and operation of the first High-Efficiency Particulate Air — or HEPA — filter Biological Containment Assessment and Education Center.

By Greg Tammen, Communications and Marketing

In the middle of it all

Kansas has a lot going for it to make unmanned aircraft systems an economic home run

*Nine billion people to feed in 2050.
Diminishing water supplies.
A changing climate.*

Meeting such grand challenges seems possible to those who have unmanned aircraft systems in their toolkit.



Leaders from the state's research institutions — Kansas State University, Wichita State University and the University of Kansas — are capitalizing on this tool and are partnering with industry

and government to help Kansas realize the economic potential of unmanned aerial systems.

And that potential is anything but insignificant: The Association for Unmanned Vehicle Systems International pegs it at nearly \$3 billion for the state during the next decade.

Joel Anderson, director of development for research and sponsored programs at Kansas State University, is part of the Consortium for Kansas Unmanned Systems that unites academic institutions, companies, organizations and government entities.

“We’re trying to get past the geographical bias against Kansas and underscore the highly skilled, technical, innovative and resilient workforce found within our state,” he said.

Kansas has several things going for it. First of all, there’s collaboration among the three research universities and the expertise those institutions bring, from agriculture to engineering.

Secondly, Kansas State University has a Salina campus, at which one of the focuses is aviation. This is one of the first places in the U.S. to offer a Bachelor of Science in unmanned aircraft systems.

Add to that, Wichita is recognized worldwide as a well-established hub for aircraft manufacturing.

“Part of the challenge is to educate and inform the collective so they understand when they look to Kansas for unmanned aerial systems, they’re going to get the full spectrum — technology, consumer needs and operations,” Anderson said.

To broaden the understanding, the consortium organized a conference in October that drew participants from across the nation and from Hungary. The conference presented information on the uses and applications for unmanned aircraft systems.

Those uses span collecting data needed to monitor and assess agricultural crops and the environment; providing critical information necessary in making the food supply more efficient; and broader implications for environmental and energy needs, incident response and in measuring sea-level change of ice sheets in Greenland and Antarctica.

“In Kansas, we understand that the platforms are only a part of the equation to meet these global challenges,” Anderson said. “If we look at unmanned aerial systems from a holistic perspective, we can support this industry in Kansas in new and profound ways.”



By Erin Barcomb-Peterson, Communications and Marketing

Flight team

Kansas universities are partnering to make unmanned aircraft systems a success in the state.

Kansas State University: College of Technology and Aviation, College of Engineering, Department of Agronomy in the College of Agriculture, Department of Geography in the College of Arts and Sciences, College of Veterinary Medicine and the Advanced Manufacturing Institute

Kansas State University Salina, as an outgrowth to its leading collegiate aviation department, established its unmanned aircraft systems program office in 2008. The program uses a hands-on approach for learning and attaining the skills needed to safely operate and manage unmanned systems. The Salina campus's proximity to accessible restricted airspace creates an ideal setting for operational training and testing of unmanned systems.

University of Kansas: Department of Aerospace Engineering and the Center for Remote Sensing of Ice Sheets

The University of Kansas aerospace engineering department has developed the 1,100-pound, 26-foot wingspan Meridian UAV as the center's semiautonomous ice-sounding flight vehicle. With a range of approximately 1,000 miles and an endurance of as long as 12 hours, the UAV is designed to augment crewed flights in the unforgiving polar regions in an effort to form a digital elevation map of the bedrock beneath Antarctica and Greenland.

Wichita State University: National Institute for Aviation Research and College of Engineering

These entities offer significant research and testing capabilities for a wide range of unmanned systems-related

subjects, including aerodynamic characteristics, material selection, susceptibility to environmental factors, human factors, network security, computational analysis and advanced coatings. Wichita State has a strong history of supporting aviation research, including unmanned systems, and currently ranks third in the nation for aeronautical research and development expenditures according to the National Science Foundation.



Validating industry standards for the FAA

The Federal Aviation Administration is turning to Kansas State University Salina to test certification standards for small unmanned aircraft systems.

“Determining the airworthiness of small UAS is a critical steppingstone to commercial flight operations of unmanned aircraft systems,” said Mark Blanks, unmanned aircraft systems program manager at the Salina campus.

The university will validate industry standards for unmanned aircraft systems weighing 55 pounds or less using its own unmanned aircraft systems and working closely with the National Institute for Aviation Research at Wichita State University. Kansas State University Salina will use the standards to apply for airworthiness certification.

“This could well be the first small unmanned aircraft system to obtain an FAA airworthiness certificate for routine operations in our national airspace system here in the lower 48,” said Kurt Barnhart, professor and head of the aviation department and executive director of the university's Applied Aviation Research Center.



Solid investment

University-industry collaboration to improve performance of bulk solids





Think about almost any product you used this morning — your toothbrush, your multivitamin, your bowl of corn flakes. They started out as plastic pellets, powdered pharmaceuticals and grain.

Known as bulk solids, these materials make up more than 80 percent of items transported and handled around the world. Although bulk solids have been studied for more than 50 years, how they transport and how they behave during processing require continued investigation.

Kingsly Ambrose is an assistant professor of grain science and industry at Kansas State University who studies bulk solids. He explains it like this: Take a bag of sugar out of the cupboard and pour it into a measuring cup. Sometimes it will pour smoothly, and other times you'll get a lump that inhibits this process.

Now imagine that problem on the scale of billions of tons, and these are the challenges that manufacturers deal with — manufacturers like Coperion K-Tron. The company makes the feeders and pneumatic conveying components, supervisory controls and digital scales for the plastics, chemical, food, pharmaceutical industries and others.

“Industry leaders all over the country recognize that formal education and research in this area are lacking,” said Todd Smith, the company's vice president.

Smith is also general manager of Coperion K-Tron Salina in Salina, Kan., future site of a \$3.5 million, 13,000-square-foot Kansas State University Bulk Solids Innovation Center. Very few bulk solids research centers exist in the world, Smith said, and this would be the only university-level research center for bulk solids in the United States.

Verna Fitzsimmons, CEO and dean of Kansas State University Salina, said that several things intersect to make the campus an ideal host. Salina is home to a number of second-tier manufacturers. The Salina campus is home to an engineering technology program suited to work with the challenges of bulk solids. The center will provide career-driven opportunities for students to experience applied research.

“It's another mechanism to connect industry with education,” Fitzsimmons said. “Higher education doesn't just have to be sitting in the classroom. We'll be demonstrating what higher education can be.”

The university will be the key tenant in the center, and two Salina companies, Coperion K-Tron and Vortex Valves, will be initial anchor tenants. Primary partners are Kansas State University, the Salina Area Chamber of Commerce, Salina Economic Development Corporation and several private companies.

The project will use both public and private sector resources, including a \$1 million-plus grant through the Economic Development Assistance Programs of the U.S Department of Commerce's Economic Development Administration.

Support is forthcoming from the Kansas Department of Commerce, the Salina Economic Development Incentives Council, Kansas State University and the private sector facility users.

By Erinn Barcomb-Peterson, Communications and Marketing

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Family Business

By Kristin Loving, Veterinary Health Center



It was the family atmosphere and values that brought veterinarian Kate KuKanich to the Veterinary Health Center at Kansas State University and it was family that she found. Literally. She came to the university as Dr. Stenske, but it wasn't long before she met her future husband, veterinarian Butch KuKanich. The two married in 2010; have a son, Jack, born in 2012, and are expecting their second child in April.

Kate KuKanich, assistant professor of small animal internal medicine, knew early on that she wanted to be a veterinarian. It was not always internal medicine that had her attention, though. Zoo medicine was her focus and she spent several years working with zoos across the country. As she worked her way through fourth-year rotations at the University of Minnesota College of Veterinary Medicine, she decided small animal internal medicine would be her specialty of choice.

"I knew I wanted to be in academia. Those of us who come to teach have a desire to help advance the career of others," she said. She also spends a significant amount of time researching bacteria that can be spread between humans and animals in hopes of minimizing illness for people and pets.

Butch KuKanich, associate professor of anatomy and physiology, studied wildlife biology and received his D.V.M. at Virginia Tech. He worked in private practice for four years before attending North Carolina State University to study pharmacology. His research focus is pain management.

"More and more dogs are having chronic pain due to conditions such as osteoarthritis and cancer, and it is important to keep them comfortable and maintain a good quality of life for them," he said.

He is a diplomate of the American College of Veterinary Clinical Pharmacology, and she is a diplomate of the American College of Veterinary Internal Medicine. This unique combination positions them well to apply for grants. They received a grant to study the effects of certain pain medications in dogs.

"Unfortunately, there are not very many choices for drug therapies to treat pain in dogs as outpatients. Tramadol is frequently used, but its efficacy is very low. The goal of the research is to enhance the analgesic effects of tramadol in dogs by enhancing oral absorption," Butch KuKanich said. They are currently collaborating on several projects investigating drug interactions between gastroprotectant and antibiotic therapy in dogs.

Kate KuKanich's research interests include bacterial sharing between companion animals and their owners; the epidemiology of antimicrobial resistance; and hospital-acquired infections. Her work is supported by grants from the Morris Animal Foundation and the American College of Veterinary Internal Medicine Foundation. Her clinical interests are infectious disease, respiratory and gastrointestinal diseases, and managing complicated urinary tract infections. She is also interested in zoonotic diseases and public health.

Butch KuKanich's research interests are in the evaluation and design of rational drug dosages through the use of pharmacokinetic, pharmacodynamics and pharmacokinetic-pharmacodynamic studies. His research is supported by the U.S. Department of Agriculture; the Morris Animal Foundation; the Veterinary Pharmacology Research Foundation; and the Kansas Racing and Gaming Commission.