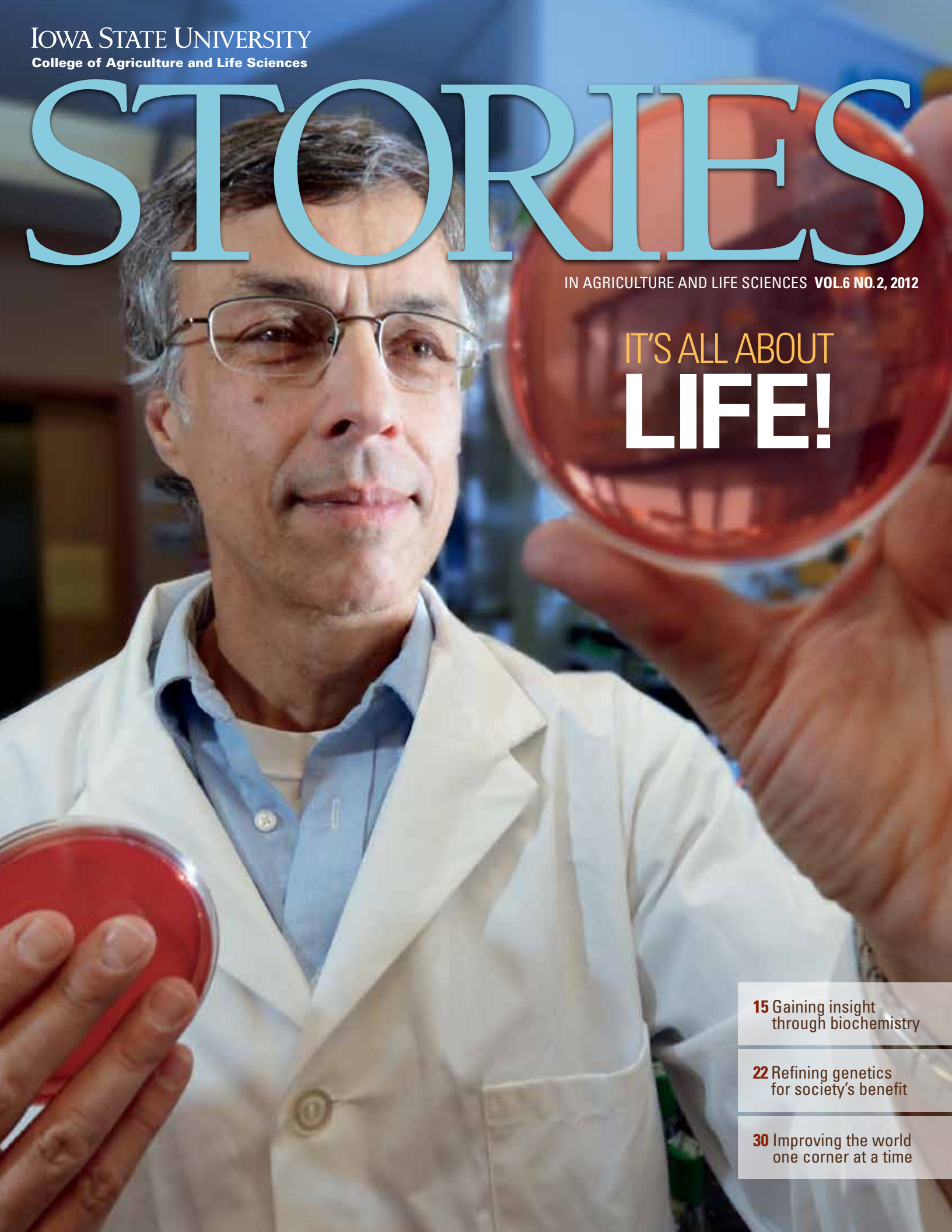
IOWA STATE UNIVERSITY
College of Agriculture and Life Sciences

STORIES

IN AGRICULTURE AND LIFE SCIENCES VOL.6 NO.2, 2012



IT'S ALL ABOUT LIFE!

STORIES
IN AGRICULTURE AND LIFE SCIENCES

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IOWA STATE UNIVERSITY
College of Agriculture and Life Sciences

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Photo: Bob Elbert

The College of Agriculture and Life Sciences is all about life.

Agriculture is biology in action. Biology is a precursor for agricultural science and practical application. Whether plant or animal, soil, air or water—it's all about life.

Here in CALS we break down the stuff of life more than half a dozen ways with faculty expertise in everything from biochemistry, biophysics, molecular biology and organismal biology, to microbiology, genetics, development and cell biology.

For those of you who haven't seen the inside of a lab since organic chemistry, I hope you'll stick around and keep reading. There's exciting science happening here every day, chipping away at huge issues facing agriculture and society.

The following pages offer a few examples of life sciences research. Faculty like Jeff Essner and Allen Miller who are searching for deeper understanding of animal and plant diseases with hopes of using their findings to improve human health. Many faculty mentor graduate and undergraduates in their labs, providing unique opportunities for students to be involved in cutting-edge research. Brandi Malchow is a perfect example of a student making the most of every day of her student experience.

Enthusiasm, passion and a drive to help others are common themes I think you'll pick up on throughout this issue.

Nancy Brannaman has traversed the globe working in embassies for the U.S. State Department and Dr. Anthony Davis treats patients in Ames as a chiropractor. Be sure to check out Carla Persaud, our "In the Margins" profile, who is featured for her work with United Way. Her efforts are anything but marginal.

Alum Chet Boruff's story spotlights his career in agricultural regulatory affairs protecting farmers and consumers. His story also offers a glimpse as to what to expect in our next issue, which will focus on farming and farm programs.

As always, your thoughts on this issue and others are welcome. Please feel free to contact me at stories@iastate.edu. I enjoy hearing from you and sharing your news here and in STORIES Online, our monthly e-newsletter. If you're not already on our e-mail list please sign up at www.cals.iastate.edu/alumni.

Kind regards,

Melea Reicks Licht

Photo: Bob Elbert

ON THE COVER

Thomas Bobik, professor of biochemistry, biophysics and molecular biology, says a culture of cooperation is crucial for modern science.
Read more on page 20.

Over the summer, I spent an enjoyable evening at the Iowa Turkey Federation's summer meeting, which had a baseball theme. To fit the theme, I spoke to the audience about recent success stories, or "home runs," in the college.

Then I listed areas I thought would be "game-changers" that were in the batter's circle for Iowa agriculture.

One was agriculture's centrality to the continuing vision for the biosciences and bioeconomy in Iowa. I shared that, to me, these areas mean research and development unlocking new economic potential in plants and animals, stimulating new kinds of value-added products and processes in agriculture. As we look to capitalize on Iowa's great competitive advantage in agriculture and in science and technology, biosciences are key to driving economic growth and job creation to new heights.

Another game changer is the rising numbers of students studying agriculture and life sciences. A grand-slam was the impending enrollment record, which was confirmed early in the fall semester—3,900 undergraduates, topping the 1977 record. More young people realize agriculture and life sciences offer exciting and life-changing opportunities for those willing to work hard to accomplish something positive. They realize agriculture is where they need to be to play a role in addressing local, national and global needs.

Finally, I told my audience the ultimate game-changer is the strong partnerships we forge together to build our future. We need to work as a team, to communicate, to know where each of us is on the field, to have everyone play their position well and to keep our eyes on the ball. That's what great teams do. The players connect the dots and great things happen.

As a team, we are partners in crossing the plate to "home" base—whether "home" is a safe, plentiful food supply; high-quality natural resources; expanding economic development; and promising futures for our children and grandchildren. Our team must include scientists, extension specialists, teachers, farmers, business people, well-prepared college graduates and many more.

For those who know me well, you know I always root, root, root for the home team—Iowa agriculture. Because when agriculture scores, society wins.

Wendy Wintersteen
Endowed Dean of Agriculture and Life Sciences

CONTENTS

BUTTER CY HELPS CHURN OUT A HOMECOMING VICTORY

Everything's better with butter—even Cy! The college partnered with the Midwest Dairy Association to sponsor a life-sized butter sculpture of ISU's mascot in celebration of Iowa State's 100th Homecoming CYtennial in October. Sarah Pratt, the Iowa State Fair's butter sculptor, created the cream of the crop creation with nearly 300 pounds of butter. Hosted by the ISU Meat Laboratory, the sculpture could be seen through a viewing window into a large cooler. Following Homecoming, Butter Cy was melted down and stored for use in future butter sculptures at the Iowa State Fair. The late Norma "Duffy" Lyon ('51 animal science), Pratt's mentor and predecessor, also was honored with a display near the sculpture. More than 10,000 people viewed the sculpture online and more than 1,000 saw it in person. Visit www.cals.iastate.edu/stories for additional photos and a video on the project.

LARGEST AG CAREER FAIR IN NATION ATTRACTS RECORD NUMBER OF COMPANIES

Nearly **200** companies and organizations sent recruiters to the fall Ag Career Day Oct.16 making it the **largest in ISU's history**. Mike Gaul, career services director, estimates more than 600 interviews were held the following day.

SUPER SCIENTIST POWER…ACTIVATE!

Scientists from ISU's Plant Sciences Institute created a comic book and characters that capture the sense of wonder that their plant sciences-centered research teams generate. "Astonishing Tales of the New Biology" was unveiled at the Science Center of Iowa this summer. Scientists on hand to discuss this unique project were: Bill Beavis, interim director of the Plant Sciences Institute; Adam Bogdanove, plant pathology and microbiology; Diane Bassham, genetics, development and cell biology; Matt O'Neal, entomology; and Diane Birt, food science and human nutrition. Find a copy of the comic online at www.cals.iastate.edu/stories.

Photo: Barb McBreen

FATHER AND SON MEMBERS OF RECORD-BREAKING FRESHMAN CLASSES—35 YEARS APART

Kevin Lauver, ('81 agricultural business) and his son Jacob, a freshman in agricultural studies, both were part of freshman classes in the college that broke enrollment records. Kevin, a crop insurance manager, was part of the 1977 incoming class of 3,623 students and Jacob is part of the 2012 incoming class breaking all past records at 3,900. Once students arrive on campus, the college's rankings stay high with 88 percent of students staying to complete their degrees at ISU (81 percent stay in the college) and 98 percent finding employment after graduation.

CALS TOPS IN GRANTS

The College of Agriculture and Life Sciences leads the campus in earning competitive grants. During the last fiscal year the college brought in **$51.5 million**, which was used to fund research, academic programs and extension and outreach.

THEN & NOW

1977 vs. 2012

ENROLLMENT

1977: College of Agriculture—3,623

2012: College of Agriculture and Life Sciences—3,900

TOP SONG ON BILLBOARD CHARTS

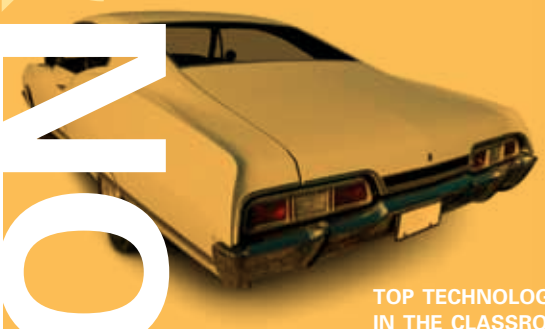
1977: "Tonight's the Night (Gonna Be Alright)"—Rod Stewart

2012: "One More Night"—Maroon 5

BIGGEST MOVIE AT BOX OFFICE

1977: "Star Wars Episode IV: A New Hope"

2012: "The Avengers"



MOST PEOPLE DROVE

1977: Chevrolet Impala

2012: Ford F-Series

TOP TECHNOLOGY IN THE CLASSROOM

1977: Apple II computer

2012: Apple iPad

GADGET STUDENTS COULDN'T LIVE WITHOUT

1977: Personal stereo

2012: Smartphone

2012:

1977:

AMERICA'S MOST POPULAR COLLEGIATE MASCOT

CREATING GREENER CHEMICALS WITH BIOMASS

By Ed Adcock

The national focus on using biomass to substitute for some petroleum-based products has given biochemist Basil Nikolau's work new focus.

Since 2008 the Frances M. Craig Professor in the Roy J. Carver Department of Biochemistry, Biophysics and Molecular Biology has served as deputy director of the Center for Biorenewable Chemicals (CBiRC) based at Iowa State University. Nikolau works with director Brent Shanks in engineering to lead the National Science Foundation Engineering Research Center of 10 academic and 30 industrial partners.

Premium research

The center concentrates on biologically producing chemicals similar to those currently produced from petroleum. Nikolau says that's where the potential for growth lies. He uses the petroleum industry as an example.

"If you take a barrel of oil, about 75 percent of the barrel is burned for fuel and worldwide that's worth about $400 billion. The 5 to 10 percent that ends up in chemicals is worth the same amount," Nikolau says.

Biofuels are a commodity product, worth the going rate at the pump. The chemicals are produced at a premium price.

"For fuels you need such a large amount of carbon, whereas chemicals you don't need that much and yet it's worth a lot more," he says.

Being worth more provides more incentive for research. Developing new ways of

Photo: Bob Elbert

*Biochemist **Basil Nikolau** looks for ways to improve foods and animal feed with better nutrition and development of biorenewable sources of industrial chemicals.*

producing chemicals from biomass also opens up more opportunities for obtaining intellectual property rights.

CBiRC's researchers seek to find catalysts that promote the reactions to efficiently produce biorenewable chemicals. Another goal is to educate students to be creative engineers by exposing them to multidisciplinary research.

The spice of biology

Nikolau and his wife, Eve Wurtele, a professor in genetics, development and cell biology, joined Iowa State in 1988 during a period when many young faculty were hired to respond to the promise of biotechnology. He took a multi-disciplinary appointment in biochemistry and the food science and human nutrition departments.

"I've stayed more on the wet lab aspect of things and she's taken on more computational aspects of research, but these are complementary approaches. The biological research with genomics has become more data generating, and managing that data and deducing valuable information out of that has become more important," he says.

This is exemplified in the emerging science of metabolomics. The W.M. Keck Metabolomics Research Laboratory uses analytical instruments to measure the biochemicals, or metabolites, that make up an organism.

"It's really geared to give biologists the analytical tools needed to measure metabolism. It could be any biological system, but we've focused more on plants. All our spices, fragrances and flavors come from plant sources. And these are pharmacologically active metabolites," he says, giving examples such as aspirin and lovastatin, drugs whose design principle originated from plant metabolites.

Metabolomics research should lead to improvement in foods and animal feeds with better nutrition and also aid in the development of biorenewable sources of industrial chemicals, Nikolau says. He calls it "the spice of biology."

Multitasking in multiple labs

Nikolau's many projects—he maintains three labs on campus—reflect his varied interests and the multidisciplinary nature of his work.

"Iowa State has a long history in plant genetics and I've dove-tailed into that by moving more into biochemistry," he says.

The Frances M. Craig Professor of Biochemistry says research was a challenge when he first started out, relating his specialty in lipid metabolism to nutritional concerns. First, fat isn't considered good for people.

"Another difficulty to consider is that, you're trying to alter peoples' well-being by modifying what they are eating. So we were trying to alter one biological system—the plants that we eat—which is difficult enough to do, so when you eat them you become better. Altering one biological system—plants—in order to make a second biological system—humans—better is difficult," he says.

His research is much more straightforward since becoming involved in biorenewable materials.

"CBiRC enabled me to put this larger umbrella over the research, a justification relative to a real nice application. Before it was a little bit eclectic in the form of a justification or a rationale. Now CBiRC provides a rationale that is all encompassing," Nikolau says.

CBiRC is in its fourth year of funding and has been renewed out to eight years, with an expectation to be funded to 10 years. By then the intent is to be self-supporting. The center is starting to make chemicals that several companies are interested in. Some of the industrial partners are sponsoring research.

Nuturing future scientists

Nikolau's teaching in biochemistry focuses on research-based education and training. Graduate students conduct the bulk of the research with opportunities for inclusion of undergraduate students, high school students and teachers.

In addition, Nikolau leads a grade school through high school program, Symbi, funded by the National Science Foundation, which allows graduate students to participate in classroom activities in Des Moines middle schools. The graduate students become resident scientists in the classroom, providing them an opportunity to expose forefront research to young Iowans at an early stage of their education. S

Photo: Lindsey Long

*ISU Ph.D. candidate **Tim Mitchell** teaches seventh graders the difference between quantitative and qualitative data at Meredith Middle School in Des Moines as part of the Symbi program Basil Nikolau oversees.*

ONLINE EXTRAS: www.cals.iastate.edu/stories

Learn more about Symbi, the NSF-funded program placing graduate students in Iowa classrooms as resident scientists providing cutting edge research to youth.

Photo: Bob Elbert

BATTLING PESTS WHILE PROTECTING BENEFICIAL BUGS

*Entomologist **Bryony Bonning** has devoted her life's work to developing alternative methods for pest control, like developing pest resistant transgenic plants or infecting pests with viruses.*

By Ed Adcock

Entomology Professor Bryony Bonning finds the range of insects stunning. "They span the complete range. You've got the repulsive ones and the beautiful ones, the useful ones and the pests," she says.

Classical chemical insecticides are widely used for insect pest management, but a downside to this, Bonning says, is that they kill both the pests and the beneficial insects. That's why she has devoted her work to developing alternative methods for pest control, like developing transgenic plants that are pest resistant, or infecting pests with viruses.

She discovered her passion for biology at her family's farm in the English countryside. She spent summer holidays fishing, catching insects and bird-watching at the farm in Derbyshire and credits her grandfather for influencing her interest and knowledge in nature. She earned her undergraduate degree in zoology at Durham University and was inspired by John H. Anstee to specialize in entomology.

It didn't hurt that entomology is one sub-discipline of zoology that offers plenty of employment opportunities. "There is an ongoing need for entomologists. It's good to know that as we train students," Bonning says.

She was drawn to Iowa State in 1994, shortly after completing her doctoral degree from the London School of Hygiene and Tropical Medicine at the University of London.

Much of her work is basic research, which she says "brings discoveries that make science exciting." But her ultimate goal is applying the findings. The combined economic losses associated with insect pest damage and human health consequences associated with insect-vectored disease are astronomical.

She currently is working on two approaches to develop transgenic plants that resist aphid attack. One involves plants that produce toxins derived from the bacterium, Bacillus thuringiensis, also known as Bt, that have been modified to bind better to the aphid gut. In collaboration with W. Allen Miller (see page 7), plant pathology and microbiology, Bonning is working on another approach to deliver a neurotoxin by fusing it to a protein from the coating of a plant virus the aphids carry.

"If I'm able to retire and have something that we developed actually used in the field, that would be the icing on the cake," she says.

To that end, she is involved in a proposed collaboration with the world's largest agricultural and insect pest control companies to discuss new research for managing pests, and to better align research conducted within academe with the needs of industry for practical solutions.

Bonning is working on a proposal with colleagues at the University of Kentucky that would create a center with industry members to streamline the development of insect pest management tools. Depending on the interest of companies to participate and the outcome of the proposal, the Center for Arthropod Management Technologies could start in the fall of 2013.

"The motivation behind this center is to collaborate with industry, so we can work together toward more effective pest management solutions for agricultural, structural and public health pests," she says.

VIROLOGIST VIES
TO ADVANCE YIELDS AND HUMAN HEALTH

By Ann Marie Edwards

A professor of plant pathology and microbiology, W. Allen Miller is using his understanding of viruses to aid both plant and human health.

In one such project Miller is working to introduce a gene into soybeans harmless to mammals, but toxic to aphids that feed on soybean plants. He collaborates with entomology professor Bryony Bonning (see page 6) on the project.

Miller wasn't always interested in the survival of soybeans.

"I became fascinated by molecular biology when I was a college student. When I went to graduate school I decided I wanted to help feed the world rather than do medical research. I would study agricultural research or biotechnology even though I had no background in plants or farming," says Miller.

He started to focus on viruses while earning his doctorate degree at the University of Wisconsin. Miller is now recognized as one of the world's leading authorities on mechanisms of barley yellow dwarf virus molecular biology.

Since joining the ISU faculty in 1988, his research has made important contributions to several disciplines including RNA structure and function of viruses (referring to the type of nucleic acid they use to store genetic information).

By publishing and sharing his findings, Miller has made the molecular biology world more aware of plant viruses as fascinating model systems. His work has been funded from many sources including the National Institutes of Health.

Today, Miller and his colleagues study molecular biology of plant RNA viruses from several perspectives including RNA virus replication from plants to humans.

"We employ plant viruses as easy-to-use model systems to provide basic understanding of how viruses express genes and replicate," Miller says. "This knowledge may be relevant to major human viruses such as hepatitis A and C viruses, West Nile and more."

While running his research lab, Miller works to create a stimulating environment for students and postdocs.

"The lab is almost like a family," Miller says. "Some of my proudest achievements beyond scientific discovery are the number of scientists who I have trained. Many of my students have gone on to very successful careers as scientists."

Miller's former student Elizabeth Pettit Kneller (PhD '05 plant pathology), agrees.

"Dr. Miller is really enthusiastic about science and instills an excitement about virology in his students. He gives students opportunities to be involved with grant applications and presenting at conferences," says Pettit, a scientist at KeraNetics, an advanced biomaterials company in Winston-Salem, N.C.

Miller recently began a faculty professional development assignment at the Institute for Plant Molecular Biology in France. While on the 10-month assignment with the French governmental research organization, he will continue to study translation mechanisms, but with a different set of plant viruses than he studies at Iowa State. The new lineup includes viruses important to sugarbeet and potato production. He will use this new experience to build his research program at Iowa State.

***W. Allen Miller**, professor of plant pathology and microbiology, has become one of the world's leading authorities in research of viruses.*

BRINGING SCIENCE TO LIFE IN THE CLASSROOM

By Barbara McBreen

Photo: Bob Elbert

***Nancy Boury**, a senior lecturer in animal science, incorporates real-life scenarios to engage students in microbiology, biology and genetics.*

Microbes rule the world. That's a fact that Nancy Boury shares with students in her Microbial World class.

"There are more microbes in one person's gut than there are people who have ever lived on earth," says Boury, a senior lecturer in animal science ('97 PhD molecular, cellular and developmental biology).

To make introductory microbiology, biology and genetics interesting, Boury incorporates real-life scenarios into her classes. In one class she asked students to bring evidence both for and against the idea that microbes can influence weight gain. She also asked students to analyze the source of the research they used as evidence.

"I want students to think and not just memorize," Boury says. "Information literacy is important because students need to understand the source of information they use to make decisions."

Making students comfortable in the classroom is a priority for Boury. She does that by trying to memorize everyone's first name, which isn't an easy task when you have more than 250 students. She also asks them to submit a question on the first day of class. Every fall she spends two weeks responding to each question.

"It would be easier to teach these classes if I didn't care, but I care," Boury says. "I went to a small, private, liberal arts school and I try to take the advantages of that setting and bring them to the class."

If you sit in on one of her classes it's obvious the students enjoy her and are involved in the learning process. Her goal is to encourage students to reach their full potential, provide an active learning experience and bring science to life.

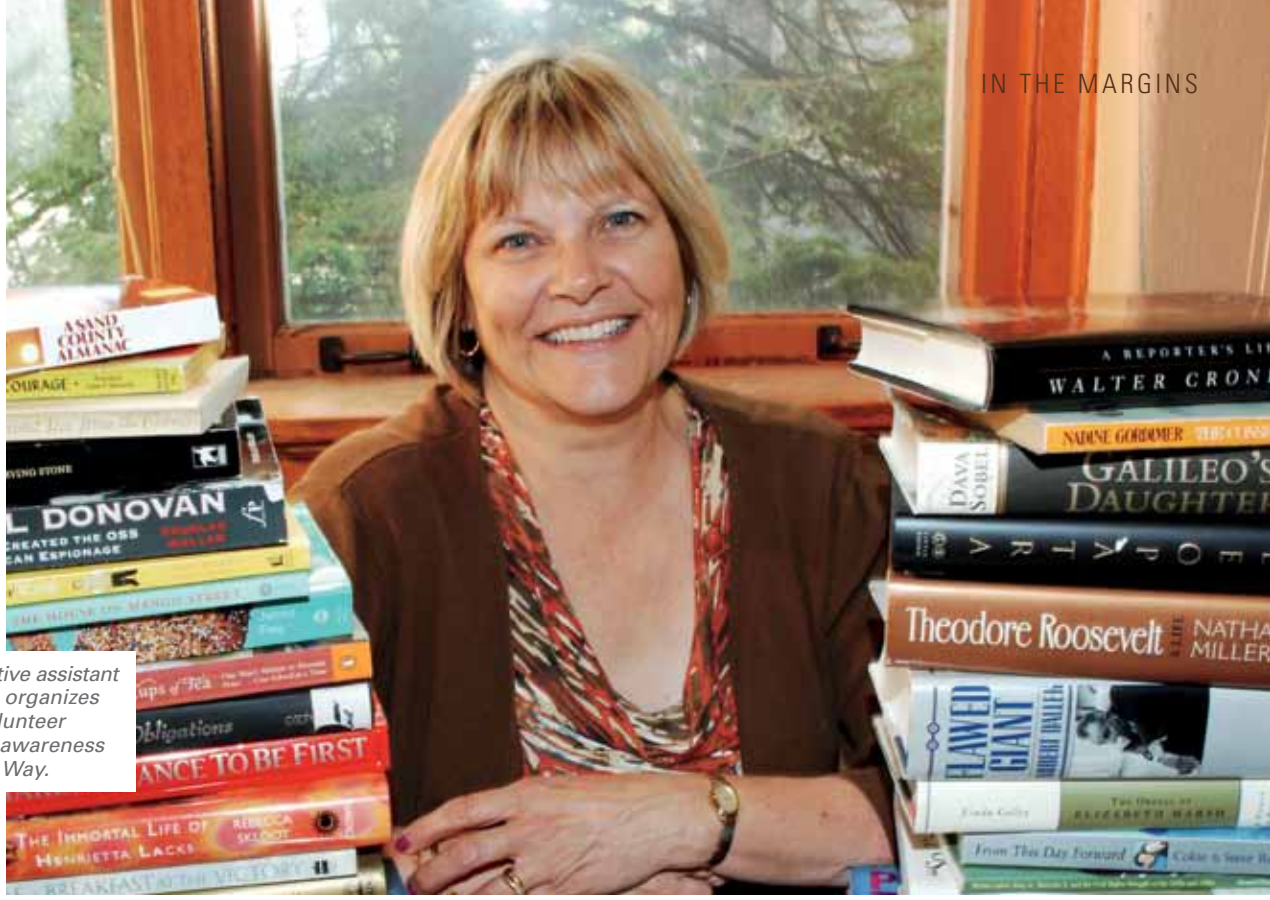
Boury advises first and second year microbiology students and is the Microbiology Learning Community coordinator. One former student and advisee, Janae Hohbein ('09 microbiology) who is attending the Des Moines University College of Osteopathic Medicine, says she still uses the study techniques she learned from Boury.

"I can honestly say that without her mentoring, I would not be flourishing in medical school," Hohbein says. "Many professors can boast about the grades their students get and the things their students achieve, but only a few can boast about who their students become as people."

Ed Braun, professor of plant pathology and microbiology, team-teaches the microbiology class with Boury. Braun focuses on the plant aspect and Boury's focus is more on the animal and human health areas. He says Boury has a great rapport with students.

"It's fantastic to watch the level of interaction she has with the class," Braun says. "She's serious, but leavens it with humor."

That humor is important to Boury. She asks students to bring in cartoons or other microbial humor she can share with her classes and says students compete to be featured. S



***Carla Persaud**, an administrative assistant in the college's dean's suite, organizes book sales, auctions and volunteer activities to raise funds and awareness for the Story County United Way.*

Photo: Barbara McBreen

SERVING COMMUNITY IN A UNITED WAY

By Barbara McBreen

IF YOU WANT SOMETHING DONE CARLA PERSAUD IS THE PERSON TO ASK. THAT MAY BE WHY SHE WAS ASKED TO JOIN THE IOWA STATE UNIVERSITY UNITED WAY CAMPAIGN.

Last year Persaud won the Story County United Way Wall of Fame Award. The award recognizes a volunteer who has gone beyond the call of duty.

Jean Kresse, president and CEO of United Way of Story County, says Persaud served on the Day of Caring committee to kickoff off the campaign for United Way. It's a big job. One that requires the coordination of 700 volunteers who helped clean and landscape areas and do odd jobs for nonprofit group homes and social service agencies in Story County.

"Carla's willingness to get involved and stay active is truly appreciated. We were honored to recognize and thank her for all of her efforts," Kresse says.

Persaud, an administrative assistant in the College of Agriculture and Life Sciences dean's suite, has served on the ISU United Way Campaign Cabinet for the past five years, but has been involved with United Way for more than 15 years.

"United Way has so many programs in this community that help people," Persaud says. "It's a very giving community and I'm proud to be part of it."

In addition to personal pledges, she's helped raise funds through online auctions and book sales, which brought in almost $3,000 last year. She welcomes contributions of new or unique items for the annual online auction for the United Way Campaign.

"Everything we do helps, not only to raise funds, but raise awareness about United Way," Persaud says.

Joe Colletti, senior associate dean of the College of Agriculture and Life Sciences, says Persaud defines volunteer.

"She offers her time, energy, goodwill and passion to help those in need. She is a professional who gives back and is the ultimate volunteer," Colletti says.

Everyone who knows Persaud, knows she doesn't walk, she practically runs everywhere—whether it's racing to a meeting or running errands.

"I like to get things done as soon as possible," Persaud says. "That allows me to address those unexpected items that come up."

You can pretty much guarantee that Persaud will be racing to surpass this year's goal of $62,500 for the college's contribution to the Story County United Way Campaign. Just ask the volunteers who help her every year—the ones, she credits, for helping United Way succeed. S

After lugging square bales in his teens, Buchele vowed to develop a less labor-intensive method for baling and moving hay. The large round baler is one of many Buchele inventions.

***Wes Buchele** (left) is well known for developing and patenting the first large round baler in 1966 with graduate student **Virgil Haverdink**.*

Contributed photos

FOR BUCHELE, CREATIVITY IS THE MOTHER OF INVENTION

By Barbara McBreen

At 92 Wesley Buchele continues to creatively solve problems. Along with his 23 patents, he has a website, a YouTube video, a radio blog and in 2008 co-authored a book about his childhood with his twin brother.

The book, *Just Call Us Lucky*, describes how a widowed mother with seven boys survived droughts, grasshopper infestations, dust storms and the Great Depression on a Kansas farm.

To survive, the seven brothers worked on and off the farm to feed the family and pay the mortgage. That's how Buchele (PhD '54 ag engineering and soil physics), got the idea for the large round baler.

"I was on a baling crew when I was 16 and it was 115 degrees in the shade, but there was no shade," Buchele says. "I made an oath to myself that I would eliminate those small square balers."

He did that and more. Buchele, Iowa State University professor emeritus in agricultural engineering, is well known for developing and patenting the first large round baler in 1966 with graduate student Virgil Haverdink ('64 agricultural engineering, MS '67).

Buchele says seeing and solving problems is what he does.

"I can no longer keep myself from inventing, than I can keep myself from breathing," Buchele says. "I'm not sure where I heard that, but it applies to my life."

Buchele's other inventions include a rotary-flow threshing cylinder used in American combines and rollover protective devices for tractors. He also started the first agricultural safety class in the United States in 1972 at Iowa State.

He built a tandem tractor in 1954 that had two tractor fronts and two steering wheels, but one driver. The combination of two tractors each able to pull a two-bottom plow, allowed Buchele to pull a six-bottom plow and get 50 percent more power.

In 2010, Buchele was one of five engineers nominated to the Product Design and Development Design Engineer Class of 2010 Hall of Fame. He is one of 13 engineers in the Hall of Fame that include Henry Ford, Thomas Edison and Leonardo da Vinci.

Buchele earned his bachelor's at Kansas State University and master's at the University of Arkansas before beginning his doctorate at Iowa State. He taught briefly at Michigan State University before joining the faculty at Iowa State in 1963 where he worked until 1989.

Mark Hanna ('73 agricultural engineering, MS '75, PhD '91), an Iowa State agricultural engineer, remembers Buchele's entertaining lectures, which resulted in questions, rebuttals and discussion.

"His lectures and exercises on brainstorming to creatively solve machinery and other problems were legendary," Hanna says. "I don't recall what tuition cost at the time, but I got more than my money's worth."

Buchele's innovativeness, he says, comes more from being creative than academic. He says lots of people can get great grades, but not many are creative. S

ONLINE EXTRAS: www.cals.iastate.edu/stories

Find links to Buchele's website, YouTube video, radio blog and book online.

CHRISTIAN INDUCTED INTO NPPC HALL OF FAME

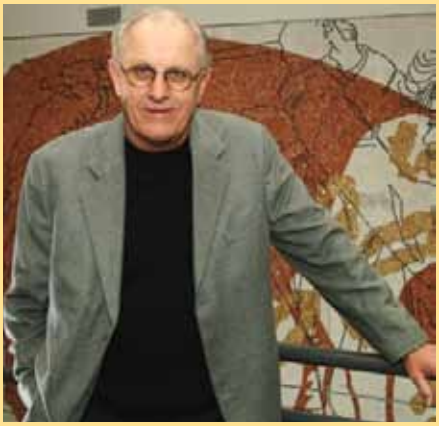


Photo: Bob Elbert

Allen Christian, former manager of Iowa State University's Swine Teaching Farm and a pork producer from Ames, was inducted into the Hall of Fame of the National Pork Producers Council for his outstanding contributions to the U.S. pork industry. Christian was responsible for the ISU hog herd for more than 50 years. The farm now bears his name —the Allen E. Christian Swine Teaching Farm. As a teacher and mentor there, he imparted skills and knowledge to his students beyond the curriculum. Many of his former charges have become pork industry leaders. In addition to his vocation as an educator, Christian was a hog breeder and judge. His influence on the purebred swine industry has been felt across the country and internationally. Find a link to a video about Christian online at: www.cals.iastate.edu/stories.

NATIONAL AND INTERNATIONAL **AWARDS, FELLOWS**

- **Rohan Fernando**, animal science, Rockefeller Prentice Memorial Award in Animal Breeding and Genetics
- **John Mabry** (MS '74 animal science, PhD '77), animal science, Bouffault International Animal Agriculture Award
- **John Patience**, animal science, Industry Service Award, American Society of Animal Science
- **Steve Lonergan** ('88 animal science, MS '91), animal science, Distinguished Research Award, American Meat Science Association
- **Jonathan Wendel**, ecology, evolution and organismal biology, International Cotton Genomics Initiative Award
- **Lloyd Anderson** ('57 animal science, PhD '61), animal science, Distinguished Scientist Award, Council of the Society for Experimental Biology and Medicine
- **Maria Salas-Fernandez**, agronomy, a Faculty Early Career Development grant, National Science Foundation
- **Helen Jensen**, economics, Fellow of the Agricultural and Applied Economics Association
- **Jo Anne Powell-Coffman**, genetics, development and cell biology, Vision and Change Leadership Fellow, Partnership for Undergraduate and Life Sciences Education
- **Curt Youngs**, animal science, Teaching Fellow of the American Society of Animal Science

IN MEMORIUM:

F.C. Parrish, emeritus professor in animal science, died Aug. 27. He was 79. Parrish served on the faculty for nearly 37 years in the area of meat science. Parrish's research program focused on fresh meat quality; he mentored numerous undergraduate, masters and doctoral students; and led and coached the Collegiate Meats Judging Teams. Parrish and his wife, Fern, established the Regional Iowa State University Invitational Meats Judging Contest and later an endowment to support the Meat Judging program at ISU.

Dean Zimmerman, emeritus professor in animal science, died March 8. He was 79. Zimmerman ('54 animal science, PhD '60) served on the faculty for 34 years in the area of swine nutrition. He taught at the ISU College of Veterinary Medicine and the animal science department and conducted research in swine nutrition.

George Beal, emeritus Charles F. Curtiss Distinguished Professor of sociology, died Sept. 20. He was 95. Beal ('43 agricultural economics, MS '47 agricultural economics, PhD '53 rural sociology) is known for his pioneering research in adoption and diffusion with colleague Joe Bohlen. He served as the first department chair of sociology at ISU. He retired in 1977 and joined the staff of the East West Center, a federally funded center on the campus of the University of Hawaii at Manoa. Read more about Beal in a previous STORIES feature at www.cals.iastate.edu/stories.

HEARTY HELLOS

Keri Jacobs, ISU Extension and Outreach economist focusing on the economics of cooperatives

Lee Schulz, ISU Extension and Outreach livestock economist

Mark Rasmussen, director of the Leopold Center for Sustainable Agriculture

Jacob Myers ('04 animal science), ISU swine farms manager

FOND FAREWELLS

Helen Olson, academic adviser for the agricultural education and studies program, retired last spring. Olson joined the agricultural education and studies program in 1992.

Doug Kenealy ('69 dairy science, PhD '74 animal nutrition), animal science, retired last summer. Kenealy began his career at Iowa State in 1975. He taught general animal science courses and served as professor in charge of dairy science and section leader for teaching.

HARRISVACCINES HONORED **FOR ACHIEVEMENT IN ECONOMIC DEVELOPMENT**


Photo: Bob Elbert

The Technology Association of Iowa named Harrisvaccines, Inc. the 2012 Iowa Life Sciences Company of the Year. Harrisvaccines is an ISU start-up company formed six years ago by **Hank Harris**, animal science. Harris also was selected to receive ISU's University Award for Achievement in Economic Development in Iowa, which recognizes faculty and staff members for outstanding ISU-based achievements in advancing the economic development of the state. Harrisvaccines focuses on improving animal health in the cattle, swine and farmed shrimp industries using advanced molecular science techniques.

Photo: ISU Foundation

GOING THE DISTANCE FOR AGRICULTURE

By Barbara McBreen

*Above: **Bethany Olson** speaks at the Monsanto Student Services Wing dedication in August. She's an active student ambassador and member of the ISU track and cross country teams.*

The summer of 2012 was a hot one, but that didn't stop Bethany Olson from training for competitive cross-country.

"You have to love running—whether it's 100 plus degrees or 21 below—you have to work out," says Olson, a senior in agricultural business and international agriculture.

As a member of the Iowa State University Women's Track and Cross Country teams, Olson trained hard this summer to reach her mileage total of 85 miles per week. An important goal because she believes cross-country competition is about teamwork.

"If you don't put your time in, you are letting your team down," Olson says. "There are no timeouts when you compete in cross country because it's an individual contribution to the team."

The teamwork paid off last year when Iowa State University's Women's team brought home Iowa State's first Big 12 Championship trophy. Corey Ihmels, Iowa State University director of men and women's track and cross country, says it's because of athletes like Olson.

"The easy part is doing the hard work, the hard part is balance. I ask students to manage life, school, get enough rest and eat well," Ihmels says. "Bethany is very involved academically and she's a committed athlete. She's doing things right."

Olson's a team player in everything she does, but balancing all her interests is a challenge. Along with Cyclone athletics, Olson is a member of the Agricultural Business Club, Alpha Zeta, the Honors

Photo: Barbara McBreen

Training, hard work and finding balance between student life and athletics has helped Bethany Olson succeed.

Program, Collegiate FFA, Lyrica (an Iowa State women's choir), the Student Athlete Advisory Council and serves as a student ambassador for the College of Agriculture and Life Sciences.

One of Olson's interests is travel. In grade school Olson listed traveling the world as one of her lifelong goals. She started her college travels in Argentina as part of an agronomy and economics travel course during spring break. The 12-day trip was packed with farm and ag industry tours along with a few tourist stops.

Olson wrote an 80-page report summarizing the trip and credited Sergio Lence's connections for making the trip a hands-on tour. Lence, a professor of economics and course adviser, grew up on a farm near Carlos Casares in the Province of Buenos Aires.

"Students like Bethany make the effort of leading travel courses worthwhile and motivate me to continue doing them," Lence says.

Nathan Johnston, a senior in agricultural business, also went to Argentina with Olson. The two grew up four miles apart from each other near Jewell, Iowa. They both have similar career plans. Johnston says the long-standing joke between them is who will be the other one's boss.

"In high school we were involved in 4-H, cross country and FFA co-presidents together. We followed each other to Iowa State and both went into the ag business program," Johnston says. "It's been great to have a friend like Bethany at Iowa State."

In June, Olson continued her international studies and traveled to Southeast Asia after being selected to participate in the International Collegiate Agricultural Leadership Program sponsored by the U.S. Grains Foundation and the National FFA. She and Karl Kerns, a junior in animal science, were among 12 students nationwide to participate in a trip to Malaysia, Singapore and Vietnam.

The group toured an aquaculture farm on the Mekong River in Vietnam and met with commodity representatives in Saigon. Olson says the experience emphasized Iowa's global connection to agriculture, especially when they visited the Chicago Mercantile Exchange and Chicago Board of Trade in Singapore.

Both study abroad opportunities fit Olson's plans to pursue a career in marketing with an agricultural business or organization that includes international connections.

"I hope to have a career that is focused on furthering the productivity of farmers and their agricultural practices around the world, while helping consumers understand that agriculture is an important and necessary part of their lives," Olson says.

Olson is co-chair of the College of Agriculture and Life Sciences' Ag Career Day. Her past awards include recognition as a Foreman Scholar and the Branstad-Reynolds Undergraduate Scholar. She was raised on a fifth-generation family farm and graduated valedictorian of the South Hamilton High School Class of 2009.

ONLINE EXTRAS: www.cals.iastate.edu/stories

Read more about Bethany Olson in the Agriculture Future of America newsletter.

ISU Athletic Communications

The Iowa State University Women's Cross Country team won the 2011 and 2012 Big 12 Conference National Championships. Photo includes: ***Katy Moen, Maddy Becker, Maggie Gannon, India Lee, Meaghan Nelson, Betsy Saina, Dani Stack, Morgan Casey, Bethany Olson*** *and* ***Taylor Petersen.***

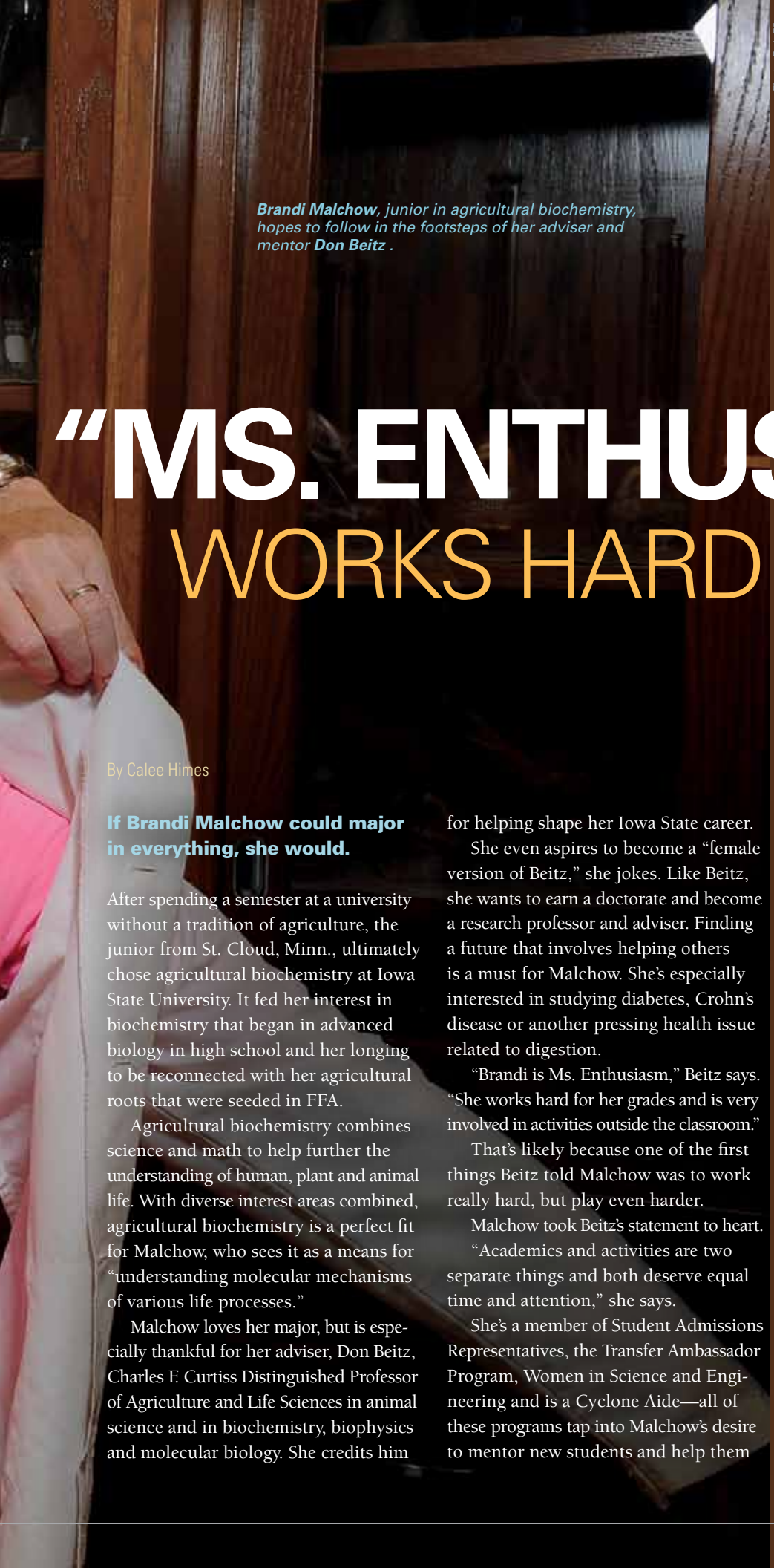


Photo: Bob Elbert

__Brandi Malchow__, junior in agricultural biochemistry, hopes to follow in the footsteps of her adviser and mentor __Don Beitz__ .

"MS. ENTHUSIASM" WORKS HARD IN AND OUTSIDE THE RESEARCH LAB

By Calee Himes

If Brandi Malchow could major in everything, she would.

After spending a semester at a university without a tradition of agriculture, the junior from St. Cloud, Minn., ultimately chose agricultural biochemistry at Iowa State University. It fed her interest in biochemistry that began in advanced biology in high school and her longing to be reconnected with her agricultural roots that were seeded in FFA.

Agricultural biochemistry combines science and math to help further the understanding of human, plant and animal life. With diverse interest areas combined, agricultural biochemistry is a perfect fit for Malchow, who sees it as a means for "understanding molecular mechanisms of various life processes."

Malchow loves her major, but is especially thankful for her adviser, Don Beitz, Charles F. Curtiss Distinguished Professor of Agriculture and Life Sciences in animal science and in biochemistry, biophysics and molecular biology. She credits him for helping shape her Iowa State career.

She even aspires to become a "female version of Beitz," she jokes. Like Beitz, she wants to earn a doctorate and become a research professor and adviser. Finding a future that involves helping others is a must for Malchow. She's especially interested in studying diabetes, Crohn's disease or another pressing health issue related to digestion.

"Brandi is Ms. Enthusiasm," Beitz says. "She works hard for her grades and is very involved in activities outside the classroom."

That's likely because one of the first things Beitz told Malchow was to work really hard, but play even harder.

Malchow took Beitz's statement to heart.

"Academics and activities are two separate things and both deserve equal time and attention," she says.

She's a member of Student Admissions Representatives, the Transfer Ambassador Program, Women in Science and Engineering and is a Cyclone Aide—all of these programs tap into Malchow's desire to mentor new students and help them navigate their first few semesters of college. And she tutors math, science and Spanish at Woodward-Granger High School.

Malchow's planning to attend the Emerging Leaders Retreat, an overnight, off-campus retreat for students interested in building leadership skills, and will spend a semester at Louisiana State University in the spring as a national exchange student. She's always been curious about living somewhere else and is intrigued by the south. She also hopes this experience will expand her network while she's researching graduate schools.

She enjoys being so involved because it's a great way to network with people she wouldn't otherwise encounter in her major. In fact, the Cyclone Aide program is where she met most of her friends.

Malchow sees every day as a new adventure. "Every day is the best day ever," she exclaims. Whether she's going over math problems with a student, conducting a campus tour or taking a calculus test, she looks forward to something new and exciting each day. S


Contributed Photos

***Andrew Paxson** grew up enjoying the outdoors in the Fox River Valley area northwest of Chicago. As president of the student Soil Water and Conservation Club he builds ground water flow models.*

FINDING A FUTURE
IN ECOLOGICAL RESTORATION

By Barbara McBreen

Andrew Paxson spent his summer biking, canoeing, mussel hunting, weeding and educating others about the importance of ecological preservation. It was an internship that fit him perfectly.

"We covered ecology, history, philosophy, economics, botany and geology all in nine weeks," Paxson says. "The internship helped me understand that I'd like to pursue a career in ecological restoration."

Paxson, a senior in environmental science, spent last summer as an intern with the McHenry County Conservation District at Glacial Park. It's an area northwest of Chicago and north of Algonquin, Ill. The 3,500-acre park is located one hour north of where Paxson grew up hiking and enjoying water sports.

"I like to challenge interns with basic questions," says Tom Simpson, field station ecologist with the McHenry County Conservation District. "This summer we had many involved discussions about how and why we do conservation. Andrew was always engaged in the discussion, which helped everyone else participate."

This summer brought hot, dry weather to most of the Midwest, which made it challenging to work outside Paxson says. At times he was worried about starting fires with vehicles used in the park. As streambeds began to dry up, he also participated in a mussel rescue and survey.

"We were on our hands and knees in the river trying to find these mussels in the mud, it was like finding gold," Paxson says.

When he returned to Iowa State this fall, he found the drought also dried up his water-sampling job. For the past three years Paxson has taken water and sediment samples from Squaw Creek to measure E. coli. The water sampling not only provided a job, but a basis for his research.

"The data is interesting because we have samples from flood years and from last spring when the creek began drying up," Paxson says.

Michelle Soupir, professor of agricultural and biosystems engineering, says Paxson's help with data collection will provide the basis for stream modeling. The project not only measured E. coli in the water, but also in the streambed.

"He went out weekly and collected water and sediment samples," Soupir says. "We found that bacteria concentrations in the bottom sediment was higher than the overlying waters."

Paxon's research focused on plotting E. coli concentrations in watersheds using geographic information systems technology. The results will be included in a modeling project used to predict E. coli concentrations in streams. He presented his research in poster sessions through the Science With Practice program and at the Research at the Capitol event in Des Moines. Both programs give undergraduate students research experience with mentors and faculty.

Paxson served as president of the Soil and Water Conservation Club Student Chapter from 2009 to 2012, which builds water flow models for educational groups. He also was a member of the Skunk River Navy, a student group that cleans trash out of the river. He also gained practical experience serving on Iowa State University's stormwater committee. S

ONLINE EXTRAS: www.cals.iastate.edu/stories

View Andrew Paxson's research with the Science With Practice program.


Contributed Photo

SENIOR ENJOYING SUMMER RESEARCH PROGRAM AT HARVARD

Aubrie James, a senior in animal ecology, had the time of her life chasing butterflies at Harvard Forest this summer. She was one of 30 students selected for the prestigious undergraduate research summer program in ecology. Her research group studied the morphological differences between two populations of the Baltimore Checkerspot butterfly. Read more online at www.cals.iastate.edu/stories.

BBMB STUDENT NAMED GOLDWATER SCHOLAR

Sam Condon, a third-year student in biochemistry, biophysics and molecular biology, has been named a 2012 Goldwater Scholar. Condon is one of 282 U.S. sophomores and juniors this year awarded the nation's premier undergraduate scholarship award in mathematics, natural sciences and engineering.

Contributed Photo

STUDENTS RECEIVE NATIONAL HONORS

- **Leah Henkes**, senior in dairy science, received the Genevieve Christen Outstanding Dairy Student Award at the American Dairy Science Association meeting last summer. Henkes is the fifth ISU student to receive the award since it was established in 1999. The award recognizes distinguished undergraduates who have demonstrated leadership ability, academic achievement, involvement in the industry and participation in ADSA-Student Affiliate Division and local club activities.
- **Caitlyn Abell**, a doctoral student majoring in animal breeding and genetics and statistics, received the 2011 Lauren L. Christian Graduate Student Award from the National Swine Improvement Federation. Abell is the 10th award recipient from ISU since the annual award was started in 1993.

ABE CLUB RECOGNIZED WITH GOVERNOR'S VOLUNTEER AWARD

Governor Terry Branstad honored Iowa State's American Society of Agricultural and Biological Engineers student chapter in June, presenting the organization with the Annual Governor's Volunteer Award. The club is comprised of more than 90 members, most majoring in agricultural engineering, biosystems engineering and agricultural systems technology. Governor's Volunteer Awards are given to Iowa non-profit organizations that provide an outstanding contribution to the state or community through service, leadership, hard work and cooperation, and also show a commitment to volunteerism through ongoing service projects. The club was nominated by the Iowa Department of Transportation for their roadside cleanup project. Club members also serve as judges at the State Science and Technology Fair; participate in outreach events for grade-school children; take-part in Keep ISU Beautiful: Adopt Campus Program; and participate in the United Way Day of Caring.

CALS STUDENT ELECTED IOWA FFA PRESIDENT

Steven Brockshus, a freshman in agricultural and life sciences education, is the current state FFA president. Brockshus is a member of Sibley-Ocheyedan FFA at Sibley and was northwest state vice president for the past year. Brockshus is part of a fifth-generation dairy operation including his father Jason ('97 dairy science and agriculture and life sciences education) who also served as FFA northwest state vice president.


Contributed Photo


Contributed Photo

BBMB: GENETICALLY PREDISPOSED FOR EXCELLENCE

By Brian Meyer

AS CHAIR OF THE ROY J. CARVER DEPARTMENT OF BIOCHEMISTRY, BIOPHYSICS AND MOLECULAR BIOLOGY, GURU RAO SOMETIMES FEELS LIKE THE CONDUCTOR OF AN ORCHESTRA.

"For 52 years of the department's history, the culture has been to foster creativity among a diverse group of people who bring their own special talents and yet work together," says Rao. "It's like having musicians who all play their instruments very well. The music they play is the research and the education. The departmental culture, like a performance of an orchestra, expects nothing but the very best from its people."

More attention has been drawn to the "music" emanating from the department since the announcement earlier this year of its naming in honor of the Roy J. Carver Charitable Trust (see online extra for details). The Carver Charitable Trust, one of Iowa's largest private philanthropic foundations, has invested more than $12.3 million in the department, including $7.5 million announced this year to support research initiatives in biomolecular structure.

The commitment by the Carver Charitable Trust will help the department achieve world-class prominence in research and education.

The DNA for excellence has been in place for decades.

"The seed was planted more than 50 years ago," Rao says. "All along the way there were university and college leaders who shared our vision. We've paid close attention to that, year after year, to hire the best, most innovative people possible and give them the freedom to do great work. The standard for excellence is set so high that no one wants to feel like we're second best. That kind of culture makes excellence self-sustaining."

The Roy J. Carver Department of BBMB (the acronym many use on campus) is coadministered by the College of Agriculture and Life Sciences and the College of Liberal Arts and Sciences. "We have a fantastic thing going on in this department that wouldn't be possible without the support from both colleges," says Rao, who along with professor Amy Andreotti, holds the title of Roy J. Carver Charitable Trust Professor in BBMB. "There's not a lot of departments like ours around the country administered by colleges that are so incredibly supportive. It's unique."

What makes life sciences so exciting at Iowa State is that you can find expertise in almost every college, Rao says. "Iowa State always has had a built-in ability to reach across departments for multidisciplinary collaborations. It happens seamlessly. The Carver Charitable Trust recognized immediately that its investment in our department would catalyze scientists from many parts of campus and promote the growth in structural biology."

Seamless also describes the double-helix of education and research woven into


Photo: Bob Elbert

BBMB's degree programs. Students can earn bachelor's degrees in agricultural biochemistry or biochemistry, as well as master's and doctoral degrees. More than 1,500 students have earned degrees since the department was formed in 1960 as "B&B"—biochemistry and biophysics. The department boasts it was the first in the nation to offer undergraduate degrees in biochemistry.

Undergraduates understand well the high standards and expectations. Put another way: Rigor, thy name is biochemistry.

All departmental courses are taught by faculty with top-level research programs. Many students get connected directly into research and are valuable contributors. It's not unusual for an undergraduate to be listed as a co-author on a paper published in a top-flight scientific journal. Students get immersed in core knowledge on biochemistry. It's later on that they decide on how to apply that knowledge specifically for work in plants, animals or biomedical fields. More than three-quarters of those earning bachelor's degrees go on to graduate school or medical school.

"Because of the rigor of our majors, many of our graduates get accepted into the nation's top programs," Rao says. "If I could do it all over again, I'd want to be an undergraduate here. Because I'd know I'd be taught by the best."

Undergraduate enrollment continues to climb—including this fall's admits there is a total of 170 students. Rao envisions the Carver Charitable Trust gift enabling the department to compete for students on the same footing as Harvard, Yale, Stanford and other elite schools. Promising opportunities await graduates. This year a Forbes story reported biochemistry was the number-two major (behind biomedical engineering) nationwide resulting in well-paid jobs.

"The reason is the explosion in the life sciences," Rao says. "Today we have genome sequences for humans, plants, animals and viruses. Someday a scan of your genome may show you have a propensity for a certain disease that should be checked out. Someday our electronics may be biobased, powered by biological molecules. Those things are going to happen. You can't take away the fact that a strong core knowledge of biochemistry and biophysics will be needed for success in those areas."

Rao says the explosion helps people understand that life sciences involves multidisciplinary efforts seeking to understand how life functions. And then, what societal benefits can be gained from a deeper understanding of life processes.

Where can you find ISU biochemistry alumni? "Our alums can be found in all walks of life," says Rao. "Many become doctors, dentists, faculty members or industry scientists. If there's a slight edge, it's in the medical or biomedical fields."

Besides strengthening BBMB's ability to attract students and to lead new research initiatives, the Carver Charitable Trust commitment will provide resources for the creation of endowed faculty positions, for nurturing new faculty and for acquiring the latest research instrumentation.

Besides his administrative duties as chair, Rao continues to be a musician in the departmental orchestra. He continues his own research program, which works to understand fundamental aspects of plant growth and development, specifically, the structure and function of plant proteins.

"First and foremost, I want to ensure the department and faculty are successful. Personally, I still want to do good science and be recognized as a scientist in my own right. This self-fulfilling idea of excellence motivates us all."

Walter Hearn, one of the department's founding faculty members who served at ISU from 1955 to 1971, provided an apt toast for BBMB's 50th anniversary in 2010 that acknowledges the past and looks forward to the future:

A wonder, is what it is, that ISU should boast
this scholarly community called "BBMB,"

Where more than just a few molecular explorers
(of various degree)

Employ vibrational waves of varying length
to penetrate parameters unknown:

An enzyme-substrate bond strength
or nucleotide components of a clone

(World-class research, I'd say, and "state of the art"),
probing more deeply than a surgeon's knife

The inner core (in metaphor, the "heart")
of robust fragility, which we call "life."

So here's a toast: May your "vibes" increase;
may your members' wonder never cease. S

Snapshot: Roy J. Carver Department of BBMB

- Established in 1960
- 26 faculty, 80 graduate students, 170 undergraduates
- First undergraduate degree in biochemistry in the nation
- Grant success averaged $6 million in FY2010, FY2011, and $5 million in FY2012
- More than $200,000 in grant funding per faculty member from National Institutes of Health, National Science Foundation, Department of Energy, U.S. Department of Agriculture and other agencies
- Faculty annually publish about 65 peer-reviewed papers in high-impact journals
- Many faculty are members of prestigious review panels for federal agencies and private organizations; serve on editorial boards of international journals; and are members of external advisory groups for other institutions
- Successful track record in attracting, nurturing and retaining outstanding faculty from leading institutions
- Distinguished alumni include:

  Keith Yamamoto ('68), the vice chancellor for research at the University of California, San Francisco. Yamamoto, who was awarded an ISU honorary doctorate in 2001, is a member of the National Academy of Sciences and a leader in national science and public policy activities.

  James Linder ('76), senior associate to the president for innovation and economic competitiveness at the University of Nebraska and president of the corporation that oversees technology development for the university.

  Charles Stewart ('00), a scientist with the Salk Institute in San Diego, received the CALS Superior Achievement Award for Early or Mid-Career Alumni in 2011.

  Leah Whigham ('93) is a research nutritionist with the USDA who conducted the first long-term safety trial of conjugated linoleic acid in humans.

  Garnett Whitehurst, (PhD '80), vice president, Brooks Whitehurst Associates, North Carolina.

ONLINE EXTRAS: www.cals.iastate.edu/stories

Learn more about the Roy J. Carver Charitable Trust awarding $7.5 million to BBMB.

BBMB FACULTY FOCUS

BIOCHEMISTRY, BIOPHYSICS AND MOLECULAR BIOLOGY

By Brian Meyer

Desi Gunning, teaching laboratory coordinator and biochemistry undergraduate academic advising coordinator

On the culture of BBMB. "BBMB is large enough to have great faculty and research opportunities and small enough for our students to feel connected and a part of this flourishing community. Students are very focused, dedicated and eager to experience research. When you combine great faculty with highly motivated and talented students, wonderful things happen."


Desi Gunning

On undergraduates and research. "Most of our undergraduates want to become involved in research and most do by their sophomore year. We encourage research as a natural extension of their education. Working with faculty mentors and alongside scientists in the lab is very exciting and motivating. Putting all those semesters of math, biology, chemistry and biochemistry to use in research helps them understand just how much they have learned. They transform from students to scientists. The application of their knowledge is what gets them hooked."

On what's exciting about working with students. "With such dynamic, capable and motivated students, we need to be on our toes. Our faculty is fantastic and ready to adapt and innovate to provide them with the education, experience and opportunities for excellent outcomes.A strength of our department is the strong sense of community that is greatly valued by students and their families. Our undergraduate program is wonderfully successful at preparing students for a variety of professional careers. Some may start as pre-med, but discover they love research. Our role is very important because we are sending our graduates off to be tomorrow's leaders as physicians, professors, pharmacists, veterinarians, research scientists and more."

On the signature BBMB undergraduate research symposium. "It is because of our students that we hold the Stupka Undergraduate Research Symposium each spring. The symposium is dedicated to the memory of Rob Stupka, a biochemistry student who inspired and developed the idea for the event but tragically died in a traffic accident. Now in its eighth year, the symposium is planned and executed by students and grows each year. It features the remarkable accomplishments of our student researchers. It has become a highly regarded professional scientific forum and we refer to it as a jewel in the BBMB crown."

Thomas Bobik, professor

On the culture of BBMB. "We have a great culture of cooperation that allows us to solve problems based on our collective interdisciplinary knowledge, which is crucial for modern science."

On his current research. "We are genetically engineering E. coli for production of renewable chemicals. We also are trying to define the architectural and functional principles of bacterial micro-compartments so they might be developed for industrial production of chemicals or as drug-delivery vehicles."

On how his work connects to peoples' lives. "We are trying to define the functional and design principles of biological systems so we can build purpose-specific systems that are useful in industry or medicine."

On what's exciting about his work. "The bacterial micro-compartments we study have unique structural and functional principles. Once we have fully defined these principles, then it will become possible to determine the scope of their importance and implement biotechnology and biomedical applications."


Thomas Bobik

Scott Nelson, assistant professor

On the culture of BBMB. "Everyone is interested in what different labs are working on. Faculty are always willing to help their colleagues and students in an area where they may lack expertise. Research is performed in a very collaborative environment, which definitely moves research forward at a faster pace. Having been a student in the department (PhD '02), I saw what a benefit it is to have easy access to professors with varying expertise. When I left Iowa State, I assumed the tight-knit, supportive atmosphere that I was part of was normal. But I've found the BBMB department is extraordinary in this regard."


Scott Nelson

On his current research. "My research focuses on discovering how enzymes carry out various activities and how these activities are regulated at the molecular level. We are currently concentrating on an enzyme complex that plays an important role in the repair of damaged DNA."

On how his work connects to peoples' lives. "Fundamental information we are collecting on the enzyme complex may prove useful in efforts to control its activity for the purpose of altering the DNA repair capacity of certain organisms. This could mean increasing the efficiency of DNA repair in plants for agricultural purposes or inhibiting DNA repair in tumor cells to increase the effectiveness of cancer treatments."

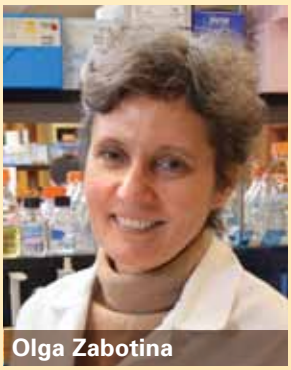
On what's exciting about his work. "We've made a great deal of progress towards identifying the routes of communication that occur within the structure of the enzyme complex. These routes are highlighting areas that may be particularly susceptible to inhibition by small drug-like molecules, which could be very helpful to rational, computer-aided drug-design efforts."

Olga Zabotina, assistant professor

On the culture of BBMB. "Open, friendly and intense. Faculty's doors are always open for students. Faculty are demanding with students because it exposes them to how demanding their future jobs will be. We try to convince them there's no time to lose: Learn how to be proactive and productive in the lab."

On her current research. "We want to understand how plants synthesize polysaccharides, which are major components of cell walls, and important for improving plants for biofuels production and industrial uses. We also are working to understand how changes in cell walls reflect interactions with the environment. This is important because cell walls are a first line of defense against environmental stresses and pathogens."

On how her work connects to peoples' lives. "We're trying to understand how we can modify plants to produce more useful food, fiber, fuel or other resources. How can we do this without affecting the plant's growth and development? Can we better understand how plants tolerate environmental stresses and use that information to improve them?"


Olga Zabotina

On what's exciting about her work. "Fundamental questions intrigue me. Step by step, we understand more about diverse, complex and dynamic structures in plants and can begin to put the information into the big picture and, in the future, apply it to practical problems. That excites me and that's why I tell students plants are much more interesting to study than other organisms because of their flexibility."

ZEBRAFISH OFFER CLEAR VIEW OF LIFE-SAVING KNOWLEDGE

By Virginia Zantow

Zebrafish are tiny vertebrates, but if you ask Jeffrey Essner, their significance to genetics research and cancer research is huge.

Essner is an associate professor in genetics, development and cell biology. He says the idea that he can improve human health—especially the idea that he can make a difference to cancer patients—motivates him in his research, which is funded by the National Institutes of Health.

Zebrafish—tiny, seemingly insignificant fish help him work toward that lofty goal. They also inspire him on another level: he enjoys looking at them.

"The embryos are just fascinatingly beautiful," Essner says.

Their embryos are optically clear, so zebrafish development is easy to observe under a microscope. Also, since fish embryos develop outside of the mother, researchers can manipulate them, and that works well for genetic engineering and identifying genes involved in disease processes. Zebrafish also happen to be prolific breeders (a given female will produce up to 400 embryos in one morning).

"We can generate lots of embryos," Essner says. "We can look at mutants and get statistical relevance from the numbers of offspring we're examining."

Precision is key

Essner has been using zebrafish to study a new method for genomic editing which uses artificial transcription activator-like effector nucleases (TALENs). This method allows researchers to cut DNA at specific sites and modify genetic information.

"We can go into any gene and introduce specific changes to the DNA with incredible precision," Essner says. "This technology has implications for working with large animals and human gene therapy."

Since zebrafish embryos develop outside of the mother, and since they are transparent, they are ideal for perfecting the use of TALENs in genomic editing. The embryos are easily accessed for microinjection, and the characteristics expressed by the modified genes are easily observed.

Essner, along with Ying Wang, a post-doctoral research associate in genetics,

Photo: Bob Elbert

Jeff Essner says the transparent zebrafish are especially suited for his research since their development is easy to observe under a microscope.

development and cell biology, and former ISU professor Dan Voytas, recently published an article in the journal Nature documenting the efficient use of TALENs in zebrafish.

The development of TALENs, an exciting new tool in the field of genetics, has roots at Iowa State. "TAL effector" proteins, which ultimately led to the development of TALENs technology, were discovered by Iowa State University plant pathologists and microbiologists.

"ISU has a great amount of intellectual property in TALENs," Essner says.

The TALENs technology started with plants, but now it is being applied to animals like zebrafish. The hope is that soon, TALENs technology will be perfected to the point that it can be applied to large animals like pigs, which are much more biologically similar to humans than zebrafish. Genetically engineering pigs to have human diseases like cystic fibrosis or multiple sclerosis would make strides toward the development of therapeutics for those diseases, and even gene therapy, Essner says.

From an agricultural perspective, perfecting genetic engineering technology like TALENs so it can be used on large animals could improve resistance to disease in livestock, meat production, and large animal production in general.

Essner is one of the founders of Recombinetics, the biotech company that holds the licenses to use TALENs on large animals of agricultural importance.

Cancer research: both sides of the coin

While Essner spends a lot of time studying the TALENs technology and applying it to zebrafish, he also uses zebrafish to study cancer with Maura McGrail, his colleague as well as his wife.

"As tumors progress, they always ask for a blood supply," Essner says. That's why his take on cancer research focuses in on blood vessel development.

Blood vessels don't just feed cancer tumors; they also transport them. Metastasis, or the spread of cancer tumors from one part of the body to another, happens through the blood stream. Essner looks for the genes necessary for blood vessel development. He is interested in finding ways to inhibit those genes, which could lead to developments in cancer therapies.

The transparency of zebrafish embryos also aids this research effort, as it allows Essner to clearly see the development of blood vessels.

McGrail, assistant professor in genetics, development and cell biology, looks at cancer from another angle. She seeks to identify the genes that are mutated in the cancer tumors themselves.

"Both of our research programs will continue to provide new insights into understanding the cellular and molecular mechanisms leading to tumor onset and progression," McGrail says.

Offering a closer look

As a third grade child, Essner was taken with the beauty of watching a sea urchin develop under a microscope. The experience was formative in his decision to become a scientist.

As Essner is still fascinated with observing life under a microscope, he passes his enthusiasm for biology on to the next generation.

"We provide zebrafish embryos to local schools in order to inspire the next generation of scientists," Essner says.

Essner inspires young scientists at Iowa State as well. He teaches Introduction to Biology as well as Developmental Biology, an upper-level course that provides research experiences to undergraduates.

Essner and McGrail mentor approximately five to ten undergraduates at any given time in their laboratory. The students take care of the fish and work on their own research projects, taking advantage of the clear view of cellular processes accessible in the zebrafish laboratory. S

IT'S ALL ABOUT LIFE:

Essner uses zebrafish to study a new method for genomic editing which allows researchers to cut DNA at specific sites and modify genetic information. The hope is for the technology to be perfected to the point that it can be applied to large animals like pigs, which can be genetically engineered to have human diseases like cystic fibrosis or multiple sclerosis and used to study therapeutics and gene therapy for those diseases. This technique could also be used to improve resistance to disease in livestock.

Photo: Bob Elbert

***Jeff Essner** and his wife **Maura McGrail**, both researchers in genetics, development and cell biology, work together to find new insights into battling cancer through better understanding the cellular and molecular mechanisms leading to the onset and progression of tumors.*

Photo: Bob Elbert

Joe Colletti is the senior associate dean of the College of Agriculture and Life Sciences and associate director of the Iowa Agriculture and Home Economics Experiment Station.

VOICES

By Joe Colletti

BEYOND ROCKET SCIENCE: SEEKING SOLUTIONS TO COMPLEX, GLOBAL CHALLENGES THROUGH LIFE SCIENCE RESEARCH

There's no doubt we face complex, global challenges in food, environment, bioenergy and human health and nutrition. Solutions will rely on new ways of thinking, new technology and analytics, new partnerships and new transdisciplinary teams.

It's not rocket science, folks. It's more complex than that. Solutions must be economically viable, environmentally sound, socially acceptable and resilient. They must make sense for the time and for the place.

For anything new to have impact and endure, it needs to be built upon a strong foundation. For the College of Agriculture and Life Sciences, that foundation is life sciences.

We have more than 150 years of success focused on crops, livestock, food, environment, nutrition and socioeconomics related to agriculture. What you may not know is that life sciences—including biology, biochemistry, ecology and genetics—have been and continue to be key to our success in science. It enriches our research portfolio, which today is both broad and deep, spanning so-called "basic science" to "applied science."

In 2009, a National Research Council report, "A New Biology for the 21st Century," outlined an approach to addressing major societal challenges of food, environment, energy and health. A key to this approach was the integration of knowledge across the life sciences, mathematics and engineering. The report stressed that the "New Biology" would build upon, not replace, "fundamental and curiosity-driven" research.

A few examples of our "beyond rocket science" work shows how we are tackling global challenges through life sciences:

- Research on zebrafish using advanced genetics called TALENS is poised to enhance food production and address human health concerns (see page 22).
- Breakthroughs in understanding plant-parasitic interactions at the genetic level may lead to new ways to thwart a $1 billion annual loss nationally in soybean production (see page 25).
- Double haploid technology allows corn breeders to more quickly produce corn inbred lines that better resist pests, respond better under extreme climatic conditions and have enhanced nutritional value.
- New understanding of components involved in plant cell wall development is central to biorefineries producing the next generation of fuels and renewable products.
- Scientists are learning more about a naturally occurring enzyme that converts glucose in plants directly into isobutene, a valuable, green fuel additive and industrial chemical.
- A blend of molecular virology, computational modeling, protein structure and function and veterinary pathology drives new vaccine strategies to combat a horse lentivirus and may shed light on a close cousin of the disease in humans, HIV.
- Capturing genetic and biochemical blueprints of medicinal plants may lead to advances in drug discovery and development for improved human health.
- Using biology and enzymology to understand how plants and animals repair DNA damage can benefit human health, including new options for cancer treatment.
- Ecology and evolutionary biology using a unique eye model in mollusks could advance therapies for human diseases causing vision loss.

You get the idea. The college's fundamental work in life sciences is the basis for solving complex, global challenges. It's a key part of how we are engaged in learning, discovery, translation and service for the benefit of Iowa and the world.

It's not rocket science, folks! It's more complex, and more meaningful! S

SCIENTISTS DISCOVER HOW NEMATODES ATTACK

By Ed Adcock

Soybean cyst nematodes have been found in fields in every Iowa county. The plant-parasitic microscopic roundworms cause an estimated loss of $1 billion dollars annually to U.S. soybean producers.

The pests get their name from the shell-like cysts, each containing hundreds of eggs, that persist in the soil until a susceptible plant is within reach.

Iowa State plant pathologists have made a breakthrough in the understanding of how cyst nematodes attack plants at the genetic level, providing the possibility of giving soybeans a way to fend off the pest.

Rosetta Green, an agricultural biotechnology company, licensed the technology last summer with the goal of developing nematode-resistant plants. The company's agreement with the Iowa State University Research Foundation is based on research deciphering how cyst nematodes infect plants.

The research is led by plant pathologists Thomas Baum, professor and chair of plant pathology and microbiology, and Tarek Hewezi, an associate scientist.

Cyst nematodes are damaging pathogens of plants worldwide. The pests feed on plant fluids by attaching to the host plant's roots.

Scientists previously discovered that nematodes hijack plant development by injecting cells with chemical signals that cause hundreds of cells to fuse into a feeding site.

Photo: Bob Elbert

*Plant pathologists **Thomas Baum** (right) and **Tarek Hewezi**, developed a new approach to studying microRNAs, powerful regulators of gene activity, to better understand how nematodes change gene activities in plants.*

Baum and Hewezi sought to understand how the nematode changes the plant's gene activities for the purpose of turning it into a food source. The researchers' new approach was studying microRNAs, which are powerful regulators of gene activity.

"These worms learned to communicate with these plants' cells in a very subtle way," Baum says.

The researchers used the plant Arabidopsis as the model because it has a relatively small genome, and studied how sugar beet cyst nematodes attacked it. They discovered a relationship one microRNA had with two genes that are associated with growth regulation.

Hewezi and Baum used molecular biology techniques to generate experimental plants in which the microRNA levels are elevated in roots attacked by cyst nematodes and they found these plants were not as susceptible to the nematode. And when they adapted the target genes to be unaffected by the microRNA, they found these plants were less susceptible as well.

"Our results indicate that the microRNA, together with its target genes, has a real function in the interaction and it's required to a certain degree for the pest to attach to plant roots," Baum says.

The Iowa Soybean Association funded research that led to the discovery, and the National Science Foundation recently funded a three-year study for $607,875 to continue work with Arabidopsis microRNAs during cyst nematode parasitism.

IT'S ALL ABOUT LIFE:

Baum and Hewezi's research gained new understanding as to how nematodes change plant gene activities to turn it into a food source for the pest. Using molecular biology techniques, they discovered elevated microRNA levels in roots are attacked by cyst nematodes, and those altered to be unaffected by the microRNA, are less susceptible. The discovery could be used to fight nematodes, which cost U.S. soybean producers $1 billion dollars annually.

NATURE'S PROMISCUOUS REVISERS:

TRANSPOSABLE ELEMENTS

By Meg Gordon

Thomas Peterson, a leader in transposon biology, does fundamental research that pulls him deep into the swoops, swishes and switches of the corn plant genome.

Sixty-four years ago transposable elements were discovered in maize. Thirty years ago a Nobel Prize was awarded to the scientist who found them. Three years ago, the maize genome map appeared in the pages of the journal Science, confirming that eighty-five percent of the maize genetic hard drive involves transposable elements, "transposons".

DNA with wanderlust

Transposons are pieces of genetic material that freely and unpredictably caper around the genome. They can contain one gene or many genes, and regulatory elements—the so called junk DNA that scientists now know is anything but junk.

"This is the raw material for evolution," says Thomas Peterson, Pioneer Chair in Maize Molecular Genetics and professor of genetics, development and cell biology.

Peterson was a graduate student when Barbara McClintock received her Nobel Prize in 1983. "At the time, it was so remarkable that this little piece of DNA could move around the chromosome when common wisdom stated that genes stayed in place," he says.

In the intervening years, transposable elements have been found within the genomes of most organisms—from Arabidopsis to Homosapien to Xanthomonas.

Mother Nature's genetic engineering

Plant breeding depends on natural variability recombined to create favorable types of plants. New molecular techniques for engineering DNA such as transcription activator-like effector nucleases (TALENs), that target specific sequences and cut the DNA, are making it possible to place genetic modifications where they are most likely to succeed.

But dramatic contributions to natural variability come from transposons. They are Mother Nature's way of introducing variability—genomic complexity—genetically engineering on a large scale.

Peterson describes their behavior as somewhat like a computer in which the select, insert and delete functions sporadically activate to delete, move, copy and paste chunks of text all over a document. The resulting copy can accumulate duplicate sentences and paragraphs. At first these additions might seem irrelevant or disruptive, but over time some of the duplicate text morphs into prize-winning prose.

"People would like to control transposons but they have a reputation for being wild—if the TALENs approach is a smart bomb then the transposon system is an atom bomb," says Peterson. "No one wants

Photo: Bob Elbert

***Thomas Peterson** uses color in the cob and seed coat to phenotypically track the genetic doings of a transposon that controls red pigment in maize. The gene for red kernel color also produces a natural insecticide.*

to unleash the transposon system into their carefully controlled genetic material but, the potential benefit transposons offer is that they open up so many kinds of large changes that are not feasible using any other method."

Where the fine-tuning begins

About 50 percent of genes present in the maize genus are duplicates. Many sit side by side; others are peppered throughout the genome. Peterson studies relative activity rates and the mechanisms transposons employ to copy, slot in, slip out, or invert whole sections of DNA in maize. A transposon containing the maize gene for red kernel color allows Peterson to track its activity phenotypically (visually) through cob and kernel.

Transposon capering is enabled by an enzyme called transposase that frees the element with what Peterson believes is a clean cut to the DNA. Whether the transposon reinserts as a simple relocation or a large chromosomal rearrangement appears to be determined by the number of surrounding transposons and which end of a given transposon is cut and therefore activated.

Furthermore, environmental stresses such as heat and cold appear to encourage transposon-enabled gene duplication. Peterson's current work proposes a new mechanism whereby endpoints of neighboring transposons contribute the scaffolding for rapid reprinting of side-by-side copies of a gene or its removal.

"Once you make two copies of a gene, one can change or adapt, developing a new function such as coding for a protein that recognizes a specific pathogen and confers disease resistance," says Peterson. The other copy preserves the original function. Alternatively, deleting or disrupting a gene that has a negative effect on the organism can confer new advantage. S

IT'S ALL ABOUT LIFE:

Transposons are pieces of genetic material that move freely and unpredictably around the genome causing natural variability within species. Peterson's research offers deeper understanding to how transposons may be used to offer dramatic advantages such as disease resistance, innate pesticide or deleting a gene carrying negative traits.

RESTORATION PRODUCES RIPPLE EFFECT AT CLEAR LAKE

By Ed Adcock

Photo: Bob Elbert

Professor John Downing leads long-term regeneration research at Clear Lake in north central Iowa. Downing says the lake's recovery has been "phenomenal," with much improved water clarity and lake function.

Photo: David Knoll—CLEAR Project

Clear Lake is getting closer to living up to its name after a restoration plan created by limnologist John Downing and his Iowa State team.

It began with a two-year study he compares with a medical diagnosis.

"We basically took that lake and the watershed apart and determined what wasn't working right and then helped the community find a way to put it back in better shape," says Downing, a professor of ecology, evolution and organismal biology and agricultural and biosystems engineering.

He credits the City of Clear Lake, Cerro Gordo County, the Iowa Department of Natural Resources and dozens of citizen volunteers with making the restoration successful.

"It's a community that really threw a lot of energy into it, worked hard and did many special things to increase the chances of success," Downing says.

The lake became a classroom for many of Downing's students.

One became the coordinator of the Clear Lake Enhancement and Restoration (CLEAR) Project. David Knoll ('99 animal ecology) worked for Downing as an undergraduate. He collected samples at the lake, analyzed them and performed GIS work during the diagnostic and feasibility study preceding the restoration.

The work convinced him to pursue a career in water resources. In 2001, he joined the Iowa Department of Agriculture and Land Stewardship as an environmental specialist with responsibility for the CLEAR Project.

Although much progress has been made, Knoll says, the community around Clear Lake is still working on implementing the recommendations of the feasibility study.

"The fact that this is a relatively small watershed (about 8,500 acres) makes it easier, but it takes a lot of maintenance work and requires consistent attention," Knoll says.

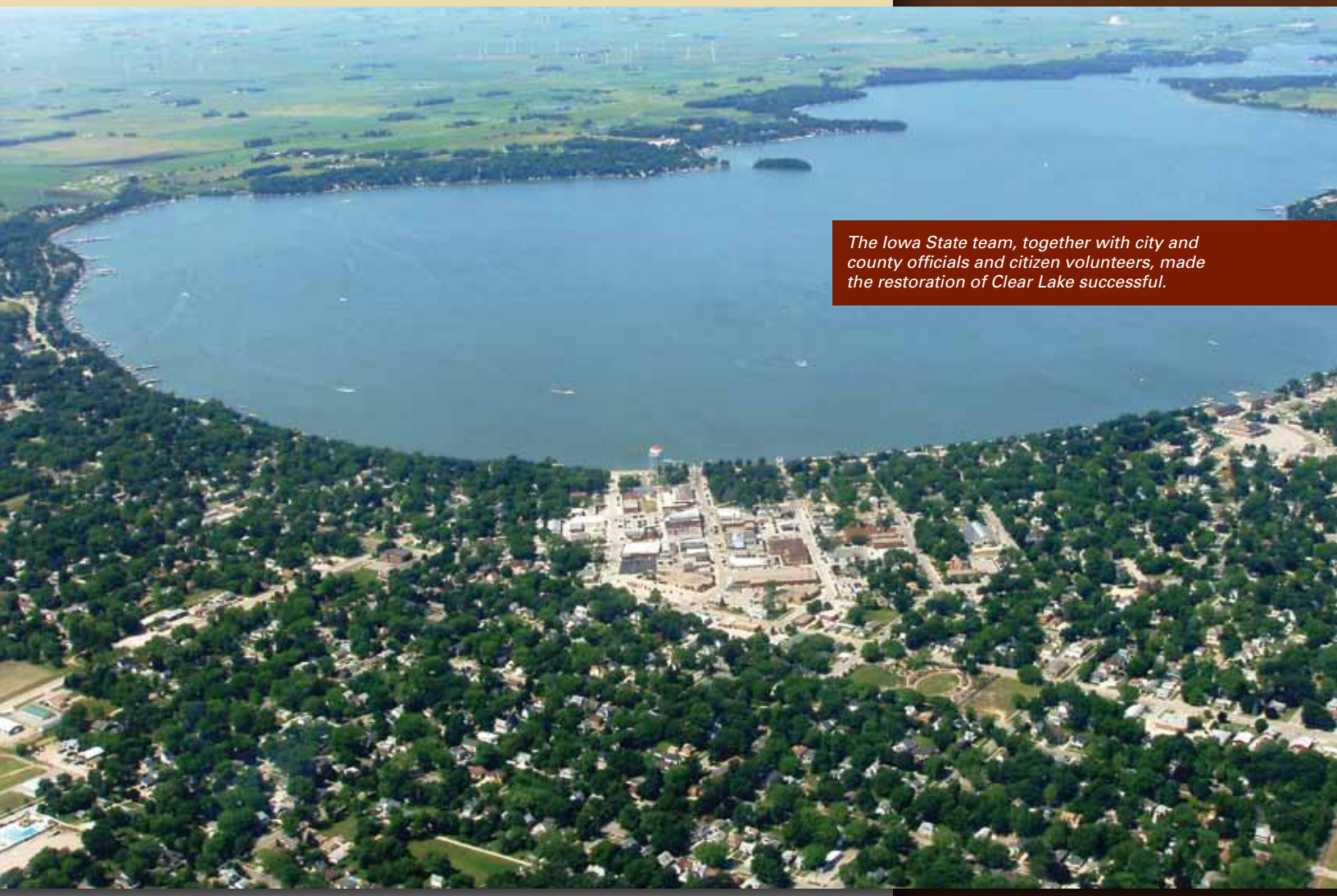
The lake's recovery has been "phenomenal," much better than expected. "The water clarity is substantially improved, the function of the lake is much, much better," Downing says.

One of the concerns when they started the restoration was heavy nutrient and sediment loading from agricultural and developed areas in the lake's watershed. Row-crop agricultural land represents 51 percent of the land in the watershed, and about 80 percent of the lake shoreline is developed. This meant that a lot of improvements needed to be made in the land around the lake to cut down on nutrient run-off.

Phosphorus coming into the lake was the main problem and is now down to a quarter of pre-restoration levels. Likewise,

IT'S ALL ABOUT LIFE:

Iowa lakes generate more than $40 million annually. Lake enhancement and restoration reduced nutrient run-off by more than 80% at Clear Lake. Clean lakes were considered valuable to the 80 percent of Iowans who visit lakes annually.



The Iowa State team, together with city and county officials and citizen volunteers, made the restoration of Clear Lake successful.

suspended sediment in the lake has been reduced by more than 80%.

The Department of Natural Resources is managing the carp, which stir up the bottom when nutrients are rich and outcompete other fish. Restoring surrounding wetlands and Ventura Marsh was another factor, and dredging the small lake west of Clear Lake helped protect it from sediment and nutrient deposition.

Downing said Clear Lake became a model for about a dozen lake restoration projects.

"We, as a state, learned a lot—how to do the studies and how to do the restoration—from the work at Clear Lake," Downing says. "We also learned a lot about the value of water, which was very important."

He collaborated with Iowa State economists Catherine Kling and Joseph Herriges from 1999-2005 on surveys of Iowans seeking to understand the return of investments in Clear Lake and other waterways. Water clarity was a prime factor in how Iowans decide to visit lakes and clean lakes were called extremely valuable to the 80 percent of Iowans who visit lakes each year.

The Lakes Valuation project found that 12 of Iowa's 132 lakes generate spending of more than $40 million annually. Overall, Iowans spent more than $9 million on average per lake.

Lake visitation increased 33 percent from 2002–2009, the years in which lake usage surveys were conducted. Of the four lakes with the largest increase in usage, three had undergone major restoration efforts.

"I grew up around water and studied to be a limnologist," says Downing, an Iowa native. "It's a great thrill for me to give something back to society." S

RESEARCH ON WATER QUALITY RECEIVES PRESTIGIOUS AWARD

Economists Joe Herriges, Cathy Kling and Dan Otto; John Downing, in ecology, evolution and organismal biology; and Kevin Egan, an ISU economics grad, were recognized for their collective work by the Agriculture and Applied Economics Association in August. The group of researchers received the Bruce Gardner Memorial Prize for Applied Policy Analysis for their project "Assessing the Value of Water Quality Preservation and Restoration: The Iowa Lakes and Rivers Projects" which included Clear Lake.

MAKING A DIFFERENCE

By Melea Reicks Licht

ONE CORNER OF THE WORLD AT A TIME

Photo: Nancy Brannaman

Nancy (Barickman) Brannaman, a foreign service officer for the U.S. Department of State, has traveled extensively helping foreign nationals and U.S. Embassy staff manage their operations, human resources and finances.

As a foreign service officer for the U.S. Department of State, Nancy (Barickman) Brannaman has experienced several moments during her career that have driven home the importance of her work.

One such moment came in September when the U.S. Consulate in Libya was attacked.

"I was anguished for all of the families of Americans and Libyan staff who worked in the Consulate. What a tragic loss of innocent lives," she says. "This event illuminates the dangers that can exist for diplomats overseas. "

Another was 9/11. Brannaman was conducting visa interviews in Ukraine ensuring those requesting to enter the United States were who they claimed to be.

"That historic event drove home the importance of keeping the U.S. safe through qualified access like visas, and striking a balance so that business people, students and visitors may travel to the U.S.," she says.

Brannaman ('83 agricultural business and farm operations, MS '85 agricultural economics), has been stationed in Islamic countries for the majority of her 12-year service. She says she felt welcomed and appreciated at each of her posts.

Motivated by a desire to help others, Brannaman and her husband John ('78 animal science, MS '82), an officer with the U.S. Agency for International Development, find their work gratifying.

"When we visit places we worked 10 years ago and see the improvements made in the area thanks to our effort—that is what it is all about," says John. "And you can't deny the sense of adventure."

John works in Food for Peace providing food aid to refugees in developing nations.

Nancy manages operations, finance and human resources in embassies and finances in the State Department in Washington, D.C.

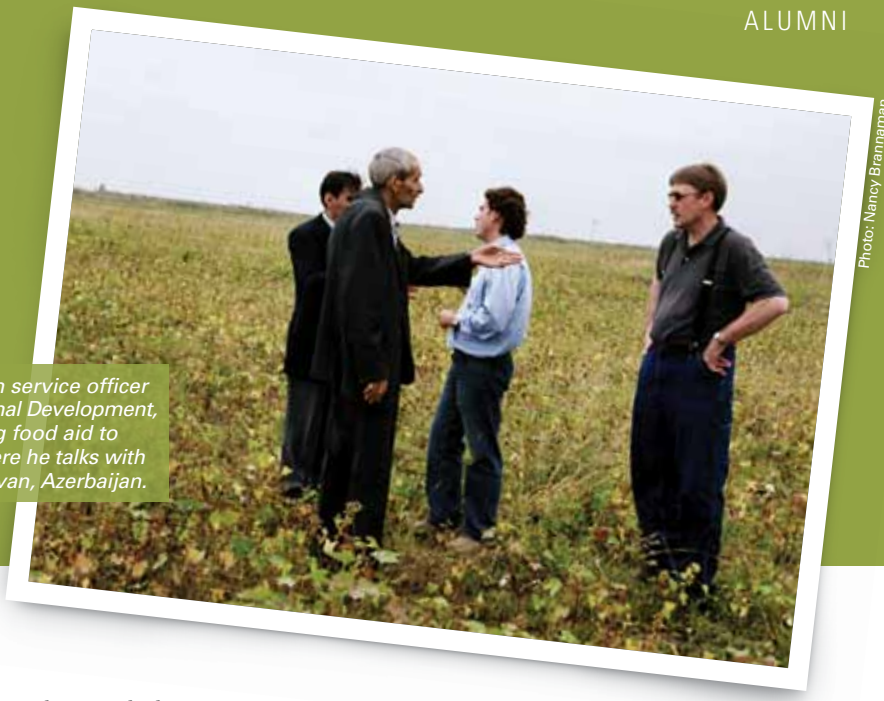


Photo: Nancy Brannaman

***Nancy Brannaman** conducts an impromptu photo shoot with local villagers in Azerbaijan. Intrigued by her camera, family after family approached her asking for portraits from her Polaroid. She and her husband John didn't leave until each person had a copy of their own. This photo is among their favorite memories of their service abroad.*

***John Brannaman** (right), a foreign service officer with the U.S. Agency for International Development, works in Food for Peace providing food aid to refugees in developing nations. Here he talks with farmers in drought-prone Nakhchivan, Azerbaijan.*

Photo: John Brannaman

"In management we want to make sure the rest of the diplomats at our embassy aren't distracted by the little details and can focus on their jobs," she says. "I help them find ways to stretch tight budgets, or accomplish special projects. For me, finance is all about helping people meet their goals."

The two have been fortunate to be placed together since she signed up with the State Department. Their first post was Ukraine in 2000. Following Ukraine, they landed in Baku, Azerbaijan; then Tashkent, Uzbekistan; then Tirana, Albania.

State Department postings last, at most, three years before requiring personnel to move to another assignment, including jobs stateside. Currently, Nancy is a financial management officer for the International Cooperative Administrative Support Service in Washington, D.C.

Thanks to rigorous language training at the Foreign Service Institute in Arlington, Va., Nancy speaks Russian and Albanian proficiently. She says her ability to communicate with local embassy employees is essential to making connections and developing an esprit de corps.

Traveling and experiencing the culture and countryside of their host nations has been the biggest perk of working abroad, Brannaman says.

"Azerbaijan was especially enjoyable. I loved the culture, the friendly, hospitable people and the food," she says. "I traveled freely throughout the country exploring Christian ruins, monasteries and mosques."

Prior to working with the State Department Nancy worked with John on agricultural development projects for the State of Iowa and Land O' Lakes Inc. in rural Ukraine and Russia for three years following the break-up of the Soviet Union. She first gained experience living abroad as an exchange student in her teens. In total, Nancy has worked in or visited more than 25 countries.

While traveling the globe Nancy, a third-generation Iowa Stater, has kept her alma mater close to heart.

She has fond memories of her time on campus, including meeting her husband while both were enrolled in macroeconomics.

After graduation, Nancy worked for Iowa State University Extension as an area management specialist. She and economics professor William Edwards traveled the state with 40-pound "portable" computers to perform financial analysis and scenario planning with farmers in the 1980s.

"We would set up our machines on their kitchen tables," she recalls. "For many we were trying to find ways to save the family farm."

Nancy is a recipient of Iowa State University's Outstanding Young Alumna Award, Outstanding Agribusiness Alumna Award and an ISU Extension New Professional Award. She is a member of Cardinal Key and received the William G. Murray Award for outstanding Senior in Agricultural Business.

Ron Dieter, economics professor, uses her as an example when talking to prospective students.

"Nancy went from farm management to Amana Appliances to a career in foreign service," he says. "She shows students a degree in agricultural business provides skills that are transferable. With an education like hers you can work anywhere."

Nancy was a guest lecturer in one of Dieter's classes this fall. She and John returned to campus to share their experiences with several classes and encourage students to consider a "richly rewarding" career in foreign service.

"Working with citizens of the host country and speaking their language we learn their history, traditions and perspectives while we progress U.S. foreign policy," she says. "We also put a human face on American values and ideals." S

ONLINE EXTRAS: www.cals.iastate.edu/stories

Brannamans were inspired to return to ISU to share their experiences with students after learning of the recently developed major Global Resource Systems (GRS) at an ISU Alumni Association event. To learn more about GRS visit STORIES online.

REMOVING BARRIERS TO BETTER HEALTH

By Melea Reicks Licht

If it is possible to be both serene and passionate at the same time, then Anthony Davis is just that.

Davis ('97 genetics) practically glows as he describes the philosophy that drives his chiropractic practice in Ames.

"The body has a remarkable ability to heal itself from illness as long as there is nothing in the way. My job is to get those barriers out of the way," he says. "There is so much joy in what I do. I help people get more control over their health. Having the opportunity to do that is such a gift. Every day is different, even when you see the same patients—your radar always has to be up to identify their current needs."

Davis describes chiropractic care similar to repairing the wiring system in a house.

"We remove stress and interference from the nervous system by adjusting bones. It's like a wiring system in a house and the vertebra are the circuit breakers. If one is out of place it leads to bad communication between the body and the brain. Discomfort or illness could result," he says.

Those barriers may contribute to neck or back pain, which chiropractors are best known for treating, but Davis says his treatment can influence the gamut of health issues from digestion to asthma to allergies and beyond.

Davis may be unique in that he came to chiropractic medicine through agriculture. He became interested biotechnology and genetics while a high school student in Madrid. A self-described "lifelong Iowa Stater," Davis says once he discovered Iowa State offered a degree in genetics it never crossed his mind to attend any other university. He shared his enthusiasm while at Iowa State playing saxophone in the marching and pep bands.

"Going to chiropractic school was a bit of a left turn for me," Davis says. "I was working in a lab at Pioneer in Johnston when I realized that I wanted to be more directly involved in helping people."

A good experience with chiropractic medicine following a sports injury in high school made a lasting impression on Davis. As he explored his options, pursuing a career in chiropractic care rose to the top. His genetics degree armed him with the necessary prerequisites and a unique perspective to approaching chiropractic care.

Davis attended Cleveland Chiropractic College in Kansas City, Mo. He specializes in a method using a small handheld device called an Activator to gently tap vertebra in place. He opened his own practice, Complete Spine and Headache Center, in 2006 in southwest Ames.

Davis lists awareness and acceptance of chiropractic care as a top challenge for his profession. About 8 percent of the U.S. population sees a chiropractor in a given year. He says his ultimate goal is to create a world-class chiropractic center in Ames so he can work to improve the quality of life for his patients and raise awareness and acceptance of his field. S

Photo: Melea Reicks Licht

***Anthony Davis**, clinic director and chiropractor, says his background in genetics gives him a unique perspective in enabling the body's natural ability to heal.*

Photo: Terry Herbig

REFEREEING THE SEED INDUSTRY

By Melea Reicks Licht

***Chet Boruff**, with the Association of Official Seed Certifying Agencies and former Deputy Director of the Illinois Department of Agriculture, considers industry regulation key to protecting farmers and consumers.*

Chet Boruff has made a career protecting agricultural producers and consumers through regulatory affairs.

Boruff ('76 farm operations) is the chief executive officer of the Association of Official Seed Certifying Agencies (AOSCA). The organization is "like the NCAA of the seed industry," he says.

"We govern how the seed industry plays in terms of isolation, handling and maintaining identity, purity and quality. We protect farmers to make sure what they buy is what they get," Boruff says.

The association's members are certification agencies in 45 states and Canada, Australia, Argentina, Chile, New Zealand and South Africa. These agencies administer seed certification programs protecting the varietal purity and quality of a wide range of seeds and plant propagating materials.

"AOSCA has always worked to ensure genetic purity and varietal identity are maintained and preserved. We are simply working with different technologies than we were in 1919 when the organization was created," Boruff says. "We want to make sure there is credibility in the seed market and our members have active participation in decisions regulating the seed industry."

Throughout his career he has operated a farm near his home in Moline, Ill., which he credits for helping him stay focused in serving agricultural producers and consumers.

Boruff was a member of Alpha Gamma Rho fraternity while at Iowa State and met his wife Joy, a journalism grad. What strikes him most about his Iowa State experience is that at the time, he didn't appreciate student access to "highly-esteemed" professors like Neil Harl, whose lectures were like "opening a fire hose" of knowledge.

Prior to his current position, Boruff worked in agricultural finance, sales and marketing.

Thanks in part to networking and experience gained as part of the inaugural class of the Illinois Agricultural Leadership Program, Boruff was selected to serve as the Deputy Director of the Illinois Department of Agriculture. He worked for seven years under former Governor Jim Edgar, overseeing regulatory and natural resource programs.

Manjit Misra, director of the Seed Science Center and the Biosafety Institute for Genetically Modified Agricultural Products based at Iowa State University, considers Boruff a capable leader and spokesperson with the ability to anticipate and meet the needs of member organizations.

"Under Chet's leadership, AOSCA has become a visible and effective organization," Misra says. "AOSCA recently developed an organic seed database that I'm hearing very good things about. They serve both conventional and organic agriculture, giving farmers access and choice."

The online organic seed finder brings buyers and sellers together and assists organic certifiers. It is one way AOSCA is evolving with the industry.

"The introduction of new types of technology will continue to provide challenges for seed producers and those that regulate and audit the seed industry," Boruff says, "as will consolidation of companies and the impacts of decreased funding for public agricultural research."

Boruff says AOSCA will continue to serve and maintain the relevance of seed certifying agencies to the agricultural industry.

USING CAREER IN CONSERVATION

TO PROTECT AND INSPIRE

By Melea Reicks Licht

"Working with animals was my ticket out of the rough, crime-infested streets of Chicago," Jeramie Strickland says. "And you can quote me on that. It's my testimony."

He isn't shy about relaying how his love for the outdoors and nature spared him from an uncertain future, one in which many of his peers became "gang-bangers and drug dealers."

Strickland (MS '08 ecology and evolutionary biology) is a wildlife biologist with the United States Fish and Wildlife Service at the Upper Mississippi River National Wildlife and Fish Refuge. He is stationed at one of the most visited refuges in the nation, which attracts millions of hunters, fishers and other outdoor enthusiasts from nearby urban areas including Chicago.

Strickland's inner-city Chicago childhood was interrupted by a three-year respite in the backwoods of Alabama. Without money for afterschool programs and sports, the five-year-old spent his days catching frogs, crafting homemade fishing

Contributed photos

*Wildlife biologist **Jeramie Strickland** says sharing his knowledge of wildlife and the outdoors is what drives him. He hopes to inspire kids to pursue careers in science.*

poles and exploring every nook and cranny of the ponds surrounding his home.

"I moved back to Chicago in third grade, and I couldn't fish or swim in Lake Michigan. It was too polluted. I didn't have that outlet anymore," Strickland says. "When I started to have behavior issues in elementary and junior high school, my teacher's response was for me to do math and science with guidance counselors as my punishment."

Strickland's "punishments" led to winning science fair projects at the school, district and city levels. He was strongly encouraged by mentors and counselors to attend the Chicago High School for Agricultural Sciences where he followed the animal science track working with the school's livestock and aquaculture programs.

To his surprise he was offered a partial scholarship to the College of Agriculture and Related Sciences at Delaware State University, where he gained undergraduate research experience and held internships at Purdue University, Michigan State University, the U. S. Department of Agriculture and in Nambia, Africa.

He realized his true passion—sharing his knowledge with youth, especially minorities and urban students—working for the Ecological Society of America as an education program coordinator. He knew a master's degree would advance his career and provide more opportunities for him to work with youth. So he sought out Iowa State University biologists Fred Janzen and Anne Bronikowski.

"Jeramie's application for graduate work simply oozed enthusiasm and the diversity of the meaningful experiences in his background was exceptional," says Janzen.

Strickland went on to study painted turtle nesting in Janzen's lab performing fieldwork at the refuge where he now works. He helped start the Turtle Camp Research and Education in Ecology program.

Strickland's work at the Upper Mississippi River National Wildlife and Fish Refuge is busy and varied. His enthusiasm and down-to-earth nature is obvious as he explains a day's work could entail hosting youth and disabled hunters during specialized hunts, bald eagle population counts, recovery of threatened ornate box turtles—the list goes on and on. There is no typical day.

"I have to remember to say, no," he admits. "There are so many fun and exciting projects to take on I have to remember I can't do everything."

One thing he rarely says no to is any opportunity to share his love for wildlife and the environment with youth. In doing so he realizes he isn't just teaching science, he's showing kids like him a glimpse of a future they may not have thought possible.

"Getting kids involved in conservation and exposing them to the outdoors is my way of giving back," Strickland says. "I am truly thankful for my mentors, and I want to give kids from my community a better role model."

Strickland serves as a mentor for the Ecology Society of America and The Minorities Striving and Pursuing Higher Degrees of Success in Earth System Science Program. Both programs provide students with professional development opportunities, science exposure (including research), networking opportunities and reciprocal mentoring opportunities. S

ONLINE EXTRAS: www.cals.iastate.edu/stories

Read more about the Turtle Camp Research and Education in Ecology.

CLASS NOTES AND MORE:
GET STORIES ONLINE

Want to hear what your classmates are up to and get recent news from the College of Agriculture and Life Sciences? Sign up for the monthly alumni e-newsletter *STORIES Online* for class notes, research news, faculty, staff and student updates and notices of college events.

E-mail stories@iastate.edu to join the mailing list.

ALUM SELECTED AS FULBRIGHT SCHOLAR

John Carlson, a professor in Western Illinois University's School of Agriculture, has been selected as a Fulbright Scholar. He will spend August through December teaching at the Ryazan State Agrotechnological University in Russia. Carlson earned an ISU bachelor's degree in animal science and agricultural journalism in 1974, and a master's degree and a doctorate in 1977 and 1980, respectively, in animal breeding.

Contributed Photo

CALS ALUMNI AND FACULTY EARN NATIONAL TEACHING AWARDS

The North American Colleges and Teachers of Agriculture honored two CALS faculty members for their teaching ability. **Curt Youngs**, animal science, was presented the Central Region Outstanding Teacher Award. **Mike Retallick** (PhD '05 ag and life sciences education), agricultural education and studies, was presented the Teacher Fellow Award. Other CALS alumni honored as Teaching Fellows were: **Nicholas Paulson** ('02 ag systems technology), University of Illinois; **Antoine Alston** (PhD '00 ag and life sciences education and studies), North Carolina A&T State University; and **Jennifer Bormann** ('97 animal science, PhD '04 animal breeding and genetics), Kansas State University.

EVANS HONORED FOR DISTINGUISHED SERVICE TO AG COMMUNICATIONS

Jim Evans ('54 agricultural journalism) was presented the Distinguished Service Award by the American Agricultural Editors' Association (AAEA). The retired professor of agricultural communications at the University of Illinois was recognized for his work developing the Agricultural Communications Documentation Center, a collection of information on agriculture and the profession of agricultural communications. The AAEA also named a new scholarship after Evans for his "tremendous impact on the establishment and growth of agricultural communications programs."

OVERCOMING CANCER, TRAGEDY TO GRADUATE VET SCHOOL

CALS alumna **Sarah Myers** ('07 microbiology) overcame cancer and family tragedy to complete her veterinary medicine degree in May. In the five years since earning her undergraduate degree her life has hit highs and lows most others experience over a lifetime: marriage, birthing two children, caring for and mourning the death of her mother, her own cancer diagnoses and treatment and finally, completing her doctor of veterinary medicine degree. Read more about her at www.cals.iastate.edu/stories.

Photo: Bob Elbert

Photo: Hickey Photography

HOIBOAR NOT THE BIGGEST, BUT STILL CHAMP FOR KIDS WITH HEART DISEASE

Paul Kruse ('80 farm operations) and **John Sweeney** ('80 animal science,'84 DVM) teamed up with fellow ISU alumni and fans to raise Fred Hoiboar, named after Iowa State Men's Basketball coach Fred Hoiberg. The tubby Yorkshire weighed in at 1,079 lbs. at the Iowa State Fair Biggest Boar contest. While Hoiboar didn't take home the gold, he did help raise funds and awareness for heart disease benefitting Hoiberg's cause of choice Camp Odayin for kids with heart disease.

Visit Hoibar online at www.cals.iastate.edu/stories.

ISU AND CAST:
PROMOTING SCIENCE-BASED AG INFORMATION FOR 40 YEARS

By Dan Gogerty

Charles A. Black, an Iowa State University agronomy professor, was instrumental in founding the Council for Agricultural Science and Technology (CAST) in Ames in 1972 to meet the need for access to science-based agricultural information.

Since then the partnership between CAST and Iowa State University continues to run deep. When CAST offered an education program, ISU was first to take advantage, so educators and students could access current news, resource material and career opportunities. Other universities and education groups followed ISU's lead to receive CAST benefits. Many Iowa State professors support CAST by contributing to research papers and serving on CAST committees.

CAST shares science-based information through its publications, weekly online newsletter, videos and social media. For four decades, the independent organization has informed educators, students, the public and policymakers about issues important in the world of agriculture and food production.

Currently, the most dynamic collaboration between CAST and Iowa State University is the intern program.

"The program is wonderful for both the students and our organization," says CAST's John Bonner. "Our organization gets help from hardworking young people with innovative ideas, while the students gain experience and make connections that often lead to successful jobs."

Bonner ('68 dairy science, MS '71 animal science, PhD '74) is executive vice president and chief executive officer of CAST.

Many interns have been part of this productive partnership. Two with strong agriculture backgrounds demonstrate why the program flourishes.

"Elizabeth Burns-Thompson came to CAST brimming with enthusiasm and insights about tech and communication. She took every opportunity to make connections and develop new programs," says Linda Chimenti, CAST's chief operating officer.

Burns-Thompson points out, "I worked on a number of projects, but the most significant was introducing CAST into the world of social media."

During her internship, Burns-Thompson ('11 agricultural business and international agriculture) kick-started CAST's involvement with the AgChat Foundation and Twitter. At the same time, she was able to "agvocate" for agriculture—including a trip to Washington, D.C., for National Ag Day. Burns-Thompson now studies agricultural law at Drake University Law School and works with the Iowa Farm Bureau Federation.

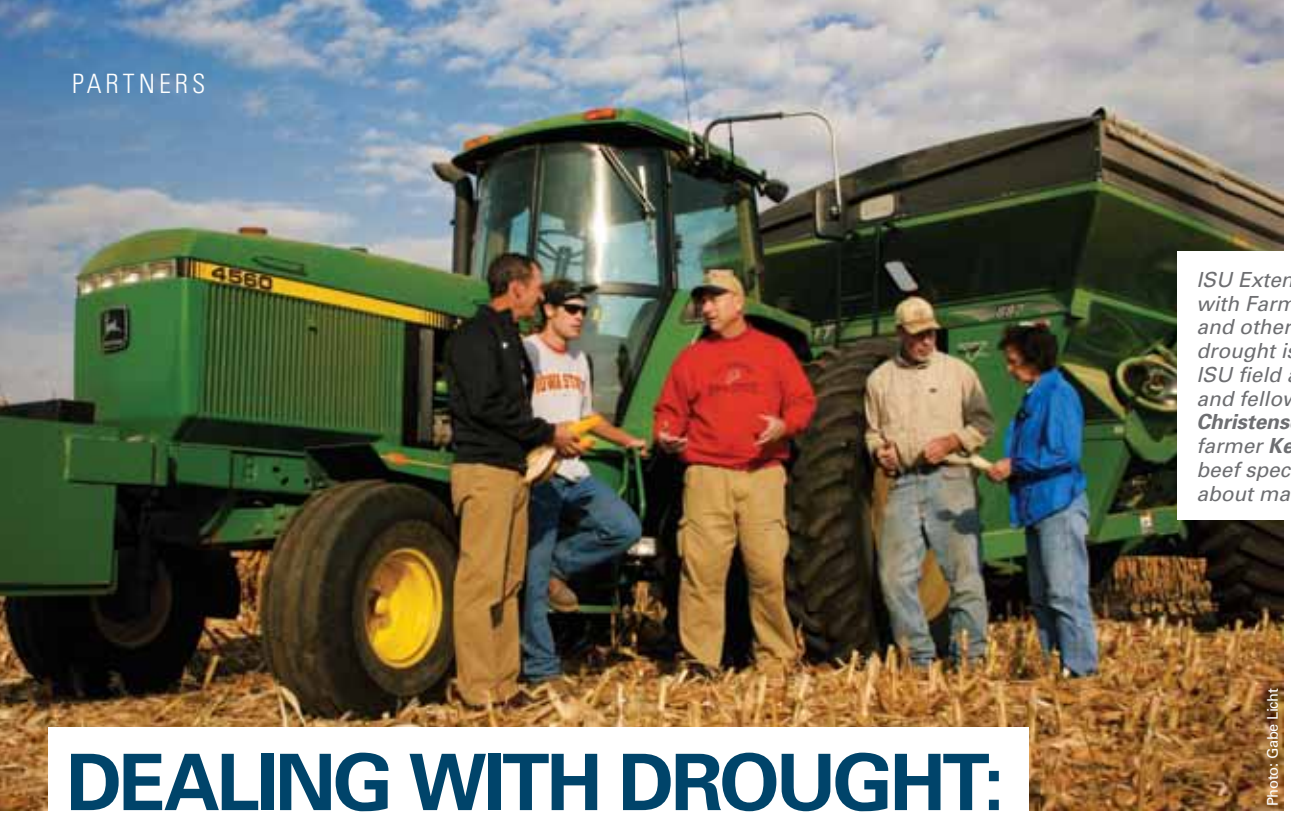
A current intern, Sally Gorenz, has kept the tweets rolling with a growing tally of 2,300 Twitter followers. Among her many jobs, the senior in agricultural and life sciences education, communications option, has expanded the role social media plays at CAST. Gorenz developed a CAST Facebook page and started the popular "Catch of the Day"—a regular Facebook link featuring high interest stories.

"Staying on top of social media helps you put a name to your organization, expand your network with the click of a mouse and keep you on your toes for the next social media outlet coming your way," Gorenz says

The ISU-CAST connection continues to be a two-way street that benefits students, educators and those interested in credible information about science and agriculture.

Photo: Bob Elbert

*Intern **Sally Gorenz** is the driving force behind the Council for Agricultural Science and Technology's social media presence. CEO **John Bonner** says their intern program is one of many ways CAST partners with Iowa State University.*



*ISU Extension and Outreach joined with Farm Services Agency (FSA) and other organizations to address drought issues in Iowa this summer. ISU field agronomist **Paul Kassel** and fellow ISU alumni farmer **Kurt Christensen**, **Les Zobrist** with the FSA, farmer **Kent Christensen** and ISU beef specialist **Beth Doran** touch base about management and feed options.*

Photo: Gabe Licht

DEALING WITH DROUGHT:
ISU EXTENSION AND FARM SERVICES AGENCY'S RAPID RESPONSE

By Willy Klein

Jim Larson, a northern Iowa beef cattle breeder, called Beth Doran in mid July with an urgent message. Larson ('69 animal science) looked to Doran, an Iowa State University Extension and Outreach beef specialist, for answers to cattle producers' drought-specific questions. Weeks of triple digit temperatures and little, if any, rainfall had contributed to the significant decline in crop and pasture conditions—and herds needed feed. What were their options?

His calls followed conversations Doran and her colleagues were having with county office and campus staff and put into motion a regional extension response that included 10 emergency meetings reaching over 660 producers and agribusiness staff.

"I was concerned about nitrates in my silage, so were my clients," says Larson. "Beth sent me information about getting silage tested and many of my clients went to the meetings where extension tested for the presence of nitrates."

Similar scenarios were happening across the state. The extension network ramped up communications, updated resources, contacted partners and began providing educational events and distributing materials.

Drought-stricken Iowa producers needed to make decisions quickly, but university research and expertise alone could not answer all their questions. Within a few days, Extension and Outreach joined with crop insurance agents and adjusters, agribusinesses and Farm Services Agency (FSA) directors across the state to hold meetings addressing drought issues.

"In July, we didn't have disaster assistance to talk about, but we attended the extension-led meetings and encouraged producers to keep good records in the event assistance became available," says Jeff Davis, Plymouth County FSA director.

FSA and ISU Extension and Outreach response continued around the state. Carol Groen, Lyon County FSA director, attended an Extension and Outreach webinar in Sheldon in late July, responding to questions and providing agency fact sheets.

Trevor Kerr, Sioux County FSA director, invited Doran and staff from the Natural Resource Conservation Service and Rural Development to a late-July county emergency board meeting to document losses in crops, pasture and hay. He completed, filed and updated U.S. Department of Agriculture reports needed to trigger USDA response to the drought. Similar county emergency board meetings were held around the state.

By the end of July, Iowa FSA authorized emergency grazing on Conservation Reserve Program acres in 26 counties, freeing up forage and feed for producers.

Haying and grazing of cover crops without impact to insurability of planted 2013 spring crops was announced by Risk Management Agency in August.

USDA designated all Iowa counties as primary or contiguous natural disaster areas due to damages and losses caused by the drought by August 15, making emergency loans available to producers.

Looking back, Doran sees partnerships worked for the benefit of producers, especially with FSA.

"The agency with the capacity to offer emergency relief and the university with agricultural experts will continue to anticipate needs and respond to continuing drought conditions," she says. S

ONLINE EXTRAS: www.cals.iastate.edu/stories

The Farm Service Agency is an agency of the U.S. Department of Agriculture administering farm commodity, loan, conservation and emergency assistance programs for farmers and ranchers. Find links to their programs and ISU Extension and Outreach.

HELPING LIVESTOCK JUDGING AND ANIMAL SCIENCE REACH NEW HEIGHTS

By Melea Reicks Licht

Dr. Tyrone Artz, a retired orthopedic surgeon in Valley Center, Kan., never forgot the lessons he learned showing livestock in 4-H and as an undergraduate at Iowa State University.

"Showing livestock teaches responsibility and that animals deserve a high quality of life," he says. "They should be respected and treated decently, and not taken for granted."

Artz created an estate provision in his will so future students may learn these same lessons as they grow their skills and experience in livestock judging at Iowa State.

As a freshman in animal science in 1960, Artz remembers feeling anxious about "making the grade." But something he heard at his orientation session stuck with him, even tho ugh the speaker's name has faded from memory: "Students that have the 'I will' fare much better than students that have the I.Q."

He took the comment to heart, worked hard and gained confidence during his first quarter. His grades were high, and he was accepted to vet school.

He would have "D.V.M" behind his name rather than "M.D." if it weren't for an exchange with his local veterinarian while working on his home farm one hot Iowa summer day.

"In the middle of a particularly hot and messy visit our local vet asked me why I'd ever want to do what he did for a living and reminded me doctors work in the comfort of air conditioning," Artz recalls with a smile. "He told me if I was smart enough for vet school I was certainly smart enough for med school."

Artz took his vet's advice. After graduating from Iowa State he completed medical school at the University of Iowa and the University of Wisconsin, Madison.

While his future didn't play out in animal agriculture, he's taking steps to ensure future animal scientists trained at Iowa State University have the best opportunities.

Now retired, Artz has invested in both Iowa State and the University of Iowa with a land gift through his estate. His gift to Iowa State also will benefit the College of Veterinary Medicine with the creation of an endowed professorship.

Maynard Hogberg, professor and chair of animal science, says Artz's gift will provide the margin of excellence over similar programs across the country.

"The Artz Judging Team Fund will assist with recruiting the best students and reinforce our commitment to leadership skills development," Hogberg says. "It will create an environment for students to interact with and care for animals and to better understand the agricultural and food system."

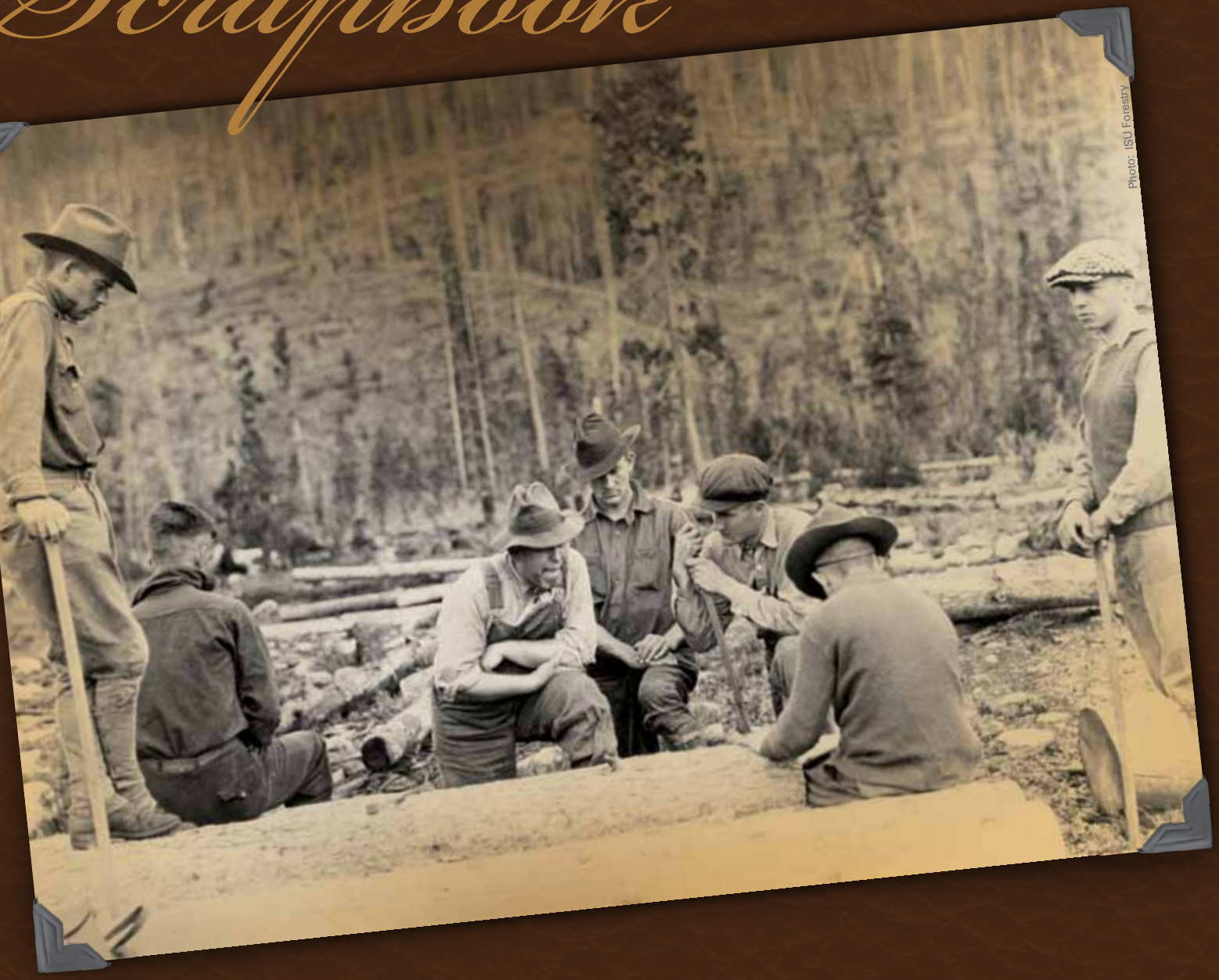
The gift also will endow the Artz Chair for Faculty Excellence in Animal Science for a faculty member who has shown distinction in undergraduate education and research in an area that strengthens and supports animal agriculture in Iowa.

Funds generated from Artz's endowed gift of farmland will support students, faculty and staff and programming. It will provide travel support, scholarships, professional development, materials, equipment and the development of a stronger advising system. The department will use part of the fund to sponsor and host judging competitions and recruitment programs.

Photo: Jeff Tuttle

***Dr. Tyrone Artz**, a retired orthopedic surgeon, didn't follow the path be began at Iowa State into the animal agriculture industry. But, his gift of farmland will help ensure future animal scientists the best opportunities.*

CALS Scrapbook



Iowa State Forestry Camp circa 1918

For 90 years, Iowa State faculty have taken forestry students to every region in the United States to explore the varied branches of forestry. The first forestry camp was held at Cass Island, Minn., in 1914. The first camps were held during the summer and lasted three months. The camps have been held every year except during the war years. In 1994, the camp was shortened to three weeks and moved to the fall. The fall curriculum includes industry tours, urban forestry, conservation and restoration among other field experiences.

IN OUR NEXT ISSUE

STORIES
IN AGRICULTURE AND LIFE SCIENCES

THE SCIENCE AND PRACTICE OF FARMING

Supporting production agriculture from **SCIENCE** to **PRACTICE** will be featured in the next STORIES in **AGRICULTURE** and **LIFE SCIENCE**. The issue will highlight college programs to **INSPIRE** and prepare future farmers, illustrate the **IMPACT** of extension education and explore research advancing agricultural **SCIENCE**. It will feature students set to return to **FAMILY** farming operations, alumni working in production **AGRICULTURE** and faculty and staff supporting **FARMERS** and informing the decisions they make.

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Miranda dreamed that **she'd protect wild animals someday.**

Someday happened sooner than she thought.

When Miranda Furrer visited a bear exhibit it sparked an early interest in wildlife. When she majored in animal ecology at Iowa State she learned she could live her dream right away. She volunteered for the Wildlife Care Clinic, building her resume and opening the door to an internship at a New Hampshire science center. Miranda now realizes how quickly someday becomes today.

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