



## PAYING IT FORWARD

### Mentoring Michigan's next generation

The practice of mentoring has its roots in antiquity. The qualities that we associate with today's mentors — the ability to guide, counsel and empower — find their genesis in Homer's epic poem, "The Odyssey," written near the end of the eighth century. The poem centers on the Greek hero Odysseus and his 10-year journey home following the Trojan War. Before leaving for battle, Odysseus entrusts the care of his son, Telemachus, and his palace to his longtime friend and trusted adviser, Mentor. Telemachus was also a favorite of Athena, the goddess of war and wisdom, who committed to help the boy through any difficulties he might encounter.

Odysseus' long absence leads many to assume that he is dead, and his wife, Penelope, and Telemachus must deal with a group of unruly suitors who compete for Penelope's hand in marriage. In addition to Mentor's tutelage, when Athena visits Telemachus, she takes on the guise of Mentor and encourages him to stand up against the suitors and to go abroad to find out what happened to his father. Because of Mentor's relationship with Telemachus and the encouragement and practical plans for dealing with personal dilemmas imparted by the disguised Athena, the word "mentor" has today been adopted in English and is defined as "someone who imparts wisdom to and shares knowledge with a less experienced colleague."

As attested to in the 10 profiles contained in this magazine and in countless other testimonials about mentor-mentee relationships, the significance of mentors is monumental. By these accounts, some of the greatest professionals in the world are where they are today because of the guidance they received from their mentors. And even when novices become leaders and mentors in their own right, they often still seek their mentors' counsel because of the personal relationship and special bond created during the mentoring experience.



In this issue of *Futures*, you can read about how AgBioResearch scientists from a variety of research disciplines are serving as mentors to the next generation of researchers and professionals, and how their protégés have gone on to careers that are making a difference as they provide innovative, real-world solutions to boost Michigan's economy, conserve the state's natural resources and enhance the quality of life for Michigan residents.

We hope that you enjoy this issue of *Futures* and that it helps you to understand a little more about AgBioResearch and its activities. If you have comments about this issue, please send an e-mail to [info@AgBioResearch.msu.edu](mailto:info@AgBioResearch.msu.edu) or call 517-355-0123. You also can view this and past issues of *Futures* by visiting our website, [www.agbioresearch.msu.edu](http://www.agbioresearch.msu.edu), and clicking on the "News & Stories" link.

In addition to *Futures*, you may also subscribe to our free quarterly electronic newsletter Innovations and our Annual Report by visiting [eAgBioResearch.com](http://eAgBioResearch.com) and indicating which publications you would like to receive.

**A final note:** This will be my last issue as managing editor of *Futures*, as I take on new responsibilities in the MSU College of Natural Science. I've greatly enjoyed sharing with you the stories and activities of our scientists, staff members, students and partners, and thank you for your interest and readership. I leave this and the other AgBioResearch publications we produce in the capable hands of my colleague, Holly Whetstone ([whetst11@msu.edu](mailto:whetst11@msu.edu)), who will continue to keep you in the know about the innovative research which is providing practical, real-world science to address issues that matter most to you. 🌱

VAL OSOWSKI



# FUTURES

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# THE SCIENCE OF MENTORING: Driving the Desire to Inspire

*“Better than a thousand days of diligent study*



We call them teachers, advisers, experts and even friends. But in reality, being a mentor isn't a profession — it's a role. Mentors are often the first people that we look to as valuable sources of information and advice. They can exist in every aspect of human life, whether it's professional, personal or spiritual. No matter what your occupation, chances are that you have at least one, probably more. But the unique part about mentors is that it requires a pupil to make one. As the old adage goes, “When the student is ready, the teacher will appear.”

“Mentoring links our research with creating the capacity for other people to be of general service and usefulness in the world,” said MSU AgBioResearch Director Steve Pueppke. “Focusing this issue of Futures on the mentoring role that our scientists play is an interesting way to show that our work is about more than the research that we do, the innovations that we provide or the results that we compile and share — there is a human element, an aspect of the work that emphasizes human capacity and future generations.”

MSU AgBioResearch Associate Director John Baker, who has mentored numerous students during his 28 years at MSU — including Michigan's state veterinarian, Steve Halstead — emphasized the importance of the mentoring role of its scientists, especially for Michigan.

“It's been a fiscally challenging time in Michigan over the past several years, so adding to the employment base and the research potential of the state is very important,” he said. “It's critical to Michigan that we're committed to doing this because, in addition to conducting research and providing innovations, we're also producing competent scientists and other professionals that are making significant contributions to the state both economically and from a quality of life standpoint.”

“I'm sure that we also do extremely well at mentoring and sending people to other parts of the world,” Pueppke added. “These connections afford huge benefits to us, but they are a little more indirect than the benefits that we see when someone starts a business here, does a good job working for a state agency, or goes back to their family farm or another aspect of agricultural production.”

Another benefit of mentoring that Pueppke sees is the strong partnerships that are in place between MSU scientists and various Michigan-based industries that provide students with opportunities to try out the real world before they graduate.

“Because of the excellent job that our scientists and educators do to prepare students for the work force, many companies and state agencies take our students on as summer interns,” Pueppke said. “This is another way that the influence of mentoring flows out of our labs and classrooms. Mentoring is all about relationships, and although we don't often think about it that way, we're really a relationship-based organization. And we have the most impact when we have good relationships with those who need the knowledge and talent that we create.”





is one day with a great teacher.”

— JAPANESE PROVERB



MSU AgBioResearch Director Steve Pueppke (right) and Associate Director John Baker

Although Pueppke hasn't had the opportunity to directly mentor anyone during his seven years at MSU, he said that he has benefitted from the mentoring opportunities provided at the university.

“The first mentor that I ever had was a Michigan Agricultural Experiment Station [now MSU AgBioResearch] faculty member, Paul Rasmussen, who worked at the university when I was an undergraduate,” he said. “He left MSU years ago, but he was the person who encouraged me to pursue graduate school in research and to leave MSU to experience other places. He was the first mentor I had after leaving high school, and he was very influential in shaping my career path — I worked in his laboratory; the very first research I did was under his tutelage.”

“The reach of MSU is pretty amazing,” Baker said. “MSU has a good-sized College of Agriculture and Natural Resources, and it's been around for a long time. I remember participating in a weeklong leadership training in Indianapolis while I was the associate dean for research and graduate studies in the College of Veterinary Medicine. There were probably 100 of us from all over the country in that training — undergraduates, graduates, faculty members — and I'd say that MSU had, at some point, touched the lives of more than 50 percent of them.

“The other side of the ‘reach’ coin that we don't always think about is sabbaticals and visiting professorships,” Baker added. “MSU has a constant inflow of people coming here to collaborate and work with our scientists and students, and that builds into the mentoring/pay-it-forward equation, too.”

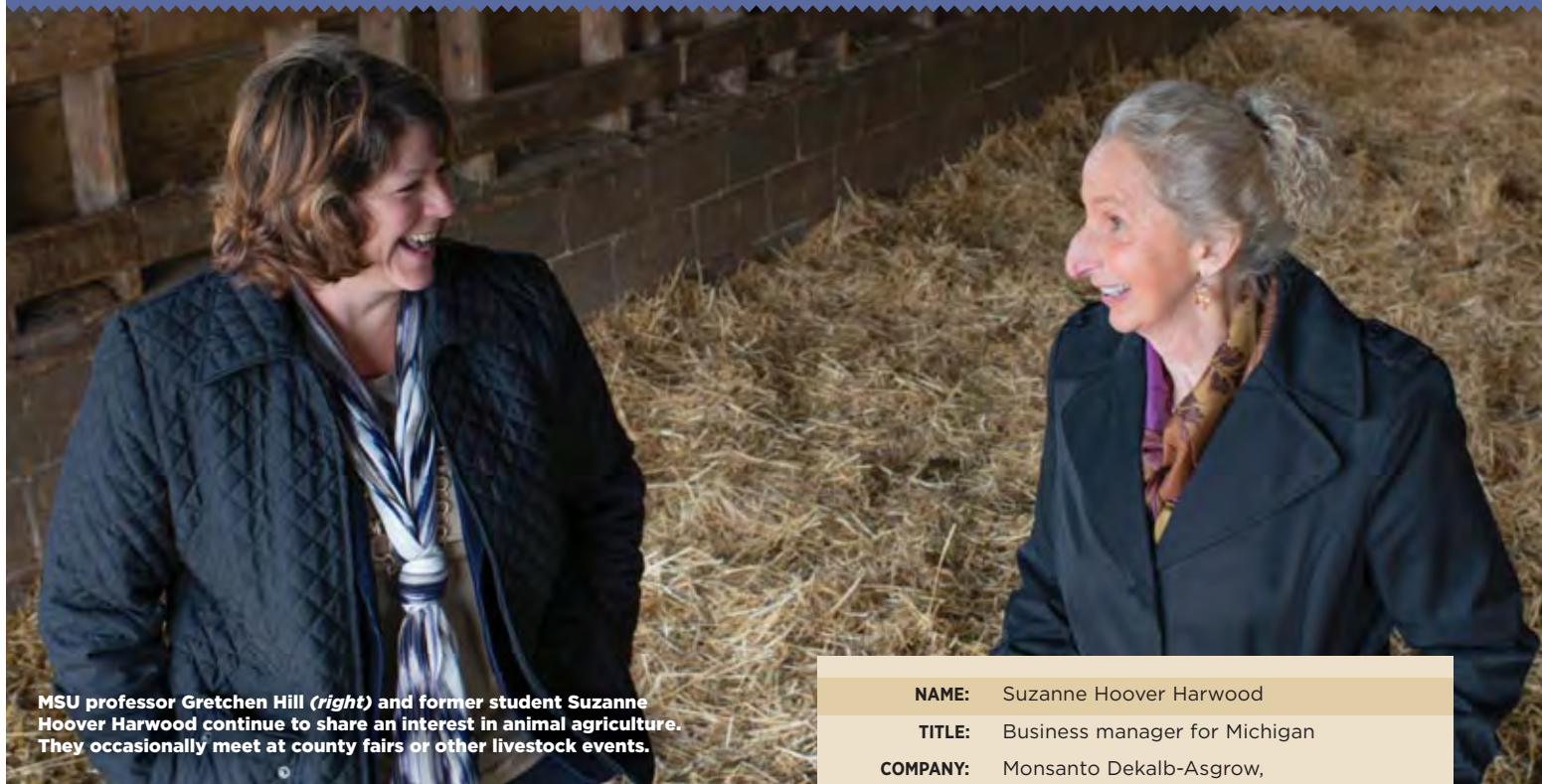
Though Pueppke admits that most of the world's attention is often placed on the research and its outcomes, he contends that connecting with the humanness of what his organization does is equally or sometimes more important than the facts and figures generated, the value of a particular industry, the cost savings and efficiencies achieved, or how much some new variety that's produced is worth.

“You simply can't underestimate the power of relationships and connectivity,” Pueppke said. “Practices such as mentoring show us that, at the end of the day, the human element of our work is the driving force behind all that we are and all that we do.”

VAL OSOWSKI



# Reining in agricultural interests, animal scientist harnesses strength in managing people



MSU professor Gretchen Hill (*right*) and former student Suzanne Hoover Harwood continue to share an interest in animal agriculture. They occasionally meet at county fairs or other livestock events.

<b>NAME:</b>	Suzanne Hoover Harwood
<b>TITLE:</b>	Business manager for Michigan
<b>COMPANY:</b>	Monsanto Dekalb-Asgrow, headquartered in St. Louis, MO; Harwood works out of a home office in Harrison, Mich.
<b>EDUCATION:</b>	B.S. (1995) and M.S. (1997) — both in animal science, Michigan State University (MSU), East Lansing, Mich.
<b>MENTOR:</b>	Gretchen Hill, professor, MSU Department of Animal Science

Suzanne Hoover Harwood considers herself a chameleon, a role that has held her in good stead as she has changed jobs in agriculture.

“Having spent time in the research setting, I looked for companies such as Monsanto as an employer because they are science-based,” said Harwood, who is now the business manager for Michigan for Monsanto Dekalb-Asgrow, selling Dekalb corn seeds and Asgrow soybeans. “Although my experience from other jobs was in a different facet of agriculture, having a background in sales and strong business acumen, I have been able to change industries and quickly get up to speed.”

When Harwood came to Michigan State University (MSU) as a freshman, she entered the nursing program.

“After six months, I decided that it wasn’t what I wanted to do,” Harwood said. “I was familiar with farming and missed the animals back home.”

She researched the MSU Department of Animal Science and made the move to that department before the start of her sophomore year.

“It was a refreshing experience,” Harwood said. “I liked the small classes, and I started to get to know people.”

She also got involved in the university’s purebred beef

operation and the MSU Block and Bridle Club, an organization that sponsors livestock, social and community service events. Harwood was president of the MSU club, which is part of a national organization. She also was involved in livestock judging teams.

Looking back, Harwood credits MSU AgBioResearch scientist and swine nutrition specialist Gretchen Hill with helping her to be successful.

“Gretchen is unique,” Harwood said. “She takes a keen interest in students in animal science, not just those involved in the swine program. She wants to get to know you and help to boost your confidence.”

Mentoring students is a large part of Hill’s career.

“Suzanne is a wonderful example of someone who needed to be told how good she was and, at the same time, reined in so that she could succeed,” said Hill, a professor in the MSU Department of Animal Science. “Students are



able to do many things, but they have to learn to harness themselves or else they get nothing accomplished.”

Part of Hill’s philosophy of mentoring goes back to her experiences as a young student. Over the years, she has developed many contacts in animal science in both academia and industry and is emphatic about introducing anyone with her to people she knows or meets.

“The kids will tell you that I introduce them to everyone,” she said. “There won’t be anyone they don’t meet. That’s because, as a student, I didn’t get introduced to people. I think that it’s very important, and I am proud to be able to do that for students.”

Her philosophy in mentoring graduate students is to encourage them to go to another school for graduate studies.

“In a professional field, you need to learn that we don’t all have the same viewpoint,” she explained. “You need to expand your relationships with many people because they will be the reviewers on your papers and grants and co-authors of your research,” said Hill, who joined the MSU faculty in 1993.

She also firmly believes that students who see the broader world and get a good education can be hired back at MSU. Harwood was one of a few exceptions — Hill took her on as a graduate student directly from the MSU animal science undergraduate program.

As Harwood was finishing her bachelor’s degree, she was struggling with the decision about what to do for a career. That’s when she traveled to a Midwest animal science meeting as a member of the MSU Animal Science Academic Quadrathlon team.

“I had an opportunity to talk with Gretchen and listen to the research presentations at the meeting,” Harwood said. “I decided research was something that I might like doing, and Gretchen encouraged me.”

After more discussions with Hill, Harwood entered the MSU animal science master’s program. Her research focus became the mineral content of nursery pigs and why feeding them diets with high levels of zinc and copper promoted growth. Hill worked with Robert Gast, who, at the time, was the MSU vice president for research and graduate studies, to set up a graduate student internship with the feed industry — a first for its time.

Harwood was the recipient of that internship. It took her to Consolidated Nutrition in Decatur, Ind., for six months, where she completed numerous research trials related to her thesis topic, returning to MSU to complete her master’s degree.

**“Gretchen is unique. She takes a keen interest in students in animal science, not just those involved in the swine program. She wants to get to know you and help to boost your confidence.”**

~SUZANNE HARWOOD

With degree in hand, Harwood went back to Consolidated Nutrition as a research assistant and then moved on to several other jobs in various phases of a agriculture.

It was finally in a position as manager of a sales team where Harwood found her true calling.

“I love managing people,” said Harwood, who has been managing sales teams for 11 years. “It’s one of those things that you decide over time. I had to find myself and what I wanted to do. Finally, I found that one of my strong talents is managing people.”

About a year and a half ago, Harwood took her current job, managing a team of seven sales people and the business as a whole for Monsanto Dekalb-Asgrow on Dekalb corn seeds and Asgrow soybeans in Michigan.

“I was excited to be traveling just in Michigan. With my other job, I had a multiple-state territory and was spending

lots of time away from home. We have three small children, so being able to be at home most nights is great,”

Harwood said. Her husband, Jeff, raises beef cattle, part of a family business in Michigan since 1914. They live in Harrison, Mich.

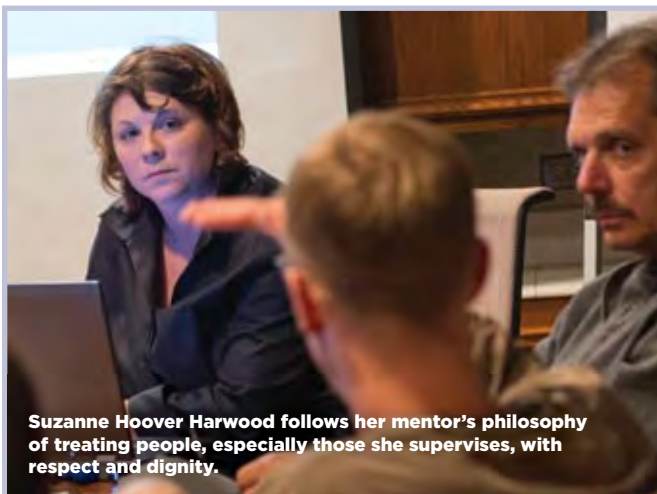
In addition to acknowledging Hill as her primary academic mentor, Harwood credits her parents, El and Toni Hartwick, for their enduring support and steady hand. Another person who had a large impact on her is

Tom Anderson, her first manager as a sales rep with Monsanto Dairy.

She sees Hill occasionally, most recently this summer at a county fair where Hill was helping to judge livestock.

“Gretchen’s greatest strength is that innate sense of knowing what young students really need and how to help them,” Harwood said. “I believe she is different from others because she takes such a keen interest in her students, not only professionally but also personally. She is very down to earth, and I think the world of her.”

JANE L. DEPRIEST



**Suzanne Hoover Harwood follows her mentor’s philosophy of treating people, especially those she supervises, with respect and dignity.**

# Entomology student catches serious teaching bug, now Olivet dean and provost



MSU entomology professor Dave Smitley and former mentee Maria Davis examine insect samples in his laboratory. Davis, who earned her Ph.D. in entomology, considers insects to be “some of the most amazing group of animals on the planet.”

<b>NAME:</b>	Maria Davis
<b>TITLE:</b>	Provost and dean
<b>COMPANY:</b>	Olivet College, Olivet, Mich.
<b>EDUCATION:</b>	B.S. in biology (1983), Siena Heights University, Adrian, Mich.; M.S. in biology (1985), Bowling Green State University, Bowling Green, Ohio; Ph.D. in entomology (1989), Michigan State University (MSU), East Lansing, Mich.
<b>MENTOR:</b>	Dave Smitley, professor, MSU Department of Entomology

When Maria Davis stepped in to guest lecture for a turfgrass entomology class, Michigan State University (MSU) professor Dave Smitley quickly realized his young protégé had a special gift for teaching.

“The students liked her lecture better than they did mine,” said Smitley, who was a new professor at the time. “Maria was a graduate student, and it was one of the first classes she ever taught. I watched what she did and I learned some things. I knew right then that she was going to be a great teacher.”

His prognostication was spot on — Davis has had an impressive career in academia, including a 16-year stint as a popular professor at Olivet College. In 2011, she was named dean and provost of the private, four-year liberal arts institution. Despite overseeing a faculty of 92 and a student body of 1,156, Davis remains a teacher at heart.

“I miss teaching very much, but I feel like I still do teaching in terms of working with my faculty colleagues and learning new things every day,” she said. “I still get to do some of that — just not in the classroom anymore.”

It was Davis’ fascination with insects that morphed into much more under the careful guidance of Smitley,

her doctoral academic adviser.

“She was a good researcher, but she had even more talent in teaching,” said the MSU AgBioResearch scientist. “I just made sure she had plenty of opportunities to get teaching experience, and she took right off.”

Davis, who taught in Lyman Briggs College at MSU while working on her doctorate, said Smitley made some sacrifices in his research to help her develop into a promising teacher.

“Clearly, what Dave did for me was to hear what my dreams and aspirations were and then help me to fulfill them,” she said. “He mentored me in my Ph.D. research, but beyond that, he allowed me to explore teaching and that’s no small thing. Teaching takes time away from the research.”

But Davis’ unique approach in the classroom couldn’t be ignored. At a time when most professors spent an hour or longer lecturing in front of a class, Smitley said Davis was



utilizing small groups and encouraging dialogue.

The mentor-mentee experience with Smitley helped Davis excel professionally, but it also played a pivotal role in her personal life. It was in Smitley's entomology lab where she met her future husband, Terry. The two began dating, but kept their romance a secret from Smitley until their engagement.

"It's kind of funny because we were worried how Dave would take it, so we didn't tell him we were dating," she said. "Eventually we made an appointment to go into his office and tell him that we were going to get married. He looked rather shocked and announced that he kind of felt sorry for us. I don't know what that meant, but we laugh about that until this day."

Smitley clarifies that he was sorry because they believed it necessary to keep their relationship from him.

This year marks the couple's 25th wedding anniversary. Terry continues to work with Smitley as a lab technician, which keeps the line of communication open between mentor and mentee today.

"With my husband continuing to work for him, I sort of feel like Dave and I have this 'transferral connection,'" she said. "I always know what's going on in his life, and he knows what's going on in mine."

Reflecting on the guidance that Smitley provided, Davis said one of the most important lessons was his individual approach to each student.

"I think what we share is our approach to teaching and the philosophy that there is no set mold that a student is going to be in," she said. "You have to think of that person, their goals and their aspirations. That's something Dave did with me and that I try to do with my students. The attention to the individual has led me to be a very successful instructor and to where I am now in terms of my leadership. I consider myself very much a servant leader meaning that the people I serve are important to me."

Davis recalls how Smitley's kind, welcoming demeanor became apparent in their initial meeting. She had driven from her home in Ohio to MSU. Her mother, an intensive care unit nurse who had just worked the night shift, tagged along to ensure that her daughter made it safely on her journey. Upon arrival at the school, Davis went in for her interview and her mother napped.

"I left her sleeping in the car, and I'll never forget when Dave said, 'Oh, your mom is here, I'd like to meet her.' So we went outside and there was my mom sleeping with her feet out the window. She was so embarrassed. But that is the kind of person Dave is — he's very personable and genuinely wants to get to know all of his students."

**"She was a good researcher, but she had even more talent in teaching. I just made sure she had plenty of opportunities to get teaching experience, and she took right off."**

~DAVE SMITLEY

Although it may not have been the ideal start for many relationships, it was the perfect beginning to theirs. From that moment, Davis knew Smitley was the adviser for her.

"He seems to have a very peaceful center and is able to keep his focus, and I struggle with that a bit," she said. "Watching him go through some very difficult things in his life and seeing how he stayed tranquil and centered was an important lesson for me — the need to keep the calm through the storm."

Despite an innate calmness, Davis said Smitley was quite persistent when it came to her research project on chinch bugs and residential lawns.

"He always pushed me sometimes to the point when I'd say, 'Come on already — do I really have to do that experiment? Haven't I already done enough?'" she said. "Constantly pushing at me and saying, 'How do you know, how do you know?' I think that's the job of a good scientist — always pushing the limit and emphasizing the need for good data, testing it, and hoping to

support our hypothesis. Always asking, 'Have we done enough to effectively test this hypothesis?'"

Today, Davis serves as an external member on a couple of MSU committees. She reflects fondly on her time working alongside Smitley.

"What a mentor does for a graduate student going through a program doesn't stop after graduation, it continues on," she said. "For good or ill, that's an influence that continues on. It doesn't stop at that one person."

"At least 10 of my students from Olivet have gone back to Dave's lab for summer projects," Davis added. "Through his lab, he has mentored some of my students and he has just kept giving back. So if I am his academic child, those are his academic grandchildren."

Through this pairing, the mentor lineage certainly continues strong.

"My life is really about mentoring others," Davis said. "I'm a mentor of students, of colleagues, and now of my faculty and other employees. It really is the framework from upon which I have built my life." 🌱



After 16 years of teaching science at Olivet College, Maria Davis is now dean and provost of the school.

HOLLY WHETSTONE

# Mentoring torch passed on: Tradition ripples from one fisheries and wildlife expert to the next



MSU university distinguished professor William W. Taylor (left) helped former student Kurt Newman thrive in his studies and go on to a successful career. Newman is now the western branch chief of the U.S. Geological Survey Great Lakes Science Center.

<b>NAME:</b>	Kurt Newman
<b>TITLE:</b>	Western branch chief
<b>COMPANY:</b>	U.S. Geological Survey, Great Lakes Science Center, Ann Arbor, Mich.
<b>EDUCATION:</b>	B.S. (1992) and Ph.D. (1999) from Michigan State University (MSU), East Lansing, Mich.; M.S. (1995) from Virginia Polytechnic Institute and State University, Blacksburg, Va. — all degrees in fisheries and wildlife
<b>MENTOR:</b>	William W. (Bill) Taylor, MSU university distinguished professor in global fisheries systems

Kurt Newman had a passion for the outdoors, especially fishing and hunting, and he wanted to find a career that fit with his interests. He enrolled at Oakland University, Rochester, Mich., on a swimming scholarship after graduating from high school, but he floundered, as he put it, unable to find what he wanted to do, and left college for more than six years. Finally, Newman discovered that he could get a degree in fisheries and wildlife and that Michigan State University (MSU) had one of the best programs of its kind in the country.

“I made an appointment just to talk with someone, hoping I could find out more,” Newman said. That someone was William W. Taylor, then an associate professor in the MSU Department of Fisheries and Wildlife.

“The rest is history,” Newman said. “Bill was so energetic, and we made a connection. I enrolled about a week later.”

More than 20 years after that first meeting, Taylor, now an MSU AgBioResearch scientist and university distinguished professor in global fisheries systems, remembers it well.

“I saw someone who wanted a chance, and I wanted to give him that chance,” Taylor said. “I knew he was a little timid about coming back to school, so I figured one of the things that could help him thrive was to be associated with

a lab. There he would have a set of people that he could depend on and a set of responsibilities. I believed it would keep him focused on what he wanted to achieve.”

That lab, of course, was Taylor’s fisheries lab, which focuses on Great Lakes fisheries ecology, population dynamics and management.

“The lab really is family,” Taylor explained. “We work hard and play hard, but we have high expectations for each other and accept people for who they are, not who they are not.”

The key in mentoring for Taylor is to treat people as individuals and help them make adjustments in what they think they ought to do. He also encourages students to discover what they are really good at and what jobs match their skill sets and personalities.

Taylor’s plan for Newman worked out well. He not only



completed his bachelor's degree but went on to get a master's degree at Virginia Polytechnic Institute and State University, and then came back to MSU for his Ph.D. where he worked with Daniel B. Hayes, a professor in the Department of Fisheries and Wildlife.

"I began working for the Michigan Department of Natural Resources [DNR] even before I finished my Ph.D.," Newman said. "I actually wrote my dissertation that first year on the job. I liked working at the DNR and was in the middle of every controversy that the Fisheries Division had."

Newman was with the DNR for 10 years. For the last five years, he was part of the senior management team of the division. He has been on his current job with the U.S. Geological Survey Great Lakes Science Center for three years and is based in Ann Arbor.

Newman's role as western branch chief focuses on deep water research using research vessels for fish population assessments; biodiversity issues, especially how managers think about conservation biology across the Great Lakes; and research activities at the Hammond Bay Research Station. The Hammond Bay Station, near Rogers City, Mich., on Lake Huron, is known throughout the world for its work in controlling populations of sea lamprey, a devastating invasive species. Newman is particularly enthused about the work of young researchers at the station who are continuing the research to control sea lampreys.

Overall, Newman has more than 20 Ph.D. research scientists working for him, plus postdoctoral students, other staff members and the crews of the research vessels, and has charge of a multi-million dollar budget for these projects.

"Today, my real strength is in administration, in being able to develop a program, to change the culture of an organization and grow young scientists," Newman said.

"All of that is directly attributable to Bill and the experiences that he gave me.

"I always come back to Bill to help me think through my options," Newman added. "He is careful not to tell me what to do or how to think. One of his strengths is in asking difficult questions that help me to think about the up and down sides of the issue."

Taylor is well-known as a mentor, not only in his department and at MSU but across the country.

"More than any awards or titles that I have received, the thing I am most proud of is being a mentor," Taylor said. "It's what I love to do. I love my research and am curious about research ideas, but I am really more curious about

**"Today, my real strength is in administration, in being able to develop a program, to change the culture of an organization and grow young scientists. All of that is attributable to Bill and the experiences that he gave me."**

~KURT NEWMAN

how people live up to their potential and how I can help them live up to their dreams."

Taylor believes that it is important for a mentor to look at an individual's strengths and remember that everyone is not the same. He also believes in the power of networking.

"When students ask me questions, I try to help them strategize to find answers and figure out answers on their own," Taylor said. "In the process, they build networks with the people who can give them the information they need."

He points out that the mentor is often being mentored by the mentee.

"It's not a one-way street," Taylor said. "They teach you. It's a bidirectional flow of information."

Taylor is so committed to the value of mentoring that he is working on a book about mentoring that will be published in 2014 by the American Fisheries Society. It features vignettes from various people on mentoring.

"It is about the most important things that we want to tell the next generation about mentoring to help them understand the challenges and how to help facilitate careers," Taylor said.

Now Newman is a mentor.

"Bill impressed on me that mentoring is something that needs to be handed forward," Newman explained. "I take mentoring seriously. I have

been involved in trying to change cultures that benefit the organizations I have worked for. I believe the best way to do that is through mentoring. I try never to miss an opportunity to share experiences and stories and connect with the people I supervise. I listen to them, really listen to them, and do the same thing Bill did for me — help them think critically about what they are doing or what they plan to do, and provide them with the support they need once they have made a decision to move forward and do the best job they can. I believe that being a good mentor is one of the things that makes me a strong administrator. My hope is that I am developing other mentors." 🌱

JANE L. DEPRIEST



**Kurt Newman (right) consults with colleague Paul Seelbach at the Great Lakes Science Center in Ann Arbor, Mich. The center conducts fishery research on the Great Lakes.**

# Graduate student is hungry for success, thriving in Michigan food processing industry



Ph.D. candidate Dharmendra Mishra (*left*) works on an experiment in the food science lab of MSU associate professor Kirk Dolan. The pair, collaborating on projects since 2007, continues to learn from each other.

<b>NAME:</b>	Dharmendra Mishra
<b>TITLE:</b>	Senior associate process engineer
<b>COMPANY:</b>	Nestle PTC in Fremont, Mich.
<b>EDUCATION:</b>	B.S. in agricultural engineering (2004), Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India; M.S. in biosystems and agricultural engineering (2007), Michigan State University (MSU), East Lansing, Mich.; currently pursuing a Ph.D. in biosystems and agricultural engineering at MSU.
<b>MENTOR:</b>	Kirk Dolan, MSU associate professor, MSU departments of Biosystems and Agricultural Engineering and Food Science and Human Nutrition

**D**harmendra Mishra will never forget the first project that Michigan State University (MSU) associate professor Kirk Dolan assigned him.

“The first week I arrived in his lab, Dr. Dolan gave me a big box filled with computer software,” Mishra said with a chuckle. “He said to me, ‘There ya go — that’s your project.’ I have a background in programming and mathematical modeling, but this was new to me. I took it as a challenge.”

And that’s exactly what Dolan, an MSU AgBioResearch scientist, intended — he wanted his new master’s student, fresh from his homeland of India, to rise to the task. Mishra didn’t disappoint.

“We still laugh about the fact that, within two days of coming in here, I handed him COMSOL — finite element software — and said, ‘Here you go, you can work on that,’” Dolan said. “He picked it up very rapidly. I could see that he would be able to handle a lot of computational and statistical work in our lab.”

It was 2005 and the beginning of what Mishra refers to as his journey with Dolan. Since then, the duo has formed

not only a strong working relationship but a close personal bond as well.

“When I was new to the United States, Dr. Dolan helped me a lot,” Mishra said. “He did a lot to bring me along into the society. I was not very familiar with this new country. He took me to different places with his church groups — to the lake and to other areas on trips. It was very nice of him to do that.”

Mishra describes the influence that Dolan has had on his life as going “above and beyond the call of being a mentor.”



“There are certain people who have touched my life, and I can remember exactly how it has shaped me,” he said. “Dr. Dolan is one of those people. He has helped me so much in both my personal and professional life.”

With most of his family still living in India, Mishra has managed to build a busy life and a successful career in the United States. He landed a full-time job with Nestle Gerber in 2010 after completing an internship with the food processing giant. His responsibilities include testing new recipes and determining their thermal processing properties, and filing product applications with the Food and Drug Administration.

Nestle officials have been so impressed with Mishra’s work that they are paying for his Ph.D., which he expects to complete by early 2013. His thesis includes the design and development of an instrument that measures the thermal properties of food under highly pressurized conditions. He calls the device ThermoCell, but says he is working on a catchier name. A patent for the instrument has been filed through MSU Technologies.

Dolan commends Mishra for balancing working at a full-time job, working on his doctorate, and designing and building an instrument that will help ensure food safety and benefit the food processing industry.

“His thesis is particularly impressive,” Dolan said. “Very few Ph.D. students are able to — when they give their defense — exhibit a device and say, ‘Here is what I’ve designed.’”

Mishra, who also completed a six-month internship with Campbell Soup during his time at MSU, said gaining work experience while in school has been critical to his success. He is thankful for Dolan’s support and encouragement of internships.

“Even when Dr. Dolan heard, while I was still his student, that Nestle was interested in hiring me, he was happy and didn’t try to stop me,” Mishra said. “Instead, he said that it was a great career opportunity. Thermal processing is a field where there is a lack of engineers, so supply is less than demand. Dr. Dolan’s lab is highly focused on thermal processing, and he provides his students with good exposure to industry folks.”

Dolan, who was employed in the food industry for a decade, said he realizes the value of establishing solid relationships with businesses. In fact, he strives to “feed” the companies with some of his brightest students, he said.

“When it comes to internships, I need to think about

**“There are certain people who have touched my life, and I can remember exactly how it has shaped me. Dr. Dolan is one of those people. He has helped me so much in both my personal and professional life.”**

~DHARMENDRA MISHRA

what’s best for the student,” Dolan said. “In the short term, it may not appear to be the best thing for me, but it’s the best thing for the student. Actually, it’s not only good for him, but it’s good for me. Unless I can help meet the needs of the industry, I can end up just sitting in an ivory tower, and that’s something I want to avoid.”

The opportunity to continue working with Dolan was the main reason that Mishra decided to continue at MSU and pursue his doctorate.

“Dr. Dolan and I have worked together now for almost seven years, and we have a good rapport,” Mishra said. “He likes my work and I like his mentorship. He has always been there for me, you could say.”

Dolan has been particularly instrumental with assisting Mishra in the area of mathematical modeling. In fact, he has enlisted one of his mentors — Jim Beck, professor emeritus from the MSU College of Mechanical Engineering, who sat on Dolan’s doctorate committee — to help. The trio has been meeting every Friday afternoon for the past four months to analyze Mishra’s data.

“Dr. Beck is the world expert in inverse problems and heat conduction,” Dolan said. “He lets us sit down with the data and go over it in lots of detail. Without him, we’d have to spend a lot more time. He’s

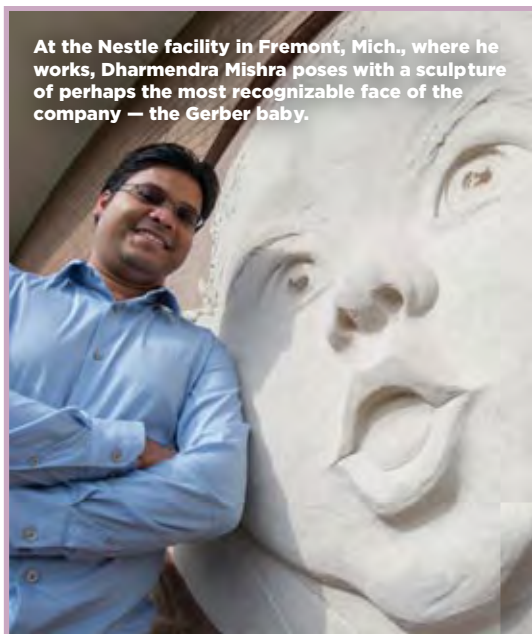
sharing with us 40 years of heat transfer experience — talk about mentoring.”

For Dolan, mentoring is about treating students with respect, and viewing them as future colleagues.

“If you treat them as colleagues, I have found that they will bring blessings back on you,” Dolan said. “The best part is when a student does a great job, moves on to a position and you maintain the contact. He will bring things back to you.”

There is no question that Dolan considers Mishra one of those blessings. 🍀

HOLLY WHETSTONE



At the Nestle facility in Fremont, Mich., where he works, Dharmendra Mishra poses with a sculpture of perhaps the most recognizable face of the company — the Gerber baby.

# Forestry calling has deep roots for tree champion, discovers fitting position in Grand Rapids



MSU forestry graduate Lee Mueller (left), an outdoor enthusiast, credits MSU forestry professor Karen Potter-Witter with teaching him to be “critically thoughtful” and to tackle questions from an array of angles.

<b>NAME:</b>	Lee Mueller
<b>TITLE:</b>	Urban forest project coordinator
<b>COMPANY:</b>	Friends of Grand Rapids Parks in Grand Rapids, Mich.
<b>EDUCATION:</b>	B.S. (2009) and M.S. (2011) in forestry, Michigan State University (MSU), East Lansing, Mich.
<b>MENTOR:</b>	Karen Potter-Witter, professor, MSU Department of Forestry

A self-proclaimed “adventure seeker,” Lee Mueller was 17 when he took a five-day canoe voyage with some friends to explore the river that ran through their hometown. It was an excursion that would later help guide Mueller down the right career path.

“We had been trying to find a place to camp for one night and came across this organization — funny enough at the University of Michigan — known as Les Voyageurs,” he said. “It was founded in 1907 by a couple of forestry majors. It was destined to be a society — not a fraternity — of members who had a love for the outdoors and for nature, and who respected nature. They had a cabin on the Huron River where they allowed us to stay.”

A year later, as a freshman studying physics at Michigan State University (MSU), Mueller continued to visit the Society of Les Voyageurs (named after the pioneering French-Canadian voyagers of the Great Lakes fur trade). He drove nearly every Sunday from Lansing to Ann Arbor to have dinner with the group. He relished the conversation with fellow outdoor buffs and even began identifying trees “just for the fun of it.”

By the end of that first year of college, Mueller realized his heart wasn’t in physics.

“I was sitting at my desk frantically writing my mathematics and physics equations when I looked outside and saw a group of students walking to a tree and a professor holding a branch of the tree,” he recalled. “It was a beautiful day, and I would have loved to have been outside. I realized it was either a forestry or horticulture class.”

Shortly afterward, Mueller met with the chair of the MSU Forestry Department, accepted a scholarship and switched majors. Mueller, who has never looked back on his decision, calls forestry the perfect profession for him.

MSU AgBioResearch scientist Karen Potter-Witter could not agree more. In fact, she quickly realized the potential of the undergraduate in her 400-level Forest Research Economics class and actively began to recruit him.

“It became clear early on in the class that Lee was very bright and engaging,” Potter-Witter said. “He had this great combination of willingness to participate, enthusiasm, analytical skills and writing skills. In fact, there was at least one other faculty member who wanted him in his program,



but I had a new project that was coming up that I knew he would be perfect for.”

But Mueller wasn't exactly drawn to Potter-Witter's specialty area of forest economics — at least not initially.

“I honestly never thought I'd end up liking economics,” he said. “But, more and more, after talking to her and working alongside her, I realized that economics isn't mathematics. Mathematics helps describe economics, but it's more along the lines of a science of decision making.”

He also credits Potter-Witter for enabling him to hone his critical thinking skills, something he puts to the test daily in his current position as the urban forest project coordinator with the Friends of the Grand Rapids Parks, a nonprofit organization. One of his primary tasks is to work with the city of Grand Rapids to raise its tree coverage from 26 to 40 percent — a mission of the city's “Green Grand Rapids” plan.

“A lot of my work is centered on engagement and education activities and building strategies to get people to begin to understand and talk about the value of trees,” he said. “I'm working to set up the context by asking, ‘Why are trees really important?’, ‘Why do we have this 40 percent goal?’ and ‘What can we do to impact or influence reaching that goal?’”

Mueller, who admits to becoming bored easily, is embracing the vast challenges of his new job, a position he assumed in May. It's a role, however, he didn't envision while in school.

“When I was at MSU, I always assumed that I would be doing traditional forestry work — helping landowners manage their 40 to 140 acres of land in northern Michigan,” he said. “I thought I'd be working on timber sales and walking in the woods, but somehow I landed in urban forestry. It's closely related but also adjacent to what I studied. It's easy to jump back and forth between the two because trees don't change terribly much whether they're in a city or a forest. It's the environment and people that are different.”

Potter-Witter takes an approach to mentoring that is based on her experience with mentors early in her career development. It is part cheerleader and part taskmaster.

“It's not so much a sink-or-swim mentality, but I do believe in giving students challenges where they can show themselves what their abilities are, as well as show others,” she said. “Lee was certainly one of those students who rose to the challenge.”

An advocate for the Society of American Foresters, Potter-Witter strongly encourages her students to participate in the

**“It's not so much a sink-or-swim mentality, but I do believe in giving students challenges where they can show themselves what their abilities are, as well as show others. Lee was certainly one of those students who rose to the challenge.”**

~KAREN POTTER-WITTER

organization. She recalls how Mueller attended the national convention in 2010 and presented their posters and research findings.

“I think, as a faculty member, seeing students find success in their profession is perhaps the greatest reward at MSU,” she said. “I know that sounds cliché, but having been teaching here for almost 30 years, this is what I really enjoy.”

Mueller is currently vice chair of the Lower Peninsula Chapter of the Michigan Society of American Foresters and, in that role, is organizing the next state meeting.

“It's really great to see how the tables have turned,” Potter-Witter said. “It's very rewarding to see what impact he is having on the next generation of foresters.”

It was guidance from Potter-Witter that helped Mueller to become better organized, improve his time management and become a leader. Today, the International Society of Arboriculture certified arborist and state of Michigan registered forester also serves on the forest stewardship advisory committee for the Michigan Department of Natural Resources Forest Stewardship Program.

“Early on, I did have the propensity to get really involved in things and overextend myself,” he said. “Her style is that of an

adviser and not a manager. She is happy to set expectations and happy to help when you ask for it, but by and large she allows you to run with your own ideas, and if need be, she pulls you back.”

Because mentoring played such an important role in her development, Potter-Witter said she has made it a top priority. She considers Mueller one of her brightest success stories.

“Lee is contributing to the well-being of the state through the nonprofit that he works for and believes in,” she said. “It's really wonderful when you see your students shine professionally.” 🌱

HOLLY WHETSTONE



**As urban forest project coordinator for the Friends of Grand Rapids, Lee Mueller is charged with increasing park space and urban forest area in the city among many responsibilities.**

# Student branches out while working in horticulture lab, sees more opportunities in farming



MSU professor Randy Beaudry (right) and Adam Dietrich, a former horticulture student, examine dwarf apple rootstock on Dietrich's family fruit farm.

<b>NAME:</b>	Adam Dietrich
<b>TITLE:</b>	Fruit grower
<b>COMPANY:</b>	Leo Dietrich and Sons, Conklin, Mich.
<b>EDUCATION:</b>	B.S. in horticulture (2008), Michigan State University (MSU), East Lansing, Mich.
<b>MENTOR:</b>	Randolph (Randy) Beaudry, professor and Extension specialist, MSU Department of Horticulture

Although raised on a multigenerational family farm, Adam Dietrich came to Michigan State University (MSU) thinking that he wanted to go into physical therapy, so he registered as a pre-med student. Then a job in MSU AgBioResearch horticulturist Randolph (Randy) Beaudry's lab opened his eyes to some innovative possibilities with farming and quickly had Dietrich changing his major to horticulture.

"During high school, I had a bad attitude about farming," Dietrich said. "It wasn't what I wanted to do, even though my whole family was involved in the farming business. But after my first semester at MSU working in Dr. Beaudry's lab, I saw more avenues and more of what goes into farming. Dr. Beaudry's research had a big impact on me. It opened my eyes to what's available. I had only thought about farming in one way, but through him I saw many different aspects."

Beaudry, who joined the MSU faculty in 1989, does research on fruits and vegetables, especially apples. One of his biggest projects is the Michigan Apple Maturity Program, designed to improve the quality of Michigan apples. Information is shared weekly among Michigan ship-

pers, packing houses, storage operators and growers. He also conducts controlled-atmosphere storage trials and updates operators on changes in recommended practices. Students working in Beaudry's lab help with these projects and others throughout the year.

"My philosophy of mentoring takes different forms, depending on who the mentee is," said Beaudry, a professor and Extension specialist in the MSU Department of Horticulture. "For undergraduates, I like to give them background on experiments and why they are relevant to the industry without the in-depth instruction I might provide to graduate students."

When he came to MSU, Dietrich knew that he needed to get a job to earn money and "stay out of trouble." A friend recommended that he talk with Beaudry.

"After meeting with Dr. Beaudry for just a few minutes, he wanted to know when I could start working in his lab. I



actually started that same day,” said Dietrich, who worked there all four years of his undergraduate program.

“I immersed myself in the lab,” he said. “It felt like home — more so than anywhere else on campus. It was a learning experience as well as a job.”

Many of Beaudry’s students come from farm families.

“These folks have direct access to the most current research information,” Beaudry explained. “They realize that they are at the cutting edge of research. They find it exhilarating and are always excited about the work.”

Another benefit of being engaged in lab work is that the students talk about what’s happening there with their parents, who often are involved in the leadership of a farming industry, such as apples.

“This helps to broaden the network of communications around this work and create enthusiasm for the subject matter,” Beaudry said. “It also helps build relationships between AgBioResearch, MSU Extension and the grower community.”

Beaudry was recognized in 2012 as “Fruit Man of the Year” by the Michigan Apple Pomesters, a grower group that supports fruit growing and production efforts. It’s an award not generally given to a researcher. Nine former MSU students, all members of farm families and former workers in Beaudry’s lab — including Dietrich — presented him with the award in recognition of his post-harvest physiology work with apples.

“Dr. Beaudry was always very accommodating and friendly with us as students,” Dietrich said. “He was willing to help when our college homework became a struggle. In his lab, he had high expectations for everyone, and we wanted to meet those expectations because of the respect we had for him and because he always treated us with respect.”

With a B.S. degree in hand, Dietrich returned to the family farm in Conklin, Mich., a fruit-growing area north of Grand Rapids. His father, Jim, and uncle, Mike, are the fifth generation of Dietrichs to run the farm, Leo Dietrich and Sons (Leo is Adam’s grandfather). They primarily grow apples and cherries.

Adam Dietrich has taken over the food safety management audits for the Dietrich and Sons farm and packing facility, a new and an increasingly important component of farming. He is involved in setting good agricultural practices for the farm, training employees on safety and hygiene practices, ensuring the proper use of crop protection products and farm equipment, and scheduling regular sampling

**“I immersed myself in the lab. It felt like home — more so than anywhere else on campus. It was a learning experience as well as a job.”**

~ADAM DIETRICH

and testing of wells and other sources of irrigation water.

“Food safety is getting a lot more attention,” Dietrich said. “There have been a lot of safety scares just this year. Having proper procedures in place is important.”

More than getting anything specific from his years at MSU, Dietrich had a change in attitude and, as a result, he believes his dad and uncle are more willing to adapt to change, to take advice and to look at new technologies.

The job outlook in Michigan for postharvest jobs in agriculture is not great, Beaudry admits, but he does see opportunities for people with technical skills in agriculture.

“Students have to recognize that the economics of agriculture have an ebb and flow,” he said. “My advice? There are down times and up times. Stick with it for the long haul, especially if your heart is in agriculture. There will be room for you.”

Students who have graduated with a horticulture degree, many of whom worked in Beaudry’s lab, have found jobs and done well in

agriculture, including positions at Gordon Foods and with the packaging industry.

Beaudry also likes to stress leadership abilities to his students.

“I push them to get involved in social organizations, such as the MSU Horticulture Club,” Beaudry explained. “There are a variety of ways that they can develop leadership potential. I try to emphasize how valuable leadership skills will be as they go through their careers.”

It’s been four years since Dietrich graduated from MSU, but his experiences in Beaudry’s lab remain with him.

“I am very thankful to Dr. Beaudry,” Dietrich said. “Getting some kind of a job was crucial to me, but the work in his lab was about more than landing a job. It made me more responsible, both for getting my school work done and getting lab projects completed on time. More importantly, I learned to take charge, be a leader in the lab and help others. Those are lessons learned that I still use today.”

JANE L. DEPRIEST



**Adam Dietrich has become a leader of young farmers near his home in Conklin, Mich., and credits his mentor with helping him to develop leadership skills.**

# Wrapped in green and white: Career becomes perfectly packaged thanks to Spartan experience



Jeff Tazelaar (right), a Ph. D. candidate in the MSU School of Packaging, shares his real-world experiences on RFID and auto ID packaging with his mentor and adviser, MSU associate professor Robb Clarke.

<b>NAME:</b>	Jeff Tazelaar
<b>TITLE:</b>	Director of business development and product manager of mobile devices
<b>COMPANY:</b>	N2N Global, Longwood, Fla.; Tazelaar maintains a home-based office in Brighton, Mich.
<b>EDUCATION:</b>	B.S. (2003) and M.S. (2004) in packaging; working on Ph.D. in packaging — all at Michigan State University (MSU), East Lansing, Mich.
<b>MENTOR:</b>	Robb Clarke, associate professor, MSU School of Packaging

When Jeff Tazelaar came to Michigan State University (MSU) in 1998, he already knew that he wanted to major in packaging.

“I was drawn to packaging primarily because everything comes in a package,” Tazelaar said. “I also like flexibility, and the industry has a lot of different packaging fields — medical, military and food — that offer career flexibility.”

Tazelaar was a preferred walk-on with the MSU football team, but the university had another draw for the young athlete: it is home to the School of Packaging, the first program of its kind in the nation. More than 60 years since its founding, the school is a leader in teaching, research and outreach focused on packaging containers and materials, and their functionality and improvement.

It was on a tour of packaging facilities in Europe in 2001 that Tazelaar met MSU AgBioResearch scientist Robb Clarke. That’s when his ideas about packaging began to develop into a much bigger picture and a mentor-mentee relationship began.

“As we were going through packaging factories and different venues, Dr. Clarke showed other students and me what to look for and how various kinds of packaging could have a big impact on the supply chain,” Tazelaar said. “He taught us

to look at the big picture. It was really eye-opening.”

Clarke also saw something in Tazelaar.

“The more I had an opportunity to talk with Jeff, the more I realized there was a lot more going on with him,” said Clarke, an associate professor in the MSU School of Packaging. “His work ethic is stronger than most people I have ever met.”

Clarke joined the MSU faculty in 1997 after spending 17 years in the packaging industry. He has seen huge advances in the industry, including in his specialty area of automatic identification and especially one of the technologies related to it — radio-frequency identification (RFID). RFID is a wireless, non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag attached to an object for identification and tracking.

“As far as my philosophy on mentoring,” Clarke said, “I



give all my students these words of wisdom — take the systems approach. This refers to packaging as a link to manufacturing, distribution, retail, even recycling. When putting a packaging system together, you have to make sure that it will work in the manufacturing and distribution system. You have to optimize the system — so many people do not understand that.”

He also tells students to see it for themselves.

“Don’t rely on reports — you have to go and physically see it,” Clarke said. “This gives you expertise in addressing issues in production, shipping and packaging problems.”

In addition, Clarke urges students to plan for failure by asking what can go wrong and, if it goes wrong, what are you going to do? Who has to be notified? And what are the processes to fix the problem?

“Although I give all my students these words of wisdom, very few get what they really mean,” Clarke explained. “Jeff was one that got it right off the bat. He has employed that advice in his working career. This understanding, combined with his work ethic, has gotten him noticed because he is someone who knows what he is talking about.”

It was Clarke who inspired Tazelaar to get a master’s degree.

“I had one semester left of undergraduate work and just one class to take,” Tazelaar explained. “I thought I could relax and have a good time during my last semester.”

That’s when Clarke asked Tazelaar if he had thought about applying for the master’s program in packaging. Tazelaar was still set on taking it easy, but Clarke eventually persuaded him to dual enroll in the master’s program.

Tazelaar was able to complete his master’s degree rather quickly, primarily because he already had a topic for his thesis. He had discussed aspects of RFID packaging for food products, which was a hot topic in retail at the time, and that became his thesis topic.

With Clarke’s help, Tazelaar walked off with his master’s degree to a job at Walmart, an early RFID leader, to help run the company’s RFID laboratory in Bentonville, Ark.

“That gave him a big boost career wise,” Clarke said. “Anyone in industry that wanted to sell products at Walmart had to deal with Jeff to ensure that their RFID system worked correctly. So he met all the equipment manufacturers and the suppliers and learned about tags, readers, antenna systems and all of the problems associated with RFID. Now he is recognized as a leader in this area.”

Eventually, Tazelaar and his wife, Ashley, returned to

**“The best advice Dr. Clarke has given me is to always dig in and ask questions. Why are things the way they are? There may be some detail of a package that is very important in the supply chain, and that explains why it was designed that way.”**

~JEFF TAZELAAR

Michigan to be closer to family. Tazelaar went to work for Lowry Computers, a company that manufactures and sells automatic identification solutions. Tazelaar also decided to return to MSU and pursue a Ph.D. in packaging, combining RFID and sustainability — one of the buzz words in packaging these days.

“The best advice Dr. Clarke has given me is to always dig in and ask questions,” Tazelaar said. “Why are things the way they are? There may be some detail of a package that is very important in the supply chain, and that explains why it was designed that way.”

Now that Tazelaar has been in the working world of packaging, even though Clarke is his Ph.D. adviser, their relationships has changed to one of joint collaboration.

“I can come back with real-world experiences on RFID and auto ID and can share those with him and sometimes give him insight on how research could affect industry,” Tazelaar said.

Meanwhile, Tazelaar has moved from mentee to mentor, working with students and teaching assistants in the School of Packaging as he pursues a Ph.D., which he hopes to obtain in 2014.

In addition to his graduate studies, Tazelaar recently became the director of business development for N2N Global, a company that monitors food quality and safety while tracing it through its

packaging from end to end — from farm to table. He travels extensively but is based in Brighton, Mich.

Clarke sees the packaging industry picking up and hiring more people, even in Michigan.

“The automotive industry and the automotive supplier industry in Michigan are bouncing back, and the food, furniture and medical industries all have big players in Michigan that hire packaging graduates,” Clarke explained. “I don’t push students to stay in Michigan; the goal is to help students get good jobs. But I’ve found that, if you leave people to make their own decisions, many of them return later. Michigan is a great state in which to live and work.”

JANE L. DEPRIEST



**Jeff Tazelaar, who is completing a Ph.D. in packaging, is now the director of business development for N2N Global.**

# Pathologist plants many 'seeds' to help prepare budding scientist for career in the laboratory



MSU professor Mary Hausbeck (left) helps students, such as former master's student Elizabeth Dorman, to find many different careers in the plant sciences.

<b>NAME:</b>	Elizabeth Webster Dorman
<b>TITLE:</b>	Laboratory scientist
<b>COMPANY:</b>	Michigan Department of Agriculture and Rural Development (MDARD), Plant Pathology Laboratory
<b>EDUCATION:</b>	B.S. in environmental botany (1999), M.S. in plant pathology (2003) — both from Michigan State University (MSU), East Lansing, Mich.
<b>MENTOR:</b>	Mary Hausbeck, professor and Extension specialist, MSU Department of Plant, Soil and Microbial Sciences

As Elizabeth Dorman pursues a career as a laboratory scientist in the Michigan Department of Agriculture and Rural Development (MDARD) Plant Pathology Laboratory, she has become a good writer and is more patient than in the past. She credits these skills to the mentorship of MSU AgBioResearch plant pathologist Mary Hausbeck.

“I was not a good writer,” Dorman said. “It didn’t come naturally to me. I must have written 20 or 25 drafts of my master’s thesis, but Mary showed me how to organize my thoughts and be a succinct writer.”

Hausbeck also helped Dorman become less defensive when defending her thesis, a skill that proved helpful in job interviews.

“She told me to think of it more as a conversation and that people are not out to get me,” Dorman said.

And when Dorman was searching for employment after finishing her master’s degree, Hausbeck told her to be patient.

“She thought that working for the state of Michigan would be a good place for me,” Dorman said. “I received my master’s in the fall, but Mary kept me on in her lab until I got my first job in the following spring. She kept telling me to be patient and that something would come up.”

Hausbeck is in charge of a lab that emphasizes Michigan’s diversity in agriculture and includes research projects on vegetables ranging from asparagus to zucchini. She and researchers in her lab also work with floriculture crops. The goal of all these projects is to reduce Michigan growers’ reliance on fungicides through novel and integrated management strategies and enhanced knowledge of pathogens.

Dorman met Hausbeck in her senior year while working on her bachelor’s degree. Hausbeck offered her a job as an undergraduate research assistant.

“Elizabeth worked for one of my Ph.D. students,” Hausbeck said. “She helped him obtain and develop a cucumber pathogen culture collection to be used for our research studies. Elizabeth is very organized and always asked good questions. I love that in a student. Students



who aren't afraid to ask questions show that they are really thinking about what they are doing and are very engaged."

Dorman continued to work in Hausbeck's lab after she completed her bachelor's degree. She took a year off from college and worked full-time in the lab.

"I was thinking of getting a master's degree, but I never imagined going into plant pathology," Dorman said.

"Sometimes things just fall into your lap."

As it turns out, Hausbeck had a grant for research on controlling diseases and limiting pesticide spraying for carrots. That became Dorman's master's project.

Hausbeck, who earned her master's degree at MSU, became a member of the faculty in 1990 after receiving her Ph.D. from Pennsylvania State University. Over the years, she has developed her mentoring philosophy.

"I enjoy students who are coachable, flexible, open to opportunities and suggestions, and who trust me as their mentor," Hausbeck explained. "Although students need to work on their specific projects, those who take an interest in other projects in the lab really benefit and become especially versatile."

Dorman used all of those attributes to get her first job as a pesticide inspector in the metro Detroit area with MDARD. She later transferred to the emerald ash borer (EAB) program as a regulatory inspector.

"I was more interested in the invasive pests than in pesticide regulations, but as funding for the EAB decreased, I had an opportunity to become a nursery inspector in the Flint/Saginaw area," said Dorman, who is originally from Elk Rapids, Mich., and now lives in Laingsburg, Mich. She is married to Alan, and they have two young children.

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"I work for the state plant pathologist at a lab in East Lansing," Dorman said. "My role is similar to what I did in Mary's lab — I manage the lab and, as samples come in, I do tests and track them. Our testing is for regulatory purposes, so we get samples from plant inspectors and even commercial growers who may want to ship products to another state or country."

The national outlook for plant pathology graduates is great, Hausbeck said. Last year, two of her graduates had jobs before they graduated. Jobs in this field in Michigan are not as good at this time.

"I have students who would stay in Michigan if there were jobs," Hausbeck said. "My students are qualified to

**"I was thinking of getting a master's degree, but I never imagined going into plant pathology. Sometimes things just fall into your lap."**

~ELIZABETH DORMAN

work in state government, at MSU or in pest management support industries. Students are not clamoring to get out of Michigan."

One of the keys in placing her students, she said, is that they are trained in field biology. That's where students work on projects in the lab but also work with plants on farms in their natural environment. That's what Dorman did with her research and with laboratory experiments as a research assistant. The disease forecasting program that she helped to develop was implemented by Michigan carrot growers and is relied on today to produce healthy carrots while reducing pesticide use.

"They can take what they see in the field and bring it back to the lab for further diagnosis and research," Hausbeck explained. "Students leaving this program are well prepared and ready to step into a job."

Hausbeck credits Christine Waddill and Mel Lacy, who were faculty members at MSU when Hausbeck was a master's student and also when she returned to MSU after her studies at Penn State, with her career success. Waddill

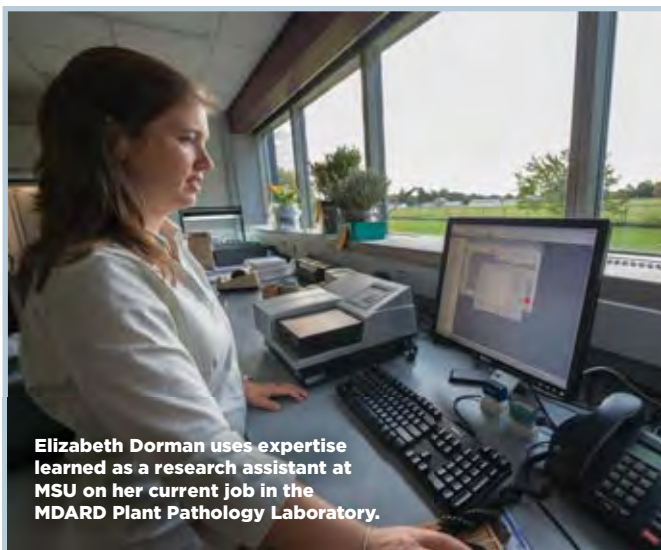
is now director of the Homestead Research Station at the University of Florida, and Lacy is retired.

"Their help meant a lot to me because they believed in me and encouraged me to pursue a Ph.D.," said Hausbeck, who keeps a photo of Waddill and Lacy in her office. "Now I am in a position to help students, and I like that."

Hausbeck believes in being an effective mentor, not hand-holding but letting students figure things out on the own.

"I try hard to balance my responsibilities so that I can be there when they need me," she said. "It takes time and experience to know when students can work through research problems on their own and when they need my help. I enjoy my students. It's one of the best aspects of my job. They keep me young and enthusiastic." 🌱

JANE L. DEPRIEST



**Elizabeth Dorman uses expertise learned as a research assistant at MSU on her current job in the MDARD Plant Pathology Laboratory.**

# Department provides fertile ground of resources for agronomist to call on even after graduation



MSU Department of Plant, Soil and Microbial Sciences chair James Kells strongly believes in giving students an opportunity to work in their fields of study before graduation. Here he walks with MSU grad Karen Zuver, now employed with Dupont Pioneer — the company she began working for as a student under Kells' guidance.

<b>NAME:</b>	Karen Zuver
<b>TITLE:</b>	Field agronomist
<b>COMPANY:</b>	Dupont Pioneer, based in Des Moines, Iowa and headquartered in Wilmington, Delaware; Zuver maintains a home office in Michigan
<b>EDUCATION:</b>	B.S. in crop and soil sciences with a dual degree in agriculture and natural resources communications (1994); M.S. in crop and soil sciences (weed science) — both from Michigan State University (MSU), East Lansing, Mich (2002).
<b>MENTOR:</b>	James Kells, professor and chair, MSU Department of Plant, Soil and Microbial Sciences

The entire cornfield, more than 50 acres, was dead. New field agronomist Karen Zuver had a strong hunch what was wrong, but it was early in her career and she didn't have any resources to back her theory. She turned to James (Jim) Kells, her former academic adviser at Michigan State University (MSU), for guidance.

"I knew that it was an herbicide issue," she said. "I called Jim, who was working in Extension at the time, and he agreed to come down and check out the situation. And he said, 'Yep, you're spot on. You had it right.'"

Kells explained the situation to the corn grower in almost the exact terms that Zuver had previously used. It was a defining moment in her budding career and one that provided a needed boost of confidence.

"It was a younger grower who was pretty influential in the area at the time," she said. "He still talks about that moment today, and I still work with him. Even when I was not his service representative, he would call and ask me questions."

Unlike many people starting a new profession, Zuver had a lengthy list of experts from MSU that she could rely on even after graduation. Those relationships began developing

when she was an undergraduate assigned to Kells' weed science team.

"I remember the first day walking in and meeting Dr. Kells and how he introduced me to the rest of the weed science crew," she said. "I remember that clearly. Ever since then, my life has really revolved around that department."

Growing up on a small farm in the Thumb area, where her father also managed a grain elevator, Zuver knew she wanted to pursue a career in agriculture. The picture became much more defined after the college freshman received a significant scholarship from the Michigan Crop Improvement Association.



“Not only did the scholarship help me pay for my tuition, it also provided me a job, which for me was necessary,” she said.

It wasn't long after she started working with Kells, an AgBioResearch scientist, that he began to see her potential. He eventually recommended Zuver to Dupont representatives, who were looking for an intern. Zuver not only landed two internships with Dupont — she ultimately went to work for the company full-time.

“That scholarship and working in that department — it really is the basis of my career, including where I am today,” she said. “Dr. Kells made sure that all of the undergraduates, not just me, met with the industry representative and that they had a shot at an internship. He had a big impact on my future career. In fact, by the time I left Michigan State, I had a solid resume and didn't have any problem getting job offers.”

Perhaps Kells' most influential mentoring contribution came while Zuver was pursuing her master's degree. By then, she was working full-time and had a family. (She had married college boyfriend, Greg, and given birth to daughter Anna, now 14. She would soon discover that she was expecting a son, Garrett, now 11.)

“At the time, I was quite overwhelmed with everything going on in my life, but Jim mentored me through that,” Zuver said. “He did that very well, and I'm not sure that there is another person who could do that without being frustrated about the way I had to split my time. It was tough.”

Despite being thoroughly exhausted, Zuver remembers Kells quietly pushing her, especially when it came to the research project which involved four universities that she was spearheading.

“When it came time to write my thesis, I thought I was going to pull my hair out,” she said. “Every time I'd turn in some pages [to Kells], this sea of red ink would come back. One time I remember going to him and saying, ‘Isn't this good enough?’ He told me, ‘It is, but it's not good enough for you because you can do better.’”

Kells was impressed with Zuver's ability to balance a career and her role as a mother and wife while pursuing a graduate degree.

“She definitely got her master's the hard way,” Kells said.

Today Zuver, through her work, provides training and education on such products as corn, soybean, alfalfa and wheat seed. She also works with producers to diagnose issues in the field and offers management suggestions to help improve the situation, and assists with company sales.

She credits Kells for instilling some basic skills that

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~KAREN ZUVER

have helped her professionally.

“He made sure that everything was complete and that the work was done to as much perfection as could be allowed. That is a great learning experience,” she said.

Zuver is pleased to continue to have opportunities to work with Kells and a host of other MSU researchers.

“The agriculture industry is a pretty small community,” she said. “I see Jim several times a year. Dupont Pioneer continues to work with large land-grant universities such as MSU, which happens to be one of my responsibilities. It's good to know that there are good people doing quality research to keep Michigan State on the map.”

Kells adds that the university supports the value of practical experience for students.

“If students come to MSU and their education consists only of what they get sitting in the classroom, they're really missing some huge opportunities that a research-intensive land-grant university like Michigan State can offer,” he said.

Although Zuver's connection to the Department of Crop and Soil Sciences — now the MSU Department of Plant, Soil and Microbial Sciences — remains strong, it is perhaps her influence on the College of Agriculture and Natural Resources (CANR) that is even more indelible. When she was an undergrad, there was a contest to create a motto for the college. Zuver (then Karen Geiger) submitted three ideas. One was chosen the winner: “Conserving all we have today . . . to ensure a better tomorrow.”

That saying — attributed to her — along with a colorful mural, greets visitors as they enter the main entrance of Agriculture Hall. It's a special place that Zuver has carved out for herself in the pages of MSU history. Rightfully so, Kells added.

“She was a great example of a student who really took advantage of the opportunities that MSU presents,” he said. “She went to her classes and did her assignments just like all good students, but beyond that, she was also involved in student social activities, and she had a job and a research project. She really got the most out of her education.”

HOLLY WHETSTONE



An agronomist, Karen Zuver inspects fields and provides producers with advice on various growing conditions and techniques.

# 'Long rope' allowed young veterinarian to hit his career stride, excel in arena of animal wellbeing



In many regards, James Averill (right), director of the Animal Industry Division, has followed in the footsteps of his mentor Ronald Erskine, a large animal professor at MSU and dairy Extension veterinarian.

<b>NAME:</b>	James Averill
<b>TITLE:</b>	Director, Animal Industry Division
<b>COMPANY:</b>	Michigan Department of Agriculture and Rural Development
<b>EDUCATION:</b>	B.S. in veterinary medicine (1999); Doctor of Veterinary Medicine (2001); Ph.D. in epidemiology (2009) — all from Michigan State University (MSU), East Lansing, Mich.
<b>MENTOR:</b>	Ronald Erskine, professor, MSU Department of Large Animal Clinical Sciences; dairy Extension veterinarian

It's no surprise that James Averill turns to animals — the subject he knows best — to describe how he was mentored by fellow veterinarian Ronald (Ron) Erskine.

“I was the newborn calf on a halter, and he was trying to halter break me, and he gave me plenty of lead,” Averill said.

Erskine admits that Averill, whom he started advising in 2002, wasn't easily corralled.

“He's always been a leader, an independent thinker, and he likes to go his own way,” Erskine said. “I just tried to make sure that when he was released that, at the very least, he was going in the right direction. I guess that's where the halter breaking comes in.”

And it would appear that Averill had one direction in mind — straight up. In August 2009, shortly after receiving his Ph.D., Averill joined the Michigan Department of Agriculture (now the Michigan Department of Agriculture and Rural Development, MDARD) as the coordinator of the Bovine Tuberculosis Eradication Program. Less than two years later, he was named director of the Animal Industry Division. He oversees more than 100 reportable animal diseases of domestic animals, an \$8.5 million budget and a staff of 60.

“I no longer deal with just bovine tuberculosis; now it

could be anything from rabies in dogs to tuberculosis in cattle to West Nile virus in a horse to viral hemorrhagic disease in fish,” he said. “It's definitely a team approach, and, yes, I'm the coach — I make sure that staff members have the tools and skills to perform their jobs to address industry concerns.”

Averill's primary charge is to ensure the health and wellbeing of all animals in Michigan. It's a daunting task by any account, and one fraught with emotion and political influences. Erskine said Averill fits the bill because he is typically the “sound voice of science” in any room.

“He's not the type to let go emotionally,” Erskine said. “I'm sure there are days his blood pressure rises, and I'm sure he's already taken some heat, but he's the type that absorbs it and learns how to deal with it.”



Averill credits Erskine, whom he calls “a free-spirited individual,” for helping him learn to put things into perspective. One personal tragedy had a profound impact: watching Erskine as he stood by his wife while she fought and eventually lost her battle with cancer.

“It really humbles you when you see someone going through that kind of pain,” Averill said. “He lost his wife and was raising his three daughters and helping them deal with the loss of their mother. I cannot put myself in his shoes, but it makes you respect that there’s much more to life than work.”

Averill said he continues to aspire to be more like his mentor, specifically in Erskine’s “work hard, play hard” philosophy. Although Averill has attempted to adopt more of that philosophy into his life, there’s someone close to him who might disagree.

“If you talk to my wife, she’ll probably say I’m all work and no play,” he said. “I can probably be considered an even bigger workaholic than Dr. Erskine.”

Despite busy schedules, the duo finds time to catch up over a game or two of disc golf and sometimes even paintball at Erskine’s 10-acre farm in Grand Ledge. They make a concerted effort not to discuss work during their adventures together.

“We’re not talking work, we’re not talking shop because we both realize that it’s important to take some time off periodically,” Averill said.

A native of Maine, where he was raised on a dairy/sheep farm, Averill’s has worked in public health, as well as animal health. Before he started working for MDARD, Averill was employed by the Michigan Department of Community Health as the deputy pandemic influenza coordinator. He organized the development of a statewide committee tasked with ensuring preparation for a pandemic flu event.

Averill also worked for the U. S. Department of Agriculture Animal and Plant Health Inspection Service in Michigan, and he worked part-time for a small animal emergency clinic after receiving his doctor of veterinary medicine degree in 2001.

All of his experiences, especially working with Erskine, have helped prepare him for the daily challenges of his current job.

“So many people think that when you’re in government, you’re pushing papers, enforcing regulations, punching the clock and working 8 to 5, Monday through Friday — but it’s so much more than that,” Averill said. “One of the great things that came out of the mentoring experience with Dr.

**“James is in an important position, and it’s a lot of responsibility for a fairly recent graduate. I think he’s a rising star and has done well in a very challenging position.”**

~RONALD ERSKINE

Erskine is that I have been able to bring that research thought process into my workplace and ask questions like, ‘What do we know?’, ‘Do we need to know more?’, ‘How are we going to get the answers we need to help us in our programs?’ and so forth.”

Carrying a heavy workload is nothing new to Averill. He recalls, while in school, agreeing to take on the task of advising the Pre-Veterinary Medical Association at MSU at the request of the associate dean. During his time with the organization, it grew from 50 members to more than 450.

“We — not I alone — were able to reenergize the club,” he said. “We mentored these students and helped get them into vet schools all over the nation, not only at MSU. It’s something that I’m very proud of.”

Averill said he considers mentoring to be a “part of his being.” In fact, one of the highlights of pursuing his Ph.D. (his dissertation was titled, “Use of Antimicrobial Agents in Dairy Calves and the Public Health Concern”) was getting the opportunity to teach.

“I know other advisers who would not have allowed me to have such free rein to do that because it would distract from my research,” Averill said. “It did distract from my studies, but I was able to balance it all. And in the end, I was able to see what it was like to be a faculty member in a tier I institution.”

Erskine said he wouldn’t be surprised if Averill ends up teaching down the road. But for now, Averill has plenty on his plate.

“I see him as one of those guys on TV that starts the plates spinning on a stick on one side of the stage, races back to get another one spinning and then goes back and forth,” Erskine said. “James is in an important position, and it’s a lot of responsibility for a fairly recent graduate. I think he’s a rising star and has done well in a very challenging position.”

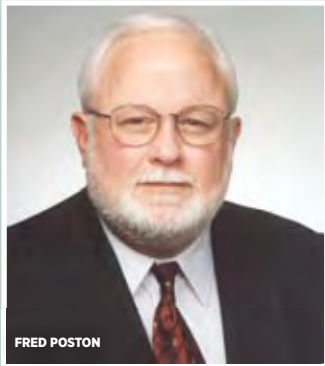
And Averill is making it a point to enjoy every second of his life, thanks in part to Erskine.

“We’re only here for a set period,” Averill said. “We don’t know how long that is, but let’s cherish it while we can.”

HOLLY WHETSTONE



**James Averill (right) discusses issues impacting the wellbeing of animals in Michigan with colleague Jim Bowes.**



FRED POSTON

## Poston appointed CANR dean

The Michigan State University Board of Trustees has appointed **Fred Poston** as dean of the university's College of Agriculture and Natural Resources (CANR).

The appointment is effective Jan. 1, 2013. He will succeed Douglas Buhler, who has served as interim dean since January 2011.

Poston has been MSU vice president for finance and operations since 1999. During that time, he has managed the financial planning of the university, kept housing costs among the lowest of the Big 10, overseen the building of a nationally acclaimed recycling center and facilitated a new university-wide human resources management program.

Poston is returning to the college where he served as dean for eight years (1991-98).

Prior to his stint as dean, Poston guided the Revitalization of Michigan Animal Agriculture project, created Project GREEN (Generating Research and Extension to meet Economic and Environmental Needs) and developed the Partnership for Ecosystem Research and Management with the Michigan Department of Natural Resources and the Great Lakes Fishery Commission.

Before coming to MSU, Poston was director of Washington State University's Cooperative Extension Service and associate dean of agriculture and home economics. Prior to that, he was on the entomology faculty at Kansas State University and



STEPHEN HSU

was associate director of the Kansas Cooperative Extension Service.

A native of Florida, Poston received his bachelor's degree from West Texas State University and his graduate degrees in entomology from Iowa State University.

## Hsu named MSU research vice president

**Stephen Hsu** is Michigan State University's new vice president for research and graduate studies.

Prior to coming to MSU, Hsu was the director of the Institute for Theoretical Science and professor of physics at the University of Oregon.

"In these days of shrinking federal research dollars, it's imperative that we have the right person for this crucial position," said MSU President Lou Anna K. Simon. "The breadth of Stephen Hsu's experience as a scientist and scholar, as well as a Silicon Valley entrepreneur and founder of two companies, give him the background needed to succeed in this critical role."

Hsu is the founder of SafeWeb, a pioneer in computer network security, and Robot Genius, an Oakland, Calif.-based information security company.

He also serves as scientific adviser to BGI (formerly Beijing Genomics Institute), and as a member of its Cognitive Genomics Lab.

Hsu's research has been in applications of quantum field theory, particularly to problems related to dark energy, black holes and particle physics.

"I am both excited and honored

to accept this position," Hsu said. "Michigan State University is a world-class research institution that has never lost sight of its land-grant heritage and mission. I look forward to working with the many exceptional researchers, students and administrators at this great university."

After receiving his bachelor of science degree in physics from the California Institute of Technology in 1986, his master's in physics from the University of California, Berkeley in 1989, and his doctorate in physics from that same institution in 1991, Hsu was named a Junior Fellow of the Harvard Society of Fellows.

He became an assistant professor at Yale University in 1995 and a full professor at the University of Oregon in 2005.

Hsu succeeds Ian Gray, who has served as MSU's vice president for research and graduate students since 2004 and prior to that served as director of the Michigan Agricultural Experiment Station (now MSU AgBioResearch) since 1996.



## First census of the human microbiome created

Through genome sequencing, scientists have created the first census of microbes living with healthy adults, as reported in a series of coordinated scientific papers appearing in the journals *Nature* and *Public Library of Science*.

Michigan State University (MSU), as part of the Human Microbiome Project Consortium that conducted

the research, revealed that each person's collection of microbes includes 100 trillion good bacteria living in or on the human body that create their own unique microbiome. Moreover, researchers calculate that they have identified between 81 and 99 percent of all microbial species in and on the human body.

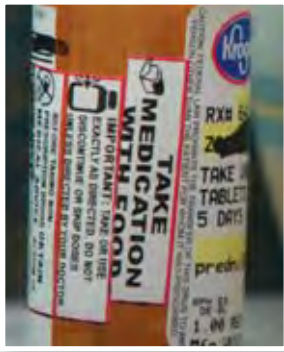
Bacteria inhabit nearly every part of the body, including on the skin, in the gut and up the nose. Sometimes they cause sickness, but most of the time, these microbes live in harmony with their human hosts, providing vital functions essential for human survival, said MSU AgBioResearch scientist **Tom Schmidt**.

"We have evolved in a sea of microbes, so perhaps it is not surprising that there are so many intimate and beneficial associations between microbes and humans," said Schmidt, MSU professor of microbiology and molecular genetics. "Understanding the microbes associated with the human body is crucial to understanding human health and disease."

Schmidt's research focuses on microbes in the gut. Genes carried by bacteria in the gut are critical for human survival, allowing humans to digest foods and absorb nutrients that otherwise would be unavailable. His future work will focus on microbes closely affiliated with the tissue lining the gastrointestinal tract. Schmidt is testing the hypothesis that these microbes inhabit this environment because of their ability to harvest low levels of oxygen from the host tissue in the colon.

The Human Microbiome Project is managed by the National Human Genome Research Institute in partnership with the National Institutes of Health (NIH) Office of the Director, the National Institute of Allergy and Infectious Diseases, the National Institute of Arthritis and Musculoskeletal and Skin Diseases, the National Cancer Institute, the National Institute of Dental and Craniofacial Research, and the National Institute of Diabetes and Digestive and Kidney Diseases — all part of the NIH.





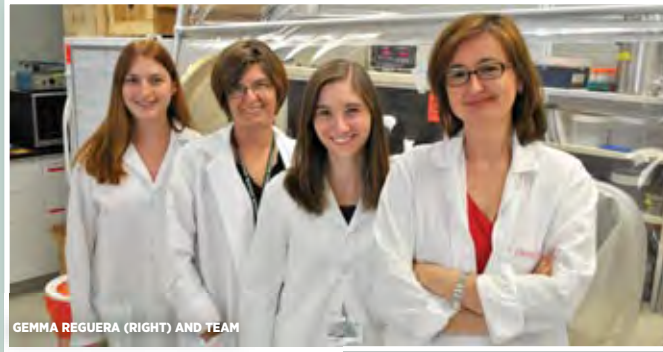
## Changes needed for oft-ignored prescription labels

Each year, an estimated 4 million Americans experience adverse reactions to prescription medications. Many of these reactions, ranging from mild rashes and drowsiness to hospitalization and death, could be avoided if warning labels were more effective, according to a study by Michigan State University (MSU) AgBioResearch scientist **Laura Bix**.

When patients are handed a new prescription, few read the critical warning labels such as “Do not consume alcohol while taking this medication” or “For external use only.” Using eye-tracking technology, MSU researchers found that one source of the labels’ ineffectiveness is inability to capture patients’ attention.

The study, which appeared in the journal *PLoS ONE*, reveals that only 50 percent of participants looked directly at the warning labels, and 22 percent did not look at any labeling. Bix, MSU associate professor of packaging, suggests that relatively simple changes could improve the labels’ effectiveness.

“Given our results, we are recommending a complete overhaul of the design and labeling of the ubiquitous amber bottles, which have seen little change since their introduction some 50 years ago,” Bix said. “Our initial recommendations are to move all of the warnings from the colored stickers to the main, white label — which 100 percent of the participants read — or to reposition the warnings so that they can be seen from this vantage point.”



The impact of this study could be especially beneficial to older patients. On average, more than 30 percent of those 65 and older take 10 medications daily. Taking multiple medications increases the odds of adverse reactions. This combination is complicated further by the fact that older participants were less likely to notice or remember warning labels. The study suggests that making labels more noticeable could be a key factor in helping people remember the warnings.

Bix and other MSU researchers plan to continue testing the effectiveness of new and current prescription packaging and reviewing prescription drug leaflets currently under regulatory debate.

## New biofuel process dramatically improves energy recovery

A new biofuel production process created by a team of Michigan State University (MSU) researchers produces 20 times more energy than existing methods.

The results, published in the journal *Environmental Science and Technology*, showcase a novel way to use microbes to produce biofuel and hydrogen while consuming agricultural wastes.

MSU AgBioResearch scientist **Gemma Reguera** developed bioelectrochemical systems known as microbial electrolysis cells, or MECs, that use bacteria to break down and ferment agricultural waste into ethanol. Reguera’s platform is unique because it employs a second bac-

terium, which, when added to the mix, removes all the waste fermentation byproducts or non-ethanol materials while generating electricity.

Similar microbial fuel cells have been investigated before. However, maximum energy recoveries from corn stover, a common feedstock for biofuels, hover around 3.5 percent. Reguera’s platform, despite the energy invested in chemical pretreatment of the corn stover, averaged 35 to 40 percent energy recovery just

bacterium. Basically, each step we take is custom designed to be optimal.”

The second bacterium generates electricity. The electricity, however, isn’t harvested as an output — it is used to generate hydrogen in the MEC to increase the energy recovery process even more, Reguera said.

“When the MEC generates hydrogen, it actually doubles the energy recoveries,” she said. “We increased energy recovery to 73 percent. So the potential is definitely there to make this platform attractive for processing agricultural wastes.”

Reguera’s fuel cells use corn stover treated by the ammonia fiber expansion process (AFEX), an advanced pretreatment technology pioneered at MSU. AFEX is an already proven method that was developed by MSU AgBioResearch scientist **Bruce Dale**, professor of chemical engineering and materials science. Dale is currently working to make AFEX viable on a commercial scale.



from the fermentation process.

“This is because the fermentative bacterium was carefully selected to degrade and ferment agricultural wastes into ethanol efficiently and to produce byproducts that could be metabolized by the electricity-producing bacterium,” said Reguera, MSU assistant professor of microbiology and molecular genetics, who co-authored the paper with MSU graduate student Allison Spears. “Removing the waste products of fermentation stimulated the growth and metabolism of the fermentative

## Canola oil industry cooking in Michigan

Canola can now be grown profitably in Michigan, thanks to research by Michigan State University (MSU) AgBioResearch scientists.

Canola, which has potential as biofuel and cooking oil, is considered a high-value crop, with seeds made up of more than 40 percent oil. Soybeans have 18 percent oil and corn yields only 4 percent oil, so canola stood out to MSU researchers as a key crop to help boost Michigan’s economy.

In 2008, MSU launched the Canola Project. The effort brought together farmers, biofuel production experts, and MSU professors and Extension agents to help establish Michigan as one of the nation's leaders in this field. By exploring the production and refinement of canola oil, the initiative aims to lessen dependence on foreign oil and strengthen Michigan's rural economies.

Working with Michigan farmers, MSU AgBioResearch scientists **Dennis Miller**, chemical engineering professor, and **Russ Freed**, international agronomy professor, oversaw multiple test plots to find the best varieties and the best seasons to plant. Research efforts have resulted in varieties that can be best grown in winter and spring.

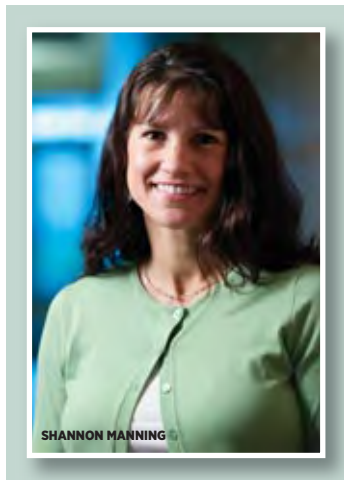
"The MSU Canola Project's initial focus was on growing canola for biofuels," Miller said. "But when the cost of our oil was about \$4 per gallon, we knew it was too high, so for now we have transitioned our efforts to food oil."

Historically, nearly all of the 1.5 billion pounds of canola cooking oil consumed in the United States have been imported. One of the challenges of producing the oil locally was the lack of a processing plant in Michigan. In 2008, MSU purchased a canola press, which can press 1 ton of canola per day.

Dan Blackledge, a canola grower and entrepreneur from Marion, Mich., planted 120 acres of canola this year. This summer, Blackledge began marketing B&B Farms canola oil. His first pressing was small, about 50 gallons. But it represents the first offering of canola oil grown and commercially produced in Michigan.

"I wouldn't be growing canola today if it weren't for MSU and the research and support they provided," Blackledge said. "It has been and continues to be an immensely helpful partnership. The land-grant model is a beautiful thing."

Future research efforts will focus on increasing the acreage of canola being grown in Michigan, increasing cooking oil production and exploring



options to improve the efficiency of biofuel production.

## Deadly *E. coli* strain decoded

The secret to the deadly 2011 *E. coli* outbreak in Germany has been decoded, thanks to research conducted by a Michigan State University AgBioResearch scientist.

The deadliest *E. coli* outbreak ever, which caused 54 deaths and sickened more than 3,800 people, was traced to a particularly virulent strain that researchers had never seen in an outbreak before. A team of researchers led by **Shannon Manning**, MSU molecular biologist and epidemiologist, suggests a way to potentially tame the killer bacterium in an article in the journal *PLoS ONE*.

The strain, *E. coli* O104:H4, shares some characteristics with other deadly *E. coli* bacteria, but its combination is novel. Researchers haven't determined the mechanism it uses to cause disease, although Manning and her team were able to find the strain's Achilles' heel — its biofilm.

By focusing on the bacteria's biofilm — the grouping of many *E. coli* bacteria that stick to a cell's surface — Manning and colleagues were able to determine why it was so deadly. When the bacterium found in Germany forms a biofilm, it increases its ability to produce toxins, such as the Shiga toxin.

This increased production of Shiga toxin is likely what contributed

to so many incidents of kidney damage and death during the 2011 outbreak, Manning said.

"What made the German outbreak so different is that many victims suffering from kidney failure were adults," she explained. "Other types of *E. coli* that produce Shiga toxins typically damage kidneys of children under 10."

In addition, the incubation period was considerably longer among individuals infected with the German outbreak strain than individuals infected with *E. coli* O157, a similar bacterium that can also cause illness and death. Manning believes this is because the German strain needs a long time to form a biofilm. Biofilms are not important for O157 infections.

"Our research demonstrates that biofilm formation is critical for toxin production and kidney damage," she said. "If we can block the bacteria from forming a stable biofilm, then it is likely that we can prevent future *E. coli* O104:H4 infections."

The next phase of Manning's research is already focusing on creating mutant strains in an effort to prevent the bacterium from forming a biofilm. This would prevent the disease completely because the conditions would not be favorable for bacterial growth.

Chris Waters, MSU assistant professor of microbiology and molecular genetics, and scientists from the University of Michigan and the Michigan Department of Community Health contributed to the research. In addition to funding from MSU AgBioResearch, Manning's research was funded in part by the National Institutes of Health and the U.S. Department of Agriculture.

## MSU AgBioResearch scientists to lead new global food security effort

Michigan State University (MSU) will use a \$7.3 million federal grant to cultivate the next generation of agricultural scientists in Africa and Asia in hopes of improving food security and nutrition there.

The new Borlaug Higher Education Agricultural Research and Development program, named after Nobel Peace Prize laureate Norman Borlaug, is funded by the U.S. Agency for International Development (USAID) Bureau for Food Security. Part of Feed the Future, the government's global hunger and food security initiative, the MSU-based program will strengthen agricultural research institutions and support long-term training of agricultural researchers at master's and doctoral degree levels.

"MSU has 50-plus years of engagement in Africa, and we're currently managing several master's- and doctoral-level training programs whose objectives and program design are similar to those of this initiative," said **Eric Crawford**, MSU AgBioResearch economist. "MSU faculty members are well-versed in



planning, designing and managing training and human capacity-building programs, especially in plant breeding, food science and food security — key areas of the Feed the Future initiative."

Crawford, professor of agricultural, food and resource economics and co-director of the MSU Food Security Group, and Frederik Derksen, chairperson of the MSU Department of Food Science and Human Nutrition, will lead the effort.

The program will begin in Ghana, Uganda, Mali, Mozambique and Bangladesh, with the potential to expand to other Feed the Future countries, Crawford said. The five





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initial countries have similar priorities: to increase agricultural productivity, reduce trade and transportation barriers, develop sound market-based principles for agriculture, accelerate rural growth and development, and improve nutrition.

The first cohort of students — 30 master's degree candidates and 10 doctoral degree candidates — will begin the program in fall 2013.

The program was developed by USAID, the Association of Public and Land-Grant Universities and the International Center for Maize and Wheat Improvement in Mexico.

## Water sustainability flows through human-nature interactions

Water's fate in China mirrors problems across the world: fouled, pushed far from its natural origins, squandered and exploited.

MSU AgBioResearch scientist **Jiangguo "Jack" Liu** and doctoral student Wu Yang looked at lessons learned in China and management strategies that hold solutions for China and across the world. The research was reported in *Science* magazine.

The researchers outline China's water crisis and recent leapfrog investment in water conservancy, and suggest addressing complex human-nature interactions for long-term water supply and quality.

China's crisis is daunting, though not unique. Two-thirds of China's cities have water shortages, more

than 40 percent of its rivers are severely polluted, 80 percent of its lakes suffer from eutrophication — an overabundance of nutrients — and about 300 million rural residents lack access to safe drinking water.

China has dedicated enormous resources — worth some \$635 billion — that represent a quadrupling of investment in the next decade, mainly for engineering measures.

Liu said that there needs to be a big-picture view of water beyond engineering measures, however, because water is part of coupled human and natural systems.

"Everybody wants something, but most don't take a systems approach, which is essential in order to see the whole picture," Liu said. "Solutions come from looking at issues from multiple points of view at the same time. That's the way to avoid the unintended consequences that plague China's water resource and to prevent a water crisis from becoming a water catastrophe."

In addition to funding from MSU AgBioResearch, Liu's work is funded by the National Science Foundation.

## Impulsive micromanagers help plants to adapt, survive

Soil microbes are impulsive. So much so that they help plants face the challenges of a rapidly changing climate.

Michigan State University (MSU) AgBioResearch biologists **Jen Lau** and **Jay Lennon** studied how plants

and microbes work together to help plants survive the effects of global changes such as increased atmospheric CO<sub>2</sub> concentrations, warmer temperatures and altered precipitation patterns. The results, which appeared in the Proceedings of the National Academy of Sciences, showed that microbes in the soil not only interact with plants — they also prompt them to respond to environmental changes.

"We found that these changes in the plants happen primarily because

environmental factors above- and below-ground and paid close attention to the interaction between the plants and microbes in the soil. Close examination of this interplay revealed some interesting results.

Researchers already knew that drought stress reduces plant growth and alters the plants' life cycles. The team was surprised, though, to observe that the plants were slow to evolve and that microbes did most of the work to help these plants survive in new, drier environments. This happened because the microbes were quick to adapt to the changing environment.

This new aspect of the plant-microbe relationship shows that plants have an additional strategy for survival, Lau said.

"When faced with environmental change, plants may not be limited to traditional 'adapt or migrate' strategies," she said. "Instead, they may also benefit from a third approach — interacting with complementary species, such as the diverse microbes found in the soil."



STEVE SAFFERMAN AND STUDENT HAYLEY BETKER

of what global changes do to the belowground microbes rather than to the plant itself," said Lau, who works at Kellogg Biological Station, an MSU AgBioResearch research center. "Drought stress affects microbes, and they, in turn, drive plants to flower earlier and help plants grow and reproduce when faced with drought."

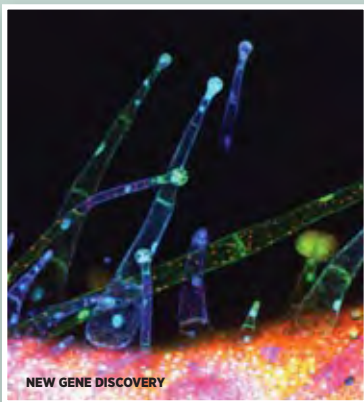
The team conducted a multigenerational experiment that manipulated

## MSU AgBioResearch scientist helps devise method to remove phosphorus from wastewater

Michigan State University (MSU) AgBioResearch scientist **Steve Safferman** is part of a team developing a new method of removing phosphorus from our wastewater. This is a problem seriously affecting lakes and streams across the country.



MICHAEL THOMASHOW



NEW GENE DISCOVERY

In addition, Safferman, associate professor of biosystems and agricultural engineering, and colleagues at MetaMateria Technologies, based in Columbus, Ohio, are devising a cost-effective way of recovering the phosphorus, which then can be reused for fertilizer products.

Within the past 50 years, eutrophication — the over enrichment of water by nutrients such as phosphorus — has emerged as one of the leading causes of water quality impairment. Although the use of phosphorus is regulated in items such as detergents and fertilizer in many states, including Michigan, it remains a critical environmental problem, in part because of its presence in human and animal wastes. Discharge from human and industrial wastewater and agricultural runoff into lakes and streams can cause eutrophication, which causes excessive algae growth, makes the water unsuitable for recreational purposes and reduces fish populations.

The research team has figured out how to produce a medium enhanced with nanoparticles composed of iron that can efficiently remove significant amounts of phosphorus from water.

“Phosphorus that is dissolved in wastewater, like sugar in water, is hard to remove,” Safferman said. “We found that a nano-medium made with waste iron can efficiently absorb it, making it a solid that can be easily and efficiently removed and recovered for beneficial reuse, while helping to solve a serious envi-

ronmental problem.”

The material should be commercially available for use within two years.

This research is funded, in part, by a National Science Foundation Small Business Innovative Research Grant.

## Plants unpack winter coats when days get shorter

Mechanisms that protect plants from freezing are placed in storage during the summer and unpacked when days get shorter.

In the *Proceedings of the National Academy of Sciences*, Michigan State University (MSU) AgBioResearch scientist **Michael Thomashow** demonstrated how the CBF (C-repeat binding factor) cold response pathway is inactive during warmer months when days are long, and how it's triggered by waning sunlight to prepare plants for freezing temperatures.

The CBF cold response pathway was discovered by Thomashow's team, and it has been shown to be active in crop species as they ready themselves for cold weather.

“We knew that when plants are exposed to cold, nonfreezing temperatures, they can better survive below-freezing temperatures,” said Thomashow, university distinguished professor of molecular genetics and study co-author with Chin-Mei Lee, MSU plant biologist. “What this new research demonstrates, though, is that plants' defense mechanisms are triggered by shortening daylight.”

It's widely known that waning daylight triggers trees' defenses

against freezing, but this has never been demonstrated in crops and other annual plants. The study not only shows that such plants use shorter days as a cue for the impending winter but that the mechanism also is turned off during the warm growing season.

“The CBF pathway is actively turned off during the summer to prevent the allocation of precious resources toward unneeded frost protection,” Thomashow said.

Identifying the genes involved in this process gives researchers the potential tools to fine-tune this regulation and increase crop productivity, he added.

In addition to funding from MSU AgBioResearch, Thomashow's research is supported by the U.S. Department of Energy (Division of Chemical Sciences, Geosciences and Biosciences, Office of Basic Energy Sciences) and the National Science Foundation (Plant Genome Project).

## New gene could lead to better bug-resistant plants

The discovery of a new gene could lead to more bug-resistant plants.

Research led by Michigan State University (MSU), including an MSU AgBioResearch scientist, appeared in the *Proceedings of the National Academy of Sciences*. The research demonstrates that domestic tomatoes could re-learn a thing or two from their wild cousins.

Long-term cultivation has led to tomato crops losing beneficial traits common to wild tomatoes. **Anthony Schillmiller**, MSU assistant professor of biochemistry and molecular biology, was able to identify a gene that is involved in one of these beneficial traits.

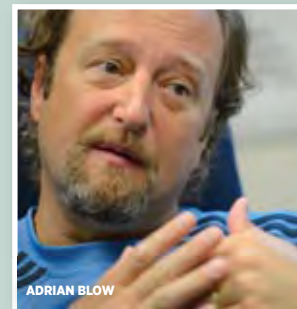
Many tomato secrets are found in its hair. Trichomes, or hair-like protrusions, produce a mixture of specialized chemicals that shape the interactions between the plant and its environment. The location of the chemicals allows some of them to act as the first line of defense against pests.

One class of compounds, acyl sugars, is a frontline defender. Trichomes secrete acyl sugars to fend off pests. Schillmiller teamed up with MSU AgBioResearch scientist and professor of biochemistry and molecular biology **Robert Last** and Amanda Charbonneau, MSU doctoral researcher, to try to understand how these chemicals are made. Little was known about how acyl sugars were produced until now, and this research identifies and describes the first gene that participates in the production of the protective sugars in cultivated tomatoes, Schillmiller said.

“Acyl sugars play a critical role in allowing wild tomatoes to fend off bugs,” he said. “Because cultivated tomatoes were not bred for their acyl sugar amounts and quality, they have reduced levels compared with wild ones that we do not eat. Understanding how they are made is the first step toward breeding cultivated tomatoes, and other plants in this family, to make them more resistant to herbivores.”

Other Solanaceous crops that could benefit from this research include potatoes, peppers, eggplants and petunias.

The research was funded by the National Science Foundation.



ADRIAN BLOW

## MSU-led projects to help war veterans

A pair of projects totaling \$1.5 million and led by Michigan State University (MSU) AgBioResearch scientist **Adrian Blow** will help Michigan National Guard members and their families in the often stress-



## Research IN THE NEWS

ful transition from battlefield to civilian life.

With the first initiative, funded by a \$1.3 million grant from the U. S. Department of Defense, Blow and colleagues will work directly with National Guard veterans and their spouses and parents to study resiliency in military families.

With the second, Blow will lead an effort to train as many as 1,000 mental health counselors to work with military families. This project is funded by a \$200,000 grant from the Detroit-based Ethel and James Flinn Foundation.

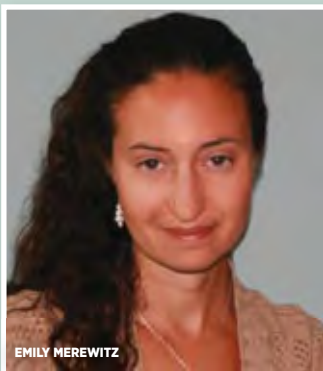
Some 19,000 service members from the Michigan National Guard have served in Iraq and Afghanistan, and many deal with the challenges of post-traumatic stress disorder, depression, unemployment, marital strife and alcoholism.

"Reintegrating into civilian society can be more challenging on many accounts than the actual deployment itself," said Blow, associate professor in the MSU Department of Human Development and Family Studies.

Blow will lead the resiliency study with Lisa Gorman, who received her doctoral degree from MSU and is now a program director at the Michigan Public Health Institute. The project is expected to help the military improve reintegration efforts and prevention and treatment programs.

"If we can identify common themes among those who flourish during extremely stressful times, we believe the project can inform prevention and intervention programs in ways that promote wellness for service members and their families," Gorman said.

Blow's second project, called Star Behavioral Health Providers, is designed to train licensed counselors in Michigan in working with the military, and then to connect veterans and their families with these providers through an online registry. Clinicians will receive training on war-related issues ranging from traumatic brain injury to substance abuse to suicidal thoughts.



The program, which was implemented successfully in Indiana, will initially target the metropolitan Detroit area and then be expanded statewide, with a special focus on the Upper Peninsula, which has a large number of National Guard veterans.

Co-investigators on the resiliency study are Hiram Fitzgerald and Ryan Bowles from MSU, Michelle Kees and Marcia Valenstein from the University of Michigan and Angela Huebner from Virginia Polytechnic Institute and State University.

### New AgBioResearch faculty members announced

Michigan State University (MSU) AgBioResearch is pleased to welcome three new faculty members.

**Emily Merewitz**, assistant professor of plant, soil and microbial sciences, became affiliated with AgBioResearch in August. Her research focuses on the environmental stress physiology of turfgrasses. Merewitz will explore turfgrasses' reactions to multiple abiotic stresses such as drought, heat and low light stresses. She will also teach the undergraduate turfgrass physiology course.

Before joining MSU, Merewitz was a teaching assistant for an advanced biology course, "Methods in Recombinant DNA," at Rutgers. She also served as a head instructor of a turfgrass stress physiology course in the Rutgers Professional Golf Turf Management School.

Merewitz received her doctorate in plant biology and pathology from Rutgers University in 2012 and dual



bachelor's degrees in plant biotechnology and plant science from Rutgers University in 2005.

**Jade Mitchell**, assistant professor of biosystems and agricultural engineering, became affiliated with AgBioResearch in August. Mitchell's research focuses on analyzing human health risks. Under the Center for Advancing Microbial Risk Assessment, she characterizes the risks associated with human exposure to pathogens in the air, water and soil. Using quantitative risk assessment, her work informs decisions about the appropriate level of concern for public health and public safety for policy makers and risk managers.

Mitchell's research recently expanded into chemical risk assessment for food safety. She will examine the levels of chemical residues that could be present in our food supply to inform the development of risk-based intervention strategies.

Before coming to MSU, Mitchell was a risk analyst with the U.S. Department of Agriculture's Food Safety Inspection Service. She also served as a postdoctoral fellow with the U.S. Environmental Protection Agency's National Exposure Research Laboratory from 2010 to 2012.

Mitchell received her doctorate in environmental engineering and her master's degree in civil engineering from Drexel University in Philadelphia in 2010 and 2007, respectively, and her bachelor's degree in civil and environmental engineering from the University of Pittsburgh in 1997.

**Michael O'Rourke**, professor of



philosophy, became affiliated with AgBioResearch in August. O'Rourke's research examines the process of developing communication and integration in cross-disciplinary research and the nature of linguistic communication between intelligent agents. He is director of the ToolBox Project, a research initiative sponsored by the National Science Foundation initiative that investigates philosophical approaches to facilitating interdisciplinary research. O'Rourke has also been a co-principal investigator and collaborator on several funded projects involving autonomous underwater vehicles.

Before coming to MSU, O'Rourke was a professor at the University of Idaho for 16 years, teaching philosophy, environmental science and neuroscience. He taught at Kansas State University from 1994 to 1996 and lectured at Stanford University in 1993 and 1994.

O'Rourke received his doctorate in philosophy and his master's degree in philosophy from Stanford University in 1995 and 1991, respectively, and his bachelor's degree in philosophy from the University of Kansas in 1987. 🌱

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