

Linked to **Agriculture**

Team Wheat

The experts that have joined forces
against a new pest.

4 **Mapping Language**

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The College of Agriculture and Montana Agricultural Experiment Station

Administration

Interim Dean and Director, Glenn Duff, PhD
 Assistant Dean for Academic Programs, Nora Smith, PhD
 Assistant to Dean & Director, Susan Fraser
 Student Services Coordinator, Jessica Murdock
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Agricultural Economics and Economics, Wendy Stock, PhD
 Animal and Range Sciences, Patrick Hatfield (Interim), PhD
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MAES Research Centers

Central AES, Moccasin, David Wichman
 Eastern AES, Sidney, Joyce Eckhoff, PhD
 Northern AES, Havre, Darrin Boss, PhD
 Northwestern AES, Creston, Robert Stougaard, PhD
 Southern AES, Huntley, Ken Kephart, PhD
 Western AES, Corvallis, Zach Miller, PhD
 Western Triangle AES, Gadi Reddy, PhD

We are the cornerstone of the land-grant mission, educating the students of tomorrow and meeting the agricultural challenges of Montana.

College Snapshots

1,055 students in the college.
878 undergraduates and 177 graduates

11 majors, **13** graduate programs, **22** options and **seven** minors

Student body represents **42** states and **10** countries.

“Student Organization of the Year”

Collegiate CattleWomen, for winning the annual Animal Agricultural Alliance Online College Aggies Scholarship Competition and a donation of 15 tons of Tyson chicken to the Gallatin Valley Food Bank in February.

“Student Organizer of the Year”

PSPPP student Hannah Estabrooks won “Student Organization Leader of the Year” with her creation and work with the MSU College of Agriculture Turf Club.

2 Endowed chair creations, with committed funding, in Animal and Range Sciences, and Plant Pathology and Plant Sciences.

29 Veteran students

Equine Science Fastest growing option at MSU.

New major Financial Engineering, housed within the Department of Agricultural Economics & Economics and the College of Engineering.

Wool Judging Team placed 5th at the 2014 National Western Stock Show Collegiate Wool Judging Contest.

Animal and Range Sciences Academic Quadrathlon Team tied for 2nd place with Texas A&M at the National Animal and Range Sciences Academic Quadrathlon in July.

Total Research Expenditures: **\$16.4 Million** (FY 2013)

107 students crossed the graduation podium in May for Spring Commencement 2014.

Famed horseman **Buck Brannaman** offered a horseman-ship class to our equine and riding students in February.



In 1889, the great territory of then-Montana, entered statehood. Five years later, the Montana State College of Agriculture and Mechanics opened its doors. Today, the MSU College of Agriculture and Montana Agricultural Experiment Station are as vibrant and necessary as they were 121 years ago.

While our mission of supporting the agricultural industry of Montana and the people that keep it running hasn't changed, our physique has. Students are flocking to MSU in record numbers, and our own College of Agriculture is in its sixth year of enrollment growth. We now represent 42 states and 10 countries. Thanks to the support from the good folks across this state, we're able to annually provide more than \$350,000 in scholarships (which translates to 180 scholarships for students, the most on campus) so we can transfer the future of agriculture to our students. If there's something certain about agriculture's future, it's that we're in good hands, and this issue is full of examples. This year our students have independently elected to create and manage 17 clubs—the most of any college on campus. Four of them won national recognition this year.

Our research and faculty continue to focus on understanding what it will take to keep feeding the world while maintaining a commitment to the land, climate and environment. To that end, we've committed to creating two endowed chairs; one in Animal and Range Sciences, and another in Plant Sciences and Plant Pathology—both well on their way in private funding commitments from our supporters around the region. These endowments will mean a great deal in our ability to solve agriculture's pressing challenges in Montana and around the globe.

I'm glad to say your land-grant university continues to lead the way in research, academics and performance, and we couldn't do so without your support.

To our friends and family across the state and here at home, thank you for helping the MSU College of Agriculture continue to serve Montana.

Come by and see us sometime.

Glenn Duff
 Interim Dean and Director
 College of Agriculture and
 Montana Agricultural Experiment Station



Warmest salutations from Linfield Hall. The crab apples bunched in the trees outside my window have made their transition to a deep red hue, so I know that the start of another fall

semester is upon us. This fall will bring a tremendous surge of energy to the building as COA undergraduate and graduate students convene and reconvene for another academic term, to be welcomed by all of us, especially the 14 new faculty members and almost 20 new professional and classified employees that have begun working here in the past year.

Even as we commence the academic year, we celebrate some major milestones: the online MS degree in Environmental Sciences (housed in LRES) has admitted more than 50 students in just two years' time, and our first class of WIMU students will begin their professional studies in veterinary medicine in cooperation with Washington State University.

As a college, we successfully pursued six proposals this summer funded through the Provost's Performance-based Funding Initiative, winning more than \$130,000 to enhance teaching in COA academic programs, implement active learning pedagogies, improve retention and provide supplemental instruction in “gateway” courses. While working across academic disciplines is nothing new to agricultural sciences, our increasing emphasis on this kind of intellectual adaptability and acuity is impacting our curricula and our students' abilities to compete for the most challenging and prestigious career paths and graduate programs in Montana and the nation.

It's going to be a very interesting and busy year, no doubt, and we invite all our *Linked* readers to keep in touch with us and to join us at university and COA events. Expect great things and myriad accomplishments from us this year.

Nora Smith
 Assistant Dean
 MSU College of Agriculture

A New Leader is Chosen

Charles Boyer from California State University, Fresno, has been chosen to lead the College of Agriculture and the Montana Agricultural Experiment Station.

Currently dean of the Jordan College of Agricultural Sciences and Technology, Boyer will begin his new role as MSU's vice president of agriculture and dean of MSU's College of Agriculture on Dec. 15.

"As the state's land-grant university, MSU is committed to enhancing and strengthening our partnership with agriculture, the No. 1 industry in the state. Charles Boyer's (PhD) vast experience advancing research, teaching and service, as well as his success working with producer groups and his successful fundraising track record, make him an outstanding choice to lead these efforts," said MSU President Waded Cruzado.

Boyer said he anticipates working closely with the agriculture community at MSU and throughout Montana. "I look forward to the opportunity to build on the strong partnerships between MSU and the agricultural community," Boyer said. "These partnerships are already strong, and they will benefit us all as we work together to find new ways to serve the agricultural community of Montana."

MSU elevated its dean of the College of Agriculture to a vice presidential position earlier this year, in recognition of its importance to the state's economy and the MSU mission. The new vice president of agriculture will lead the College of Agriculture and Montana Agricultural Experiment Station.

MSU's College of Agriculture has approximately 1,028 students with 11 bachelor degree programs, nine master degree programs and four doctoral degree programs from five departments and one division. Historically, it has been among the top three MSU colleges in terms of research activity. The Montana Agricultural Experiment Station conducts research at seven research centers strategically located across the state to address the diverse climatological challenges of Montana's agriculture industry.



Boyer earned a bachelor's degree in biology from Eastern Oregon State College and a master's degree and doctorate in genetics, both from The Pennsylvania State University.

In 2006, he was named dean of the Jordan College of Agricultural Sciences and Technology at California State University, Fresno. Prior to the appointment, he served as associate dean and associate director of the Agricultural Experiment Station, College of Agricultural Sciences, at Oregon State University; as professor and head of the Department of Horticulture at Oregon State University; as chairman of the Intercollege Graduate Program in Genetics at The Pennsylvania State University; as professor and associate professor of plant breeding and genetics at The Pennsylvania State University; and as assistant professor of horticulture at Rutgers University.

Boyer takes over from Glenn Duff, who has been interim dean and director since Jeff Jacobsen stepped down in September 2013.

"The College of Agriculture was in very good hands with Dr. Duff, and we thank him for his service," Cruzado said.

Boyer was selected after a national search conducted by a 22-member search committee that was composed of industry and academic representatives. The committee was chaired by Brett Gunnink, dean of the MSU College of Engineering.

"MSU thanks Dr. Gunnink and all of the members of the search committee for their exceptional work throughout this search," Cruzado said. ■

Online LRES MS program growing

Good things come to those who wait. That's gone through the minds of several Land Resources and Environmental Sciences faculty the past few years as they've watched a long-time dream become a reality. What was once just the spark of an idea—an online LRES master's degree—is now an established program with three graduates and more than 50 students.

"The stars aligned a few years ago," said Bob Peterson, who teaches in the program and also advises students. "President Cruzado was very supportive, Tracy Sterling (LRES department head) was behind it, and the need was out there. It felt like the right time."

The team worked with MSU Extended University to launch in fall 2012, and the first three graduates earned their diplomas this spring: Erin Frolli, a jellyfish researcher who completed online coursework from California, Montana and Mexico; Marley Vaughn, an environmental consultant from Wyoming; and Carla Rickert, a biologist and grandmother from Florida.

"I didn't think we'd have grads this soon," said Peterson. "They really epitomized who we're trying to reach, and they surprised us by their dedication."

Rickert said the online degree presented an opportunity to fulfill a lifelong goal.

"My dream was to finish my graduate degree, but being a member of the 'sandwich generation' (taking care of an elderly mother in Iowa, spending time with an adult daughter in Florida and expecting our first grandchild in Bozeman), I did not see how it would be possible to finish and still fulfill obligations and desired family time," she said. Rickert said she applied to the program the day she discovered it. "It seemed like an opportunity made especially for my crazy schedule at this time in my life."

"The degree provides opportunities for place-bound students," said Peterson, adding that most current students are raising families and/or building their careers. "The beauty of this program is that we're reaching a different demographic of students."

"With my job, I traveled all over," said Frolli. "I didn't have to miss a beat—you still have flexibility; you can do it from anywhere."

The program now has 54 students enrolled for fall semester 2014. ■

Students who wish to enroll in the online LRES master's program for Spring 2015 must apply for admittance by November 15; however, non-degree-seeking students can take courses for professional development and career advancement. Most Fall 2014 courses begin August 25.

Visit <http://eu.montana.edu/environmental-masters>

Faculty Awards Highlights



Carl L. Wambolt, PhD professor emeritus of range science, received the W.R. Chapline Research Award of the Society of Range Management.

The Chapline Award is the most prestigious award bestowed by the Society of Range Management.



MAES Research Center Department Head **Barry Jacobsen** was awarded a Lifetime Achievement Award from the American Phytopathology Society in July.



LRES Professor **Perry Miller** was recently selected as a 2014 American Society of Agronomy Fellow. ASA's annual awards are presented for outstanding contributions to agronomy through education, national and international service and research.



Animal and Range Sciences Interim Department Head **Patrick Hatfield** received the 2013 Western Section American Society of Animal Science Distinguished Service Award.



Northern Agricultural Research Center Professor of Weed Sciences **Bob Stougaard** was elected as a fellow to the Western Weed Science Society.

Don Kress, professor emeritus of Animal and Range Sciences received the American Society of Animal Science Fellow Award.

Jeff Mosley, professor of Animal and Range Sciences, received the Green Award for Leadership in Extension Sustainability Programming, Association of Natural Resource Extension Professionals.



Mapping Language

LRES Native student wins prestigious Udall Scholarship

Language is like the wind.
You know it's there, you don't always see it, and it might be fleeting.

Sitting at the window of a local taco bar near the MSU campus, Emery Three Irons, a member of the Apsaalooke Nation and descendant of Chief Pretty Eagle, explains why language and culture are important to Montana agriculture.

"Agriculture includes a lot more than just science and resources," he says. "To me, ag also encompasses history, culture and language. All of that matters in any kind of relationship with land or place."

Three Irons, a senior in the Department of Land Resources and Environmental Sciences in MSU's College of Agriculture, is pursuing a geospatial and environmental analysis (GIS) degree and is using his skills to map something much bigger than the physical world—the linguistic prevalence of his native Crow language.

It's a project that garnered the attention of the prestigious Udall Scholarship Foundation. Three Irons was named a national Udall Scholar in the Tribal Public Policy category last spring. He is the first MSU student to have ever been selected for such an award.

Using GIS to find and map where on the Crow Indian Reservation tribal members are fluent in their native language is a large task, and it's a unique project when it comes to the College of Agriculture.

"Mapping something that's not physical is challenging, and it's different than all of the projects I've seen," he said. "Tracking indigenous language and the clusters of people who might still only speak Crow is probably way harder than I realized."

Three Irons himself didn't even learn English until he was a four-year-old in the Head Start Program in Hardin, Mont. His mother, now retired, taught Crow at Hardin High School as a language elective and spoke it exclusively in the home. Now with an eight-year-old son of his own, Three Irons views his GIS project as something more than an academic pursuit.

"A people's language goes hand in hand with their culture," he said. "If the language disappears, so does the heart of the culture. I remember Crow fading away when I learned English. Now, I look at my son and I realize more than ever, that it's up to my generation to preserve our language."

Three Irons' GIS project mirrors a statewide effort to help tribes preserve their linguistic heritage.

At the same time he's mapping native Crow fluency, he'll also be working to clarify Crow political districts, subdivisions, historic sites and infrastructure.

LRES Department Head Tracy Sterling said the uniqueness of the project shines a light on Three Irons' distinct work. "It's an absolute honor for this department to host the first Udall scholar in the Tribal Public Policy category in MSU's history," Sterling said. "We're very proud of Emery, and feel that this achievement speaks not only to Emery's incredible focus, but also to the important role native history, policy and culture plays in our research questions."

The largest reservation in Montana at 2.2 million acres, there's enough challenge with the project in terms of the sheer landmass of the Crow Agency alone. Add tribal politics, driving distances and the usual delays when it comes to data collection, and the project starts to feel overwhelming.

"There are a lot of aspects that make this project seem more layered than what I imagined," he said. "For me, it's a good project because it's much more representative of projects in the real world because you have to learn how to work with and around unexpected turns."

Juggling tremendous responsibility is something Three Irons knows well. Managing a full academic schedule while single parenting eight-year-old Avery, Three Irons said his academic path has taken an unexpected route. He began

THREE IRONS PORTRAIT BY KELLY GORHAM, MSU POWWOW PHOTO BY ANNIE CANTRELL AND KELLY GORHAM

his journey at Little Big Horn Community College where he first used GIS as a wild land firefighter with the U.S. Forest Service. Facing many of today's common student obstacles, Three Irons weaved life between school sessions and managed to always make his education a priority.

LRES Academic Programs Coordinator Linda McDonald, whom Three Irons calls "kaala" — the word for grandmother in Crow, said Three Irons is every bit deserving of the Udall Scholarship.

"A lot of students walk in here and they come with their own background stories, so you've got to use your toolbox to help them meet their goals," McDonald said. "For native students, that might be a more challenging task because most are bridging a tribal community with an academic one. That fact can make their entire college career more challenging."

Three Irons said he had to overcome personal challenges in his youth before he was able to fully commit to academic studies. Now he's considered a leader among other native students on campus. Last year, Three Irons was nominated by the MSU American Indian Council to be the head Man Dancer at MSU's annual spring Pow Wow.

A descendant of Chief Pretty Eagle—a celebrated Crow Chief, warrior and U.S. Diplomat and delegate of the Crow Nation in the mid-19th century, Three Irons said being nominated by peers to honor his heritage was humbling.

"It was a real surprise when I found out I was nominated as

head Man Dancer," Three Irons said. "It's a big responsibility and honor and it's also a lot of work. I called all of my family when I found out, and the next thing I knew, everything that needed to be done was already rolling."

When his family's honor song was played on the gym floor of MSU's Brick Breeden Fieldhouse during the Pow Wow, Three Irons grabbed his son Avery and began dancing on the floor, as is tradition. Family, friends and tribal members can choose to dance and sing behind the family during the song as a showing of respect.

"At one point, I looked back, and the floor was packed, I couldn't believe all the people behind us. Even people who weren't dressed came down from the stands to dance behind us," Three Irons said.

"That moment, seeing all of those people—words can't describe. I felt very lucky. That was a sign for me that I've got to complete this project not only for my son, but for my people too."

At the end of the Pow Wow, Three Irons presented McDonald with a thank-you gift; a quilt made by his family in her favorite blue color.

"When he wrapped the quilt around me, my heart was so touched to have some part of his educational path. I'm so proud of Emery and all that he's accomplished, I just know that kid is going places," McDonald said.

Three Irons plans to graduate with a Bachelor of Science degree in Geospatial and Environmental Analysis fall semester 2015, and hopes to find full-time work with his tribe or private industry. ■

Meeting agricultural challenges across Montana

The Department of Research Centers has continued to grow and thrive over the past year, with the departmental office joining the Bozeman campus this November, and welcoming new Administrative Associate Shana Wold in April.

MAES Research Centers welcome new faculty

Hans Schneider, PhD Associate Professor of Plant Pathology, who joined the Eastern Agricultural Research Center in Sidney July 2013.

Jessica Torrión, PhD Assistant Professor of Crop Physiology, who joined the Northwestern Agricultural Research Center February 2014.

Zach Miller, PhD Assistant Professor of Horticulture, who joined the Western Agricultural Research Center in Corvallis as their Superintendent May 2014.

2014 MAES Highlights

Chengci Chen, PhD Professor of Cropping Systems & Agronomy at the Central Agricultural Research Center, and Olga Walsh, PhD Assistant Professor of Soil Nutrient Management at the Western Triangle Research Center successfully organized and coordinated the 2014 Western Crop Science Society of America (WCSSA) meeting held in Bozeman. Chen is the current President of WCSSA and Walsh was the appointed Secretary of WCSSA.

Interim Department Head Barry Jacobsen, PhD hosted the 2014 American Phytopathological Society (APS) Pacific Division meeting in Bozeman this summer, and was honored with a Lifetime

Achievement Award for his dedication to the society and his field.

2014 MAES Field Days, held at each of our research centers, were a success and attracted participants from every corner of the state. Each Field Day was well represented and research topics ranged from the study and management of crop varieties and pest management/disease control to crop rotation, soil management and irrigation. President Waded Cruzado was present at the SARC Field Day in Huntley, Mont. as part of her "Follow the Energy" bus tour and the new Director of Extension, Jeff Bader, was present at each Field Day to celebrate and promote Extension's 100th Anniversary.

Orange Wheat Blossom Midge

MSU, Extension experts team with wheat growers to combat new pest · by Sepp Jannotta

Montana State University and wheat growers across the state are working together to protect the state's billion-dollar wheat industry from a tiny orange midge capable of inflicting major damage to the crop.

The adult orange wheat blossom midge superficially resembles a small, orange mosquito and lays its eggs on the maturing head of spring and durum wheat. After hatching, large numbers of midge larvae feed on the developing wheat kernels causing yields to plummet from 80–90 bushels per acre to as little as two.

Bob Stougaard, superintendent of MSU's Northwestern Agricultural Research Center in Kalispell and professor of weed science, said the first economically devastating appearance of the orange wheat blossom midge in Montana occurred in Flathead County in 2006.

"We estimated that our losses in 2006 were at least \$1.5 million," Stougaard said. "That kind of number really gets your attention. We've been working on addressing this problem ever since."

The orange wheat blossom midge is an invader from Eurasia that has plagued certain areas of the upper Great Plains and much of Canada wheat country. While it is known in the Western Hemisphere as a pest of spring wheat and durum, in Europe and Asia it attacks winter wheat.

Although the Flathead Valley was the first area in Montana to suffer severe economic losses due to this pest, the wheat midge has since made its growing presence felt in other areas of the state, putting wheat growers on alert across Montana, Stougaard said.

Experts with MSU Extension, MSU's Montana Agricultural Experiment Station and the MSU College

of Agriculture have worked with wheat producers to create a statewide, early-warning detection system to monitor the midge's spread; are sharing information about strategies to combat the midge through the well-timed application of pesticides and use of biocontrols; and have developed a new wheat variety that is genetically resistant to the midge and which should be available for planting for the 2016 season.

The early-warning detection system involves trapping the midges and counting their numbers. Six Montana Agricultural Research Centers and 26 MSU Extension offices have worked with growers and crop consultants to place hundreds of traps across the state. The cooperative effort, known as the Orange Wheat Blossom Midge Monitoring Project, helped spearhead development of an online information sharing system—MSU Pest Management Network where findings are mapped and quantified so that grain growers throughout the state can see if midge populations are present in their area and if the numbers warrant action.

The presence of 10 or more adult midges in a trap over a two-day period indicates farmers should scout their fields at twilight when the females fly and lay their eggs. If they see more than one midge per six heads, they know their field is vulnerable to an attack that could hurt the value of their harvest.

David Weaver, a professor of entomology with MSU's College of Agriculture who also participated in efforts to manage this pest after that first outbreak, said word about how to address the problem has spread thanks to some key players. In particular, Weaver said Dan Picard, a retired MSU Extension agent for Pondera County with a small wheat farm in the Golden Triangle, has taken a leading role in what has been a huge collaborative effort, both to track the insect's appearance and to educate the farmers.

The Orange Wheat Blossom Midge Monitoring Project, which Picard likens to MSU and growers setting up a neighborhood watch—brought Picard out of retirement for short-term contracts with MSU Extension and the Western Triangle Agricultural Research Center.

Both Picard and Weaver said the project is an example of how well integrated MSU is within Montana's tight-knit wheat community.

"It really is a team effort. People might not be aware of how much the academic community collaborates directly with growers," said Weaver.



Continues on back cover.

A Global Classroom

Agricultural Economics class travels the world

Travelling to far corners of the world to absorb the global presence of Montana agribusiness, apply academic training and build industry relationships—all in a few weeks' time—might be a tall order for students at other schools. Not at MSU.

Fifteen years ago, a class syllabus that allowed MSU College of Agriculture students to experience global agribusiness was drafted. Today, that class has acquired a student-spurred reputation as one of the highest quality seminars in all of Montana's universities.

This is the storied and increasingly rich history of the Agriculture in a Global Context initiative, housed in the Department of Agricultural Economics and Economics (DAEE). It's a class that has launched many of its students into successful careers in agribusiness, finance, Extension, and masters and PhD programs at leading universities. It's also a class that uniquely defines the intersection between international commerce, academic rigor, science and faculty research at MSU.

Perhaps more than an example of what students and engaged faculty are capable of, the class is an MSU legacy. Two of the faculty who built the foundations of the course have passed away (Stuart Knapp and David Buschena). Generous Montanans around the world have pitched in to make student travel experiences possible. The course was designed with the sole deliverable of enabling MSU students to learn about the global structure of agriculture.

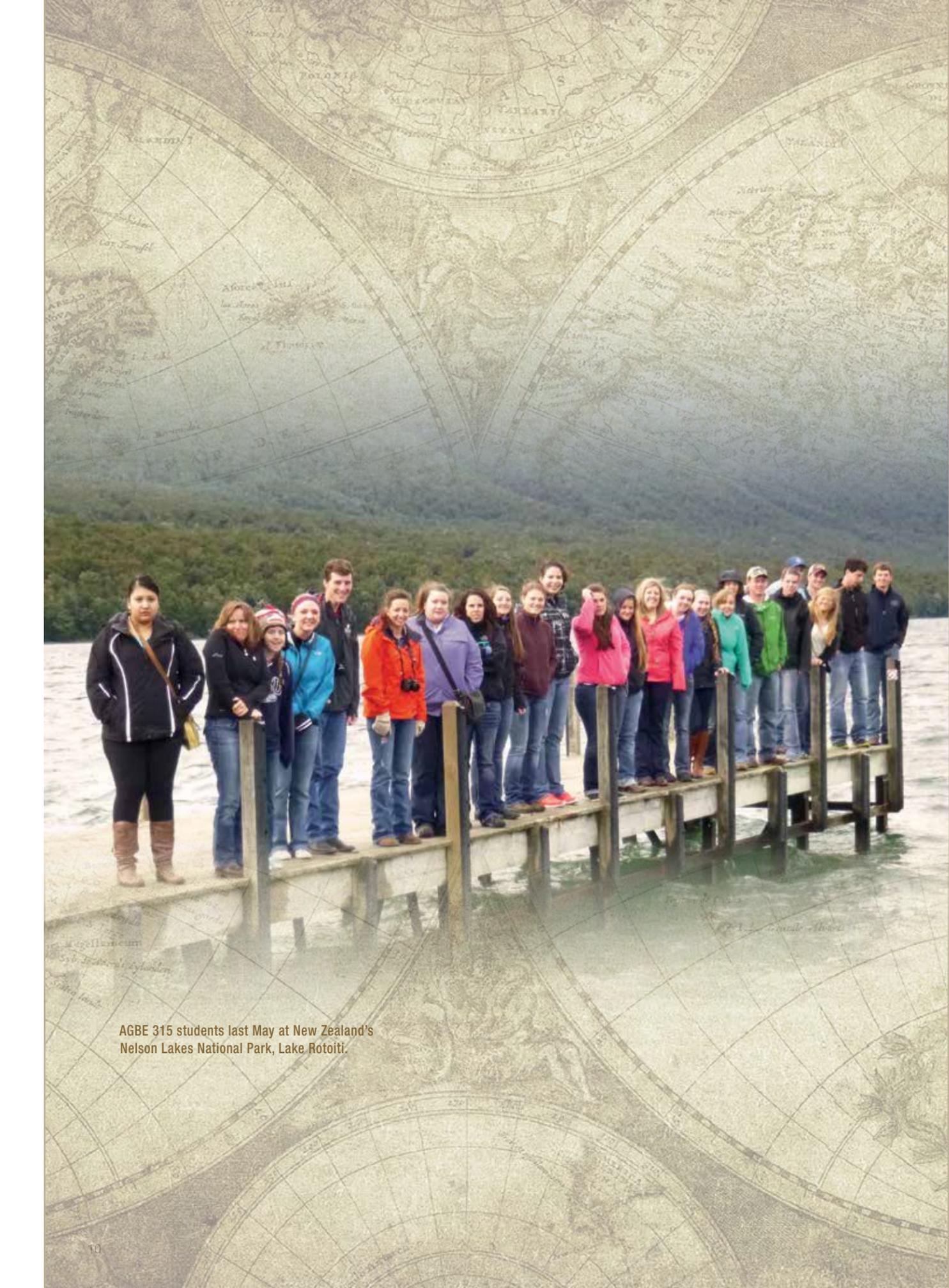
When beloved MSU administrator Stu Knapp was interim dean of the College of Agriculture in 1998-'99, he suggested the college host a class with an international component. DAEE Professor Vince Smith was asked to draft the inaugural syllabus, which continues to serve as the template for the class today. With the support of then DAEE Department Head Myles Watts, PhD, fellow faculty Jim Johnson, PhD, and then MSU Cereal Quality Lab Director Deborah Habernicht, the first AGBE 315 seminar class with an international component was born. Since then, the class has visited 11 countries and influenced the career and academic trajectory of many students.

The rationale for the program, according to Smith, was the need to represent the bigger picture of agriculture to students. "We saw a need to bring bright young people to another level in their understanding of the industry in which they are working from all aspects; to appreciate the role and relevance of basic and applied sciences, farm management, and food processing and distribution—both in a U.S. context, as well as on an international scale."

That objective, combined with providing a unique multicultural experience for College of Agriculture undergraduate students, was transformed into an impressive experiential learning and travel experience. Since 1999, when the first class traveled to Taipei, Taiwan, (which was visited for a second time in 2006), students have literally travelled the world. The class visited Argentina in 2000, France and England (2001 and 2003), Australia (2004), England, Ireland and Scotland (2007), China (2008), California (2009), Chile (2010) and Ukraine (2011). Most recently, in 2014, the class visited New Zealand. Depending on whether the focus is on the grain or livestock industry, the Agriculture in a Global Context course is either called "Follow the Grain" or "Conception to Consumption."

Thanks to the support from many sources that provide resources for student travel expenses, funding is available for students who wouldn't otherwise be able to participate in the program. Gary Brester, professor of agricultural economics, said the College and DAEE have made this objective a central commitment of the program.

"There are several goals of the course, and one of them is to provide a unique opportunity for students who are committed to academic excellence and leadership," Brester said. "Thanks to the generosity of various agribusinesses, commodity groups and other funding sources, at least one-half of student travel expenses are covered so that virtually any high-achieving student has the opportunity to participate."



AGBE 315 students last May at New Zealand's Nelson Lakes National Park, Lake Rotoiti.

From the outset, support for students has been central to the program. Stuart Knapp, with the help of the MAES advisory committee, Vince Smith and Jim Johnson, garnered funds and in-kind support from the Montana Department of Commerce, U.S. Sen. Max Baucus's (retired) staff, U.S. wheat and grain associates in offices around the world, and a grant from the USDA International Programs fund. Those efforts made the first trip possible without burdening students with the high costs of international travel.

Between 2005 and 2008, DAEE Professor David Buschena, who passed away in 2010 at the age of 45 after a courageous three-year struggle with cancer, was instrumental in establishing an endowment for student travel expenses. Buschena, who taught in the department from 1992–2009, was greatly respected and loved by his students and colleagues as well as many in the grains industry. He was committed to establishing permanent support for student participation in the program because he understood how much students gained from their experiences in the seminar.

Today, thanks to multiple funding sources including Montana producers, the Montana Grain Growers Association, the Montana Wheat and Barley Committee, private individuals, and agribusinesses like CHS, Inc. and BNSF, between one-third and one-half of all student travel expenses are covered.

Joel Schumacher, now an MSU extension associate specialist, was an undergraduate student in the very first class that travelled to Taiwan in 1999. Schumacher, then an economics minor, said the class deepened his interest and appreciation for global economics.

"I think back on that class and the trip now, and I can say that I probably wouldn't have applied to graduate school in economics at MSU, had I not been a student in that class," he said. "It's the most unique class I took, because it opened my eyes to how Montana agriculture fits into the global picture. The enormity of it all really stuck with me."

The AGBE 315 class is offered approximately three out of every five years to students who are majoring or minoring in the College of Agriculture. One element of the original USDA grant that supported the development of the program was to include representation from Montana's tribal colleges as well.

International travel is certainly a highlight of the class, but the course isn't about having a fun time in a different country. It is serious educational business. Class requirements include extensive visits with in-country private businesses, academics, U.S. diplomats, trade representatives and native populations. Before the two-week long international experience, students are required to participate in a semester-long, upper-division course, where the class studies either the grains or livestock industries of the United States and the selected country, and agricultural challenges and successes in the region. In addition to academic and agribusiness speakers, students also conduct and present research relative to some element of the

country to be explored. Upon returning, they are often asked to present highlights of the trip. Smith said the trip has high standards, which contributes to professional participation.

"At every turn, students are expected to behave like young professionals and to represent our department, College and MSU," said Smith. "There are certainly concerns about some international travel programs—but, our course is structured, challenging and includes a high level of performance expectations. Our students perform admirably and are great representatives of Montana."

In fact, the class always has the singular end-goal of providing a rich academic experience alongside real-world international agribusiness exposure, according to Brester.

"It's no secret that Montana students are often isolated from the activities of global commerce. So, we thought, let's devise a class that has the ability to engage students in unique career-changing educational experience that reflects that kind of engagement, which is endemic among the faculty in our college," Brester said.

In the dynamic employment market facing today's college graduates, international experience is almost expected, if not required. That fact has made the class even more popular. In fact, students must now apply to gain entry and faculty judge those applications based on academic performance and leadership activities.

"We have outstanding, brilliant students," said Smith. "Because numbers, logistics and travel challenges dictate constraints on the program, we've now had to create an application system for acceptance into the class."

Despite the application process, students know the extra time spent applying is worth it.

"It's one of those classes that really makes you appreciate MSU," said Sarah Snow, a senior in ag-business and AGBE New Zealand class veteran. "It's a lot of work, but understanding the role of Montana agriculture, and realizing there are careers that can take you to these amazing places and still work in ag, it's just amazing."

The only reason this class exists, according to Smith, is because of the college's faculty research activity.

"The course is a prime example of the benefits students obtain from working with gifted faculty who have internationally recognized research programs," he said. "Active research programs with international partnerships are standard in this department and throughout the College of Agriculture, and those connections create exciting and unique opportunities for our students—which is always the end goal."

Next year, the number of student applications for the course is expected to jump. Brester said he knows the course's heritage will continue.

"I see a program that embodies the kind of rigor and experience we want students to graduate from our program with," said Brester. "This class is one of those opportunities that changes lives." ■

MSU WIMU in White

MSU's inaugural class of regional vet-med students receive white coats

The 11 students in Montana State University's first class of the Washington, Idaho, Montana and Utah Regional Program in Veterinary Medicine received their white coats during a formal induction ceremony at Washington State University in Pullman, Wash., last August. The students will begin their first year of the regional program, dubbed WIMU, in Bozeman this year, before eventually finishing the final three years of their doctor of veterinary medicine degrees at WSU.

MSU's participation in the program was approved by the Montana Legislature and Gov. Steve Bullock during the 2013 session to bolster the state's veterinarian workforce. The program will also provide affordable access to Montana students wishing to pursue veterinary medical education.

Glenn Duff, interim dean of MSU's College of Agriculture and interim director of the Montana Agricultural Experiment Station, said the ceremony marks an important moment, both for the students and for MSU, which, as the state's land-grant university, is charged with disseminating knowledge and technology for the direct practical benefit of citizens.

"We're proud and excited to welcome these students into the inaugural class at our campus in Bozeman," Duff said. "The WIMU program has developed into one of the highest-quality regional veterinary medicine programs in the country, and we're pleased to be a part of that heritage as we produce veterinarians who are Montana natives."

The new program will tie in with the pre-vet advising program that the MSU College of Agriculture already

offers undergrads. The veterinary medicine students in the WIMU program will have opportunities to intern at Montana veterinary practices as they pursue their degrees, and any senior veterinary student from WSU will also have the opportunity to rotate through established practices across the state.

The program will also be supported by state-of-the-art animal facilities, including MSU's Molecular Biosciences Building, the Johnson Family Livestock Facility, and laboratories that offer valuable training in biosafety related issues associated with infection in livestock, wildlife and other animals, including humans. WIMU is modeled after the highly successful WWAMI Medical Education Program, which has provided medical training for Montana students for more than 40 years. The WWAMI program enrolls students from Washington, Wyoming, Alaska, Montana and Idaho at the University of Washington Medical School.

Mark Quinn, interim director of WIMU at MSU, said the regional program provides not only a competitive veterinary education, but also involves a supportive network of practicing veterinarians.

"The program is unique in that it includes a surrounding network in a four-state region in terms of clinical study and internship opportunity for students," Quinn said. "We're certainly enthusiastic for Montana and MSU to be a part of this program and the benefits it can bring to Montana." ■

For more information on the WIMU program, visit <http://wimu.montana.edu>. Photo by Henry Moore.



Alpha Gamma Rho

A Greek legacy in Montana agriculture

Cole Ratzburg joined because he wants to be a leader in the livestock industry.

Taylor Broyles joined because he plans to be a leader in Montana small grains production.

Lane Nordlund joined because of the diverse leadership opportunities, and he heard you could meet girls.

The Alpha Delta Chapter of the Alpha Gamma Rho Fraternity (AGR) on the campus of Montana State University is the home away from home for 40 MSU young men. Despite varying convictions for joining, there remains a constant among them; most arrive on our large campus from small towns, and they leave as poised gentlemen ready to begin influential careers in agriculture. The AGR commitment to Montana agriculture mirrors much of the work done within MSU's College of Agriculture. In fact, AGR has been a presence in Linfield Hall since the date of their charter in 1925. All along, their mission has been to "make better men and through them, a broader and better agriculture."

In Montana, you don't have to look very hard to find an AGR alumnus. Across the intermountain west and nation, AGRs serve leading chairs in agriculture banking, production, commodities and communications. They operate successful family farms and ranches and they have steady hands in legislative representation. Several sit as members of the Montana Legislature and another is the director, and deputy director, of the Montana State Department of Agriculture. At MSU, active brothers participate in 10 of MSU's College of Agriculture 20 clubs.

At a time when the national Greek system is suffering and American college life is troubled with the rash of claims of sexual assault, excessive drinking and other behaviors that lead national commentators to decry the poor state of college social life, these AGR guys seem to have it figured out.

The house currently holds the second highest fraternity GPA on campus at 3.1, and fall semester 2013, they held the highest new-member GPA in the entire

MSU Greek system at 3.2. Their recruitment numbers are up. They were awarded this year's MSU Fraternity Philanthropy award (they gave more than \$4,000 to statewide charities this year) and they recently garnered a national award only given to 10 percent of national chapters: the Gold Award. Being recognized as an AGR Gold Chapter is a prestigious national recognition only bestowed on chapters which demonstrate success at every turn. MSU's AGR house joins other top collegiate ag leaders in their Gold delegation including Purdue University, Ohio State, University of Nebraska and Kansas State. The house even garnered a thumbs-up from MSU President Waded Cruzado when she called the house a "model fraternity" last spring.

AGR Chapter Advisor for the last 10 years, Ray Knox ('82), said the house has revamped and refocused efforts on academics.

"The guys in the house are all very smart and hardworking—but more than that, they truly want to help each other pass those tough classes. They know they're here for academics first, and that's a priority among all of them," said Knox. "Success in academics transfers to success in life and career, so they understand that connection and value."

The house started an in-house tutoring program with extra support for the College of Agriculture's notoriously tough classes and general coursework. The house membership includes Hispanic, Filipino and Brazilian representation.

Lane Nordlund from Lewistown, Mont., said the diversity of the house helps create a brotherhood.

"It's like a family, everyone has a similar background (most small, rural towns), but we've all got different experiences," Nordlund said. "I've learned a lot about patience, communication and empathy with my AGR brothers. I would have been a completely different college student without that kind of education."

Fraternities and sororities have existed in American colleges and universities since the mid-19th century, and MSU has had its own Greeks since the early



The AGR brand board inside the chapter house. After receiving a membership pin, AGR members either create a personal brand or use their family brand, and burn it into the brand board—a legacy of members on the wall.

20th century. A house like AGR's bucks the perception of fraternities often created by popular culture and scattered headline-grabbing incidents on campuses across the nation. To counter this perception and reduce the potential for incidents, the AGR house is participating with the other fraternities on campus in MSU's "Not in our House" program, designed to deepen responsibility, awareness, accountability and mitigate the risk of sexual assault.

AGR Noble Ruler Cole Ratzburg, from Sunburst, Mont., said combatting the partying reputation is part of the responsibility of fraternities these days.

"It takes one bad event to mess it up for everyone else and that gets reflected on the entire Greek system," Ratzburg said. "We make better men, and we don't tolerate sexual assault. The good news out of this is that we've had a chance to educate fellow students, and we want everyone to know that anyone who enters our house is safe."

Fraternities and sororities maintain a meaningful presence for many students at MSU. With senior students providing tutoring and mentoring support, fraternities and sororities consistently help their members achieve higher graduation rates and grade-point averages than the general student population.

Erin Macdonald-Peck, MSU assistant dean of students, said the campus's AGR chapter models a campus-wide standard for involvement and behavior.

"At MSU, we hold high standards for our fraternity and sorority community, and the AGR house continually meets those standards," Macdonald-Peck said. "The AGR house is active not only in community service, but they work hard to define everything a successful fraternity on campus should be. It's my pleasure to work with them and to share in their success."

Peer expectations within the houses also encourage members to participate in extracurricular engagement and service activities, enhancing students' experiences. But perhaps most important is the fact that students who participate in fraternities and sororities are much more likely to persevere and stay in college through graduation.

Taylor Broyles, from Rapelje, Mont., said AGR will help him pursue his post-college goals.

"For me, I know agriculture is only going to see more and more demand from our global systems and natural resources, and I want to be on the other end providing," said Broyles. "Of course, that prospect is made a whole lot easier when you've got hundreds of friends with the same goals behind your back."

Many of these men leave their homes just before or at harvest to pursue their degree, and they return home during the academic year to help out with harvesting, planting, calving, branding, feeding and fencing. Many of these brothers will be the first to tell you that their work at home reminds them of their parents' toil to even send them to college.

"It's not just the collegiate experience, but the life-long connections made in the house and the values learned there that I'm thankful for," said MSU senior Adam Heggelund from Wisdom, Mont. "It's not something that everyone gets to experience, so I feel pretty lucky."

As MSU's College of Agriculture continues success in teaching, research and outreach, AGR maintains its commitment to mold the agriculture leaders of future generations.

"The times may change, but the core values are always there—work ethic, manners, service, brotherhood and leadership," Knox said. "Those are timeless qualities that every generation of men needs." ■

Microbiology in Science

MSU team determines structure of a molecular machine that targets viral DNA for destruction

by Evelyn Boswell

With a featured publication in the August 7, 2014 issue of *Science*, Montana State University researchers have made a significant contribution to the understanding of a new field of DNA research, with the acronym CRISPR, that holds enormous promise for fighting infectious diseases and genetic disorders.

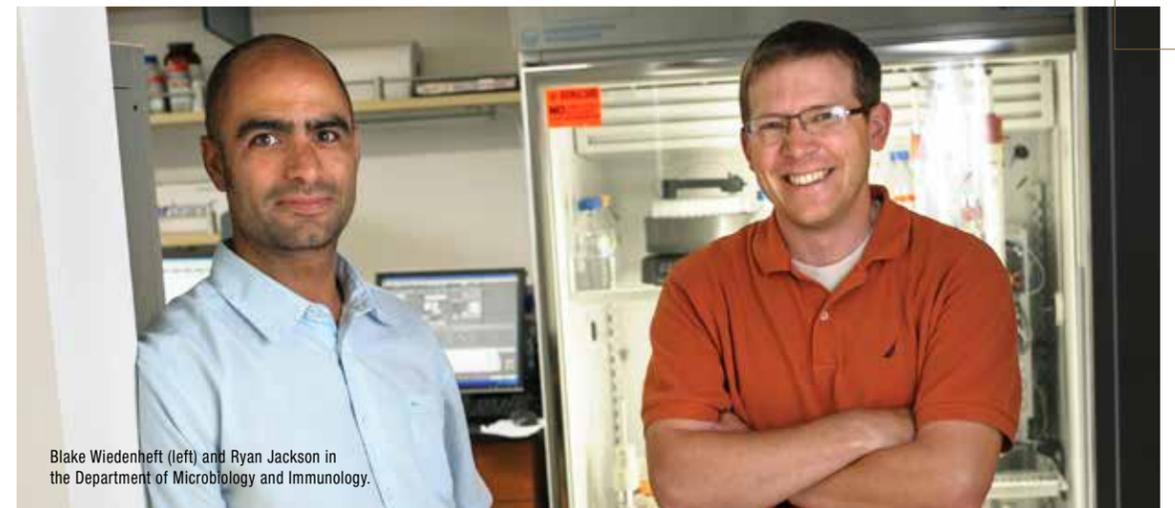
The MSU-led research provides the first detailed blueprint of a multi-subunit "molecular machinery" that bacteria use to detect and destroy invading viruses.

"We generally think of bacteria as making us sick, but rarely do we consider what happens when

the bacteria themselves get sick. Viruses that infect bacteria are the most abundant biological agents on the planet, outnumbering their bacterial hosts 10 to one," said Blake Wiedenheft, senior author of the paper and assistant professor in MSU's Department of Microbiology and Immunology.

"Bacteria have evolved sophisticated immune systems to fend off viruses. We now have a precise molecular blueprint of a surveillance machine that is critical for viral defense," Wiedenheft said.

These immune systems rely on a repetitive piece of



Blake Wiedenheft (left) and Ryan Jackson in the Department of Microbiology and Immunology.

DNA in the bacterial genome called a CRISPR. CRISPR is an acronym that stands for Clustered Regularly Interspaced Short Palindromic Repeats. These repetitive elements maintain a molecular memory of viral infection by inserting short segments of invading viral DNA into the DNA of the "defending" bacteria. This information is then used to guide the bacteria's immune system to destroy the invading viral DNA.

The molecular blueprint of the surveillance complex was determined by a team of scientists in Wiedenheft's lab at MSU using a technique called X-ray crystallography. Ryan Jackson, a postdoctoral fellow in the Wiedenheft lab, collected X-ray diffraction data from synchrotron radiation sources located in Chicago, Berkeley and Stanford.

"Interpreting these X-ray diffraction patterns is a complex mathematical problem and Ryan is one of a few people in the world capable of interpreting these data," Wiedenheft said.

To help determine the structure, Wiedenheft sent Jackson to Duke University for a biannual meeting on X-ray crystallography. At the meeting, Jackson sat between "two of the greatest minds in the field of X-ray crystallography"—Randy Read from the University of Cambridge and Thomas Terwilliger from Los Alamos National Lab—whose expertise facilitated the computational analysis of the data, which was critical for determining the structure.

"The structure of this biological machine is conceptually similar to an engineer's blueprint, and it explains how each of the parts in this complex assemble into a functional complex that efficiently identifies viral DNA when it enters the cell," Wiedenheft said. "This surveillance machine consists of 12 different parts and each part of the machine has a distinct job. If we're missing one part of the machine, it doesn't work."

Understanding how these machines work is leading to unanticipated new innovations in medicine and

biotechnology and agriculture. These CRISPR-associated machines are programmable nucleases (molecular scissors) that are now being exploited for precisely altering the DNA sequence of almost any cell type of interest.

"In nature, these immune systems evolved to protect bacteria from viruses, but we are now repurposing these systems to cut viral DNA out of human cells infected with HIV. You can think of this as a form of DNA surgery. Therapies that were unimaginable may be possible in the future," Wiedenheft said.

"We know the genetic basis for many plant, animal and human diseases, and these CRISPR-associated nucleases are now being used in research settings to surgically remove or repair defective genes," Wiedenheft said. "This technology is revolutionizing how molecular genetics is done, and MSU has a large group of researchers that are at the cutting edge of this technological development."

Wiedenheft, a native of Fort Peck, Mont., was recently recruited by MSU from UC-Berkeley. Wiedenheft explained that the research environment, colleagues and support at MSU is second to none and the opportunity to move back to this great state was a "no-brainer."

In addition to Jackson, Read, Terwilliger and Wiedenheft, MSU co-authors on the *Science* paper are research associate Sarah Golden, graduate student Paul van Erp and undergraduate Joshua Carter. Additional collaborators included co-authors Edze Westra, Stan Brouns and John van der Oost from Wageningen University in the Netherlands. ■

Research in the Wiedenheft lab is supported by the National Institutes of Health, the National Science Foundation EPSCoR, the M.J. Murdock Charitable Trust and the MSU Agricultural Experimental Station. Atomic coordinates for the Cascade structure have been deposited into the public repository (Protein Data Bank) under access code 4TVX.

The Nesting Place

Montana art and agriculture meet

There's a new testament to Montana agriculture sitting on the west lawn of the Animal Bioscience Building.

Bozeman artist and MSU fine arts alum ('08), Jennifer Pulchinski, has sculpted a piece of abstract art that honors the intersection between fine art and Montana agriculture. A recipient of the Percent-for-Art Program, a program organized by the Montana Arts Council to place art in public buildings, Pulchinski was chosen from a national search with 60 applicants, to construct a piece of art for the Animal Bioscience Building.

Constructed solely of reclaimed steel fence posts and barbed-wire, Pulchinski titled her abstract sculpture "The Nesting Place," which is how she describes her undergraduate years in the "nesting" environment of MSU.

Much of the barbed-wire for the sculpture came from a ranch in the Gallatin Valley, owned and operated by the Sherwin Leep family. The Leep family donated barbed wire to Pulchinski, who rolled and collected the wire herself.

"I was amazed how quickly she was able to roll up the miles of barbed wire that we wanted removed," Leep said. "The result is a piece of work that stimulates the imagination. Makes one wonder where the materials have been, and what they have seen over their decades of existence."

Years ago, while helping a friend in the art studio located in the center of the Bozeman Agricultural Research and Teaching Farm, Pulchinski noticed piles of old, rolled-up barbed wire nearby. She decided to reclaim and use barbed wire as a medium for some of her sculptures. Since then, she's been privileging western landscape materials in her work.

"It's not as easy to pin point why I remove old rusty barbed wire and then use it as my sculpting material," she said. "To take this harsh material that has a long history of changing the West and then turning miles of it into a dense, flowing, soft-looking knot that disappears into the sky, just feels like the right thing to do and the right thing to make."

Pulchinski said meeting farmers and ranchers when collecting materials for her art has been one of the highlights of her work.

"I've heard family histories from places I have removed wire from, and met absolutely unforgettable people who tell me how wonderful it is that this material is being reused," she said. "Of course, they're a bit surprised when I tell them I'm reusing their old wire for art, but then they get excited and interested."

Preserving the West's heritage and culture is something



that art has the capacity to do, according to Pulchinski.

"When removing wire, I get to thinking about the people who put that fence up as I am taking it down," she said. "What would have happened to all that material if I didn't reuse it, what happens to all that material I never got my hands on? Most of the time it sits under the grass and slowly rusts away. I like to think I have preserved history in another form and language."

The nature of abstract art also mirrors the intellectual nature of universities.

"Abstract can be hard to wrap our minds around because it forces people to think, and it's unrecognizable because the image has never existed before," Pulchinski adds. "If the image is something that people like or don't like, they should ask themselves why. After all, critical thinking is what learning is all about, and what a great location for the piece to get people thinking outside of their comfort zone."

In 1983, the 48th Montana Legislature enacted a law that capital project appropriations by the legislature

include "an amount not to exceed one percent of the amount appropriated for the use of the Montana Arts Council for the acquisition of art for new state buildings."

The Montana Arts Council has administered the Art-For-Percent program since its inception in 1985, placing

art in more than 18 state buildings. The selection committee for each project is composed of three voting members: the architect who designed the building, a local artist and a representative of the facility. ■

Economics + Engineering

MSU students start classes in new financial engineering program

A group of students at Montana State University are in their first semester of a new financial engineering program that will feature professors from two colleges.

The new program, approved by the Montana Board of Regents last year, will allow MSU undergraduate students to major or minor in financial engineering with a curriculum of courses spanning the Department of Agricultural Economics and Economics in the College of Agriculture and the Department of Mechanical and Industrial Engineering in the College of Engineering.

Financial engineering is a growing field with high demand and the potential for high salaries. Financial engineers commonly work in banking, corporate finance, securities, insurance, manufacturing, agricultural businesses and other industries that require sophisticated financial management skills. They analyze risk, create strategic business opportunities, look for ways to lower costs, and access new markets by combining new and existing financial economic instruments. To remain competitive, regional industries, as well as national and international firms, employ financial engineers because of the increased complexity and sophistication of business risk management.

MSU will be one of the only universities in the West to offer students a degree in this increasingly important discipline, said Wendy Stock, professor and head of the Department of Agricultural Economics and Economics.

"By taking advantage of MSU's strong faculty, this program will give our students the opportunity to study a discipline that will put them on track for challenging and highly rewarding careers," Stock said. "With skills in risk assessment and an understanding of the complex financial instruments that help shape the direction of the global economy, firms the world over have recognized that financial engineers play a pivotal role in their businesses."

The program, which will have a small enrollment and will have existing faculty teaching existing courses, will put students through a rigorous sequence of courses in financial economics, mathematics, and software engineering and modeling.

Myles Watts, MSU professor of economics and head of the program development team, said the program would be one of the most academically challenging on campus, with math requirements stretching beyond the normal engineering curriculum to include more statistics and probability theory. The financial economics component will include a solid background in classical economic theory and markets.

While the program will largely focus on the kind of computer modeling and theory used to predict market behavior and manage risk in the context of the financial sector, Watts said students would also come away with skills applicable to important Montana industries like agriculture, mining and timber. National statistics put average salary range at \$74,000 to \$115,000, according to the website PayScale.

"We feel really good about the launch of this program," Watts said. "We've had calls from as far away as Florida and we've had a lot of interest from students who are already enrolled at MSU."

The program development team, which included faculty members Bill Schell and Durward Sobek in mechanical and industrial engineering, and Greg Gilpin and Joe Atwood in agricultural economics and economics, has experience in the practice of financial engineering. The same is true for many of those who will be teaching and mentoring students within the dual-college program.

"We are very excited about adding financial engineering to the array of disciplines taught within College of Engineering," said David Miller, professor and interim head of the Department of Mechanical and Industrial Engineering. "It is a cutting edge discipline and, like many of the fields we teach, it is one that is seeing increasing demand for graduates with this kind of education. It's great that MSU will be helping meet that demand and offering students such a high-paying career track." ■

For more information on the program, including the curriculum, visit <http://bit.ly/1oKCG3q>

PHOTO BY ALISON GAUTHIER

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Orange Wheat Blossom Midge continued from page 7.

“Many people think that we work in isolation as researchers, but it’s the classic ‘it takes a village’ scenario.”

To further help growers, MSU Extension produced a *MontGuide* on the orange wheat blossom midge, offering critical advice on how to determine the risk. The guide is available as a free download from the MSU Extension Publications website.

MSU experts have advised growers that spraying—which can be a significant cost—can only benefit a crop if the timing is right, both for the growth stage of the wheat, as well as for the development and hatching of adult midges. The wrong timing of pesticide can prove counterproductive by reducing certain populations of wasps, one of which is a biological control that helps keep wheat stem sawfly at bay, and another that attacks the orange wheat blossom midge.

Luther Talbert, professor of plant breeding and genetics specializing in developing Montana spring wheat varieties, represents perhaps the hardest line of defense. Soon after the 2006 outbreak, Talbert looked for a line of wheat that might hold promise against the new pest. He found it in an experimental line developed by North Dakota State University.

He cross bred it with several experimental Montana-adapted spring wheat lines that thrive in the Flathead area and have a resistance to the wheat disease, stripe rust. The result was a highly midge-resistant spring wheat dubbed Egan after Egan’s Slough, the location where the pest was first detected in 2006. The new wheat line will go into the seed production next season, with commercial seed to be available in 2016.

“The gene for resistance didn’t exist in any of the 10,000 wheat lines we were evaluating on our breeding program. However, our colleagues in North Dakota and Manitoba (Canada) had developed the tools we needed to breed the resistance gene into our own varieties,” Talbert said. “From our work, Egan rose to the top due to its resistance to the midge, resistance to stripe rust, and its high grain protein.”

A similar effort is underway to breed varieties for other Montana wheat-growing areas, such as a solid-stemmed variety for the Golden Triangle that is also resistant to another major wheat pest, the wheat-stem sawfly.

“The effort to develop integrated approaches, including developing wheat varieties that can resist pests and disease, gives us an ability to respond relatively efficiently and provide sustainable tools to combat the midge,” Talbert said. ■

MONTANA STATE UNIVERSITY



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AGRICULTURAL EXPERIMENT STATION

Calendar

Be sure to mark your calendars for the College of Agriculture’s annual **Celebrate Agriculture** event, **Nov. 7–8**, where we’ll celebrate the heritage and importance of Montana agriculture.

<http://ag.montana.edu/CelebrateAg>



Keep up with the College of Agriculture on Facebook and Twitter. Search for “College of Agriculture” or “MSU College of Agriculture.”