

SOLUTIONS

CFANS

FALL 2016

Cheers!

How Minnesota brewers
tap into CFANS expertise

ALSO

STAR(RY) TREK

A LOT ON THEIR PLATES

**FORWARD STEPS IN
FOOD SECURITY**



College of Food, Agricultural
and Natural Resource Sciences

UNIVERSITY OF MINNESOTA

SOLUTIONS

Solutions magazine is published twice a year for friends, alumni, faculty, staff and students at the College of Food, Agricultural and Natural Resource Sciences. Like the college, the magazine focuses on how science leads to solutions for today's problems in food and agricultural systems; global climate and environmental change; biodiversity; and bioenergy and bioproducts.

CFANS is composed of six divisions, 13 academic units (two are held jointly), 10 research and outreach centers throughout Minnesota, the Bell Museum + Planetarium and the Minnesota Landscape Arboretum. The college also participates in many interdisciplinary centers and cooperatives.

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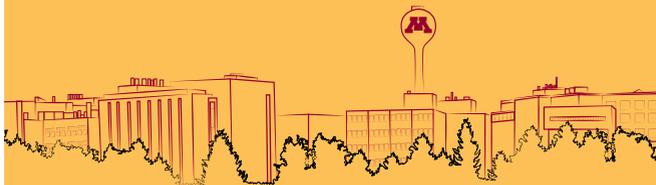
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Cheers!

by Becky Beyers

Craft beer makers tap CFANS expertise to keep the brewing industry hopping

Next time you hoist a locally made craft beer, consider making a toast to CFANS, for without the college's research and outreach efforts, you might be drinking a less flavorful, mass-produced beverage.

Why? Consider this: The past decade's boom in craft brewing has intensified the efforts of scientists across the college who collaborate on research about two of the major beer ingredients, barley and hops. Many people in the beer-brewing community credit Charlie Rohwer, plant scientist at the Southern Research and Outreach Center, with helping hops grow from a hobby to an industry in Minnesota. And several of the fledgling local industry's most ardent advocates have close ties to the college, including alumni Eric Sannerud and Benjamin Boo, co-owners of Mighty Axe Hops. They recently announced plans for an 80-acre expansion, creating by far the largest hops grower in the state.

Healthy Hops

The number of hops growers in Minnesota has more than doubled in the past four years, says Angela Orshinsky, assistant professor in the Department of Plant Pathology, who works closely with growers statewide. Because craft brewers use more hops than mass-market beers—and because of consumers' interest in locally grown food and drink—demand for Minnesota-grown hops is high.

"Until recently, part of the reason hops weren't grown in the Midwest was downy mildew," she says. "Most hops are grown in the Pacific Northwest, where the environment is much less conducive to downy mildew. Here, disease-conducive environmental conditions last through the whole growing season."





(Below left) Angela Orshinsky and colleagues are exploring how hops might be grown in high tunnels. (Above and below) Charlie Rohwer leads hops research at the Southern and Rosemount research and outreach centers.

It's very aggressive and destructive." New mildew-tolerant varieties from established hop-growing regions have helped solve some of that problem, along with better understanding of how to keep plants healthy.

For Orshinsky and her colleagues, fine-tuning hops growing techniques and then sharing that knowledge with local growers is essential. A half-dozen CFANS scientists belong to a USDA-funded network of researchers, the Great Lakes Hops Working Group, studying hops-growing from the Dakotas to Vermont with specialties that include plant-breeding, pest prevention and best growing practices. Disease prevention is key. "A lot of growers are new to this and don't know how to apply fungicides legally and appropriately.

People don't always realize that's what they need to do. Developing solid recommendations takes a minimum of three years," she says. "It's very climate-specific," with tests taking place at the college's Research and Outreach Centers across the state, to see how different growing conditions affect hops plants.

"A century ago, downy mildew wiped out the hops growing in the Midwest and eastern United States, shifting production to the Pacific Northwest, where established breeding programs developed a handful of tolerant varieties that can be grown here," Orshinsky says. Powdery mildew is also a major threat to hop production. "Here in the Midwestern states, both mating types of the powdery mildew fungus exist. However, the Pacific Northwest region only has one mating type. There is a concern that some hop enthusiasts may send hop plant material to the Pacific Northwest region despite a quarantine order," she says. "The introduction of the second mating type to the Pacific Northwest could pose serious management challenges for hop growers in a region where 30 percent of the world's hops are grown."

Despite the national boom in hop farming and craft beer brewing, funding for research that will help the industry thrive has been hard to find, because hops are considered a specialty crop. Orshinsky and her colleagues in CFANS collaborate on research across a wide range of disciplines, which she says is unusual for similar institutions. "We're all working toward the same goal, which puts us in a unique and beneficial situation."



Better Barley

Historically, the barley breeding program in CFANS partnered with the malting industries and large breweries, says Kevin Smith, professor in the Department of Agronomy and Plant Genetics. A few years ago, “we saw what was happening and shifted our research toward development of two-row barley varieties, which are more popular with small brewers.”

Barley becomes an ingredient in beer when harvested grains are soaked in water until they start to germinate, then dried to stop the germination process, a process known as malting. The dried grains—malt—provide the sugars needed for fermentation.

Traditionally, barley research in CFANS had focused on six-row varieties (the number refers to how kernels of grain are arranged on each node of the stalk) because they tend to have higher enzyme activity and thrive in this climate. Large American breweries have used six-row barley in beer for decades, but that’s changing, Smith says.

Craft brewers generally prefer two-row barley because in part its larger kernels yield more malt extract, and ultimately more beer from the same grain. The higher enzyme levels in six-row barley are important for brewers that use adjuncts like rice or corn. Craft brewers prefer to do “all-malt” brewing which doesn’t require additional enzymes to convert the adjunct starch into sugars. Recently, the two major beer trade associations—the American Malting Barley Association and the

Brewers Association—developed new guidelines for breeding barley that addresses all-malt brewer needs, which is important for Smith and his colleagues to direct their research.

The goal is to create varieties that are agronomically productive, Smith says. Historically two-row barley has been susceptible to leaf diseases, which is one reason barley is no longer a major crop in Minnesota. Other crops became more profitable, which drove down barley production, but now the craft brewing renaissance has again created a market for locally grown barley.

With new funding from the Minnesota Department of Agriculture, Minnesota-based Rahr Malting Co. will expand its malt evaluation capacity and provide important data back to CFANS researchers. “That will expand our ability to measure things that brewers are interested in,” Smith says, and help better tailor new barley varieties to brewers’ specifications.

“One big challenge is to connect the scale of a breeding program that produces thousands of small grain samples, to the commercial scale that needs large samples of only a handful of new lines to test,” he says. “We are excited to meet this challenge and work with our local brewers to put beer made from locally produced barley in their growlers.”

The whole process takes time. Smith’s lab has two-row barley varieties in development but they won’t be ready for testing for another two years or so—which should be about the same



Barley breeder Kevin Smith is shifting his team's research toward two-row barley, which is preferred by craft brewers.

time the small-scale malting equipment might be ready too.

Smith’s program is one of only a handful of barley research efforts at U.S. universities. He and his students are tapping into reams of data mined during the 10 years of the Barley CAP research, a U.S. Department of Agriculture multi-state effort aimed at making barley a more viable crop.

In addition, “we probably have more barley scientists here at the U than anywhere in the world,” including the plant pathology department and U.S. Department of Agriculture’s Cereal Disease Lab on campus. “We are well positioned to conduct the research that will support Minnesota grown barley and welcome conversations with our local stakeholders to help make that happen.” ●



Connecting the Dots

Entomologist Chris Philips explores how ecosystems interact

To Chris Philips, there's almost never just one right answer.

The assistant professor of entomology, who is based at the North Central Research and Outreach Center in Grand Rapids, approaches his research and teaching with a philosophy that emphasizes the connections between seemingly different ways of addressing a challenge.

"We talk about management of any system—weeds, insects, disease—as separate. I'm trying to put those pieces together and explore how they interact, how a management approach affects outcomes across habitats," he says.

His work ranges across a variety of topics, but focuses on evaluating the impact of management practices on insect behavior and ecology and understanding how these changes impact ecosystem functioning, and ecological processes in a diversity of cropping systems including high tunnels. In fact, he is leading a project team working on diversification of crops grown in high-tunnel systems.

"When I first got here, I would ask people what they grow in their high tunnels and it was 'tomatoes, tomatoes, tomatoes,' because that's the most profitable crop for growers," he says. But growing tomatoes over and over in the same environment can lead to disease and other problems, so researchers are testing whether the season-extending tunnels might be able to produce two harvests of different crops in a season.

"Maybe you start one crop earlier and run another one later," he says, so even though the crop isn't as profitable as tomatoes the grower can sell twice as much. But because insects show up at roughly the same time each year, Philips is investigating how



Chris Philips is one of only two instructors in CFANS who teaches classes remotely from a Research and Outreach Center.

shifting the growing season will affect the insects. Will they evade predators? Will they attack different plants? How could pest management be altered to coincide with the new plant-production schedule?

That multi-faceted problem solving approach also drives the syllabus in the online course he teaches for CFANS students, "Agroecology and Insect Pests." He's one of only two instructors in CFANS who teach online courses from the off-campus research and outreach centers. "It's a challenge," he says. "The perfect online course doesn't exist. But I have learned that when it's more conceptual (rather than routine online discussions and quizzes) it works better, and the students pay attention.

"I stress to them that we have to move away from the idea that there's one answer. That's not the way it works. You have to move away and think through the process." Eventually he'd like to create an online

course that uses individualized simulation activities, along the lines of a video-game environment. "They'd have to solve real-world problems, with individual challenges that would force them to figure out how to solve those problems collaboratively and innovatively."

He was always fascinated by nature, "but I didn't know it was a career path. Like most people, I thought that the only good insect was a dead one." As an undergraduate, he attended a seminar about birds and the links between trophic systems—organisms' place in the food chain—and found his niche.

He believes that broader perspective will help solve both big and small challenges. "Ultimately it's about how to optimize management, not just for pests, but all over the landscape," he says. "It's on us to figure that out."

—Becky Beyers



STAR(RY)

An unknown species showed

It started with a routine scoop of water and lake weeds.

A year later, the starry stonewort in the net that day on Lake Koronis has made waves across not just Minnesota's lakes and ponds, but through the network of scientists and advocates who deal with non-native and invasive aquatic species.

Scientists at the Minnesota Department of Natural Resources had gotten a routine call from homeowners along the Paynesville, Minn., lake, asking for help removing large patches of plants that were impeding boats and swimmers. A crew member that day noticed the plant looked odd and sent photos to a plant ecologist at the agency. She, in turn, passed it along to a colleague in New York, who confirmed the diagnosis.

The plant was starry stonewort, a grassy algae that forms dense mats in lakes. Until last summer, it hadn't been seen in Minnesota and researchers had no reason to expect it would arrive so soon. But it had leapfrogged many miles, likely by hitching a ride on a boat or trailer from an infested lake somewhere far to the east and south of Lake Koronis, which is in west-central Minnesota. The network of researchers and public officials who work to control and manage invasive species in the state's waters were facing a new and unexpected challenge.



TREK

Written by
**BECKY
BEYERS**

up where none had been before, and researchers sprang into action

What it is

Starry stonewort looks similar to other native charophyte (green algae) species found in Minnesota lakes, says Dan Larkin, assistant professor in the Department of Fisheries, Wildlife and Conservation Biology, but it has distinctive small star-shaped bulbils, about the size of a lentil, from which the grassy part of the plant sprouts.

“There’s very little research on this species as an invasive,” says Larkin, who was hired last summer—shortly before the Lake Koronis discovery—as a Minnesota Aquatic Invasive Species Research Center (MAISRC) faculty member. Starry stonewort was first found in the United States in 1978 in New York and gradually has spread to the Midwest.

Hundreds of papers have written about it as a model species in cell biology research—it’s native to and endangered in Japan, on conservation watch in Britain—but little research has been done about it as an invader, Larkin says. “It

is largely a rare species in its native range. But it often happens that a species will behave differently when it arrives in a new place.”

There are many anecdotal accounts about how this species invades, but little data to draw upon, he says. “There is very high uncertainty. Will it spread to new lakes in Minnesota? What will its impacts be?” In Michigan, starry stonewort has been found in over 120 lakes and there are reports of it spreading quickly in some locations. In Minnesota, the state’s second infestation was reported just a few weeks ago, in a lake near Bemidji.

“We didn’t expect the first place it would be found here is Lake Koronis,” says Chip Welling, who coordinates aquatic invasive species work for the DNR. “But boaters can drive, and they can bring it along. The worst-case scenario is that a non-native species fragment survives the trip” and shows up in a lake far from previous infestations, as it did in Lake Koronis. “But right now, we have more questions than answers,” he says.

Even less clear is how the invader affects aquatic animals and whether it’s taking up space that otherwise would be occupied by native plants.



Carli Wagner is pursuing a fisheries and wildlife major and is a UROP student on the project.

Timing is everything

While starry stonewort was only discovered in a Minnesota lake last summer, it might not be a new arrival. "Nobody knows how long it's been there—it could be that it's been there for years and finally got to the point where it was noticeable, or it could be that it was recently introduced and spreads very fast," Larkin says.



Dan Larkin arrived in Minnesota just in time for the first appearance here of starry stonewort.

Larkin's arrival to MAISRC was in some ways perfect timing. "It wasn't something I had worked with before, but out of necessity became familiar with it quickly," he says. "There's a window of opportunity to respond to a new invasion." That's where research comes in.

This summer, researchers are exploring several questions:

- Where starry stonewort might go next.

Post-doctoral researcher Luis Escobar, who specializes in ecological niche modeling, used global occurrence and climate data to predict areas of the U.S. that may be vulnerable to starry stonewort invasion. The next step will be to take a finer-grained look at characteristics of lakes where starry stonewort has persisted—water chemistry and nutrient availability, for example—to predict which lakes in Minnesota and elsewhere could be vulnerable to invasion.

- How it grows and spreads.

Undergraduate student Carli Wagner will be collecting plants, establishing cultures and doing controlled experiments in the new MAISRC lab, which has plant growth facilities for this kind of work. One question is to see how long starry stonewort can stay alive out

of water, Larkin says. Can it stay alive on a boat for an hour, a day, or a week and survive to produce new plants if returned to water? "That will increase our understanding of the risk of spread by boats and other activity," Larkin says.

- How to control it.

Killing off starry stonewort using herbicides or mechanical removal is difficult, because small fragments can give rise to new plants. Even if 90 percent of the plant dies, the rest of it can regrow. "And we don't know how sensitive the bulbils are to control efforts," Larkin says. "Even if you got the plants out, would bulbils left in the sediment sprout new plants?" Experiments in the MAISRC lab will be used to test the efficacy of different algaecides for starry stonewort control—and the potential for non-target impacts to native species.

Two citizen science efforts are also in development to help address future invasions and management: the "Aquatic Invasive Species Detectors" program will train volunteers to identify and report new invasive species occurrences in state waters, and the "Aquatic Invasive Species Trackers" program will engage citizen scientists in monitoring the outcomes of management efforts.

"We have large gaps in scientific information about this plant," Larkin says. A gathering of an international group of starry stonewort experts on campus in June was aimed at synthesizing what is known about the ecology and effects of this species and identifying key research needs to support management responses.

For the DNR, which is responsible for preserving Minnesota's natural resources, the establishment

of MAISRC has been "invaluable," Welling says. When invaders show up, property owners and lake associations sometimes hear about untried approaches, "and they may be oversold, or incompletely represented in terms of the effects on plants and water. Having a third-party is important to our understanding of these situations and possible research solutions."

Long-term answers

Starry stonewort's arrival in Minnesota is following a pattern common to non-native species, Larkin says. "Invasions take time," and often follow a long pattern of dormancy before population increases.

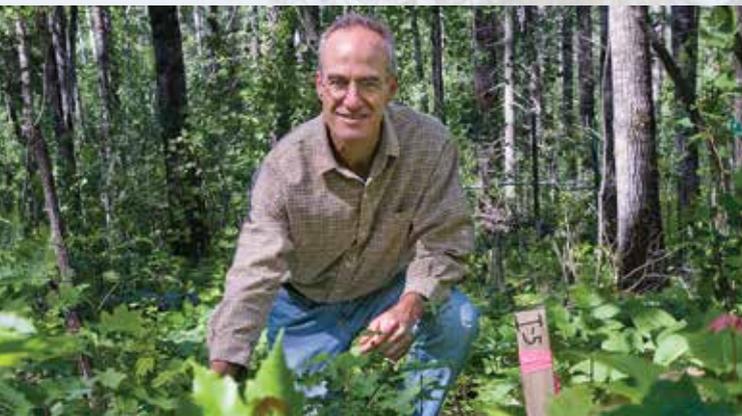
This "lag phase" can take 50 years or more. "We tend to focus on the outcomes, versus the process of what happens with an invasive species, but to get from A to B can take decades," he says. "What that means is early on we have a lot of uncertainty where we don't know what the arrival of this species means. Sometimes a non-native arrives and does not cause harm, but when species are invasive and do cause harm to ecosystems or human uses, that's bad.

"At different stages in the process, there are different needs and priorities; for example, curly-leaf pondweed is long established in Minnesota and here to stay, so the goal there is managing nuisance growth. But in the early stages, like this, the goal is to prevent further spread and potential impacts."

With starry stonewort, "we have the opportunity at this stage to limit damage." ●

Kevin Farnum is with the Koronis Lake Association and the Minnesota Coalition of Lake Associations and volunteers his time to help the research.





How size and lifestyle rule the plant world

Department of Forest Resources professor Peter Reich, along with numerous colleagues around the world, has found what scientists have long suspected: that despite Earth's rich diversity of plant life, only relatively few combinations of traits are successful.

Drawing on a data set of 46,085 plant species, the researchers gave each an identity based on its scheme for growing, surviving and reproducing. Describing plants this way gives scientists a way to predict how different vegetation will respond to climate change, most crucially by the amount of carbon it can scrub from the atmosphere.

"This paper tells you about constraints on evolution," says Reich, a Regents Professor. "We need better models to understand and predict how vegetation globally will change with climate change. To do that, knowing more about the small number of ways plants vary can help us build more predictive models."

The study appeared earlier this year in the journal *Nature*.

Tortoises and hares

The researchers studied vascular plants—the ones that circulate water and nutrients via xylem and phloem—to see how they varied in terms of six traits:

- adult plant height
- stem density
- leaf area
- leaf density
- nitrogen density in leaves
- mass of seeds or spores

They found that most combinations—like a tiny plant with huge seeds—don't exist, and only a few avenues to success are available. In fact, 78 percent of the variation in plant traits occurred along just two continuums: 1. size and 2. economic strategy, i.e., from the conservative "tortoise" strategy of growing and reproducing slowly to the risky "hare" strategy of living and dispersing offspring rapidly.

"A plant with the hare strategy has traits consistent with putting its energy into growing, but it's more likely to die soon," says Reich. "These plants tend to be fragile and produce many small seeds. Tortoises are long-lived, as are their leaves, and they grow relatively more slowly but are durable in the face of heat, fire, drought, insects, and so on."

Dandelions and aspen both grow fast and count as hares, while classic tortoises include redwoods and coconut palms. Hares and tortoises are both found along the size continuum from tiny to gigantic.

Plants, says Reich, are like businesses, where one can invest a lot in photosynthesis, grow fast, and make a fast profit. But if the return on investment is low, then conserving re-sources and making deposits into accounts less often is the smart strategy.

"The hare's 'live fast' strategy is best in conditions of high water, light, and nutrients," Reich explains. "It's like renting an expensive space for a store in a high traffic volume—you better sell a lot of goods to make up for the high costs."

"But tortoises are favored in hostile environments where it's cold, dry, salty, etc. Because survival is key, those plants won't do a lot of photosynthesis on any given day, and seeds are produced slowly."

A new language

The research creates a common language, based on plant traits, to understand and model how different environments or biomes will change along with climate. Future models will take data on plants' chemistry and size and, knowing daily conditions such as water and sunlight availability, simulate how much carbon is scrubbed out of the atmosphere that day.

"Knowing something is a shrub or tree doesn't tell you how it'll respond to drought, fire, etc., but these traits do, especially the combination of size and position on the hare/tortoise continuum," says Reich. "This helps us have a more informed framework to predict how our vegetation will be altered by climate change."

—Deane Morrison

A longer version of this story appeared on Inquiry, the Office of the Vice President for Research blog.

Chipping In for Clean Water

Biofilters help improve water quality, but how could they work more efficiently?

Farmers across the Midwest have installed bioreactors to help stop nutrients in agricultural runoff from washing into nearby lakes, rivers and streams. By filtering drainage water through a trench filled with woodchips or a similar material, these systems take advantage of naturally occurring microbes to break down nitrogen compounds and improve regional water quality.

There's just one problem with this low-cost, easy-to-maintain technology: It isn't very efficient, and scientists do not understand it well enough to improve it.

A team of researchers is now studying the microbial mechanisms behind bioreactors to discover how to make them more efficient at removing nitrogen and phosphorus from agricultural runoff. Led by Carl Rosen, head of the Department of Soil, Water, and Climate, the team has constructed a 360-foot-long, field-scale bioreactor in Willmar, Minn., to measure the way different variables affect

the system's efficiency. The project's initial funding came from the MnDRIVE Advancing Industry, Conserving Our Environment research area, with additional support from Discovery Farms Minnesota.

While a promising technology, current bioreactors only remove about one-third of nitrates from the water, according to a 2012 study of woodchip bioreactors conducted by researchers at Iowa State University, Kansas State University and the Iowa Soybean Association. Low temperatures tend to curb the systems' efficiency and heavy rainfall can overload them, causing excess water to skip the bioreactor. Rosen's team is exploring how to work against these pitfalls to not only remove more nitrates, but to reduce phosphorus as well. Their strategies include supplementing bioreactors with specific types of microbes, as well as adding different food sources to fuel the microbes' ability to efficiently remove nitrogen.

"We are trying to speed up the removal rates so that the process becomes more efficient," said Gary Feyereisen (M.S.—'01; Ph.D.—'05, biosystems and agricultural engineering), an adjunct professor and agricultural engineer with the USDA-Agricultural Research Service. "If we can increase the rate water flows through the bioreactor while maintaining efficiency, less water will bypass the system and more contaminants will be removed."

So far, the researchers have constructed the bioreactor and divided it into eight compartments with equal water flow. The next step is to introduce different conditions to each compartment—such as different types of microbes or a new carbon source to feed the microbes—to measure how well it removes nitrogen from the water. Researchers will use genome sequencing methods to identify the bacteria that are best suited to remove nitrate and phosphorus in



low-oxygen environments, as they believe these types will break down water contaminants more easily.

The team is seeking additional funding to support technicians who can log data at each compartment, along with water samplers who can support analyses for contaminants in the water leaving the bioreactor. They also will draw woodchip samples from each compartment to see whether microbe populations flourish or falter through changing temperatures, different concentrations of nitrates and other conditions.

“This is one of the world’s only field-scale bioreactors of its kind,” said Michael Sadowsky, professor and director of the BioTechnology Institute. “We are using it as the basis for experiments that will help us optimize performance of these systems as a whole.”

The bioreactor is a platform technology, meaning that it can be used for many different applications. Beyond the scope of agricultural runoff, researchers believe the technology could remove contaminants like sulfur from water used in other operations, such as mining and aquaculture.

Moving forward, the researchers hope to partner with their counterparts in MnDRIVE’s Robotics, Sensors and Advanced Manufacturing research area to integrate sensors that can detect the concentration of nitrates and phosphorus in the water exiting the reactor. Such sensors could make the system easier to use and may even allow an operator to control it remotely through a smartphone app.

“I view this technology in the future as being fully automated,” Sadowsky said. “We really want to make it have minimal requirements for the farmer.”

—Kevin Coss

This story originally appeared in Inquiry, a publication of the U’s Office of the Vice President for Research.

Previous page and top: The team demonstrated how biofilters work to farmers and community members. Middle: Ehsan Ghane, Post-Doctoral Associate Soil, Water, and Climate; Michael Sadowsky, Director, BioTechnology Institute; and Satoshi Ishii, Assistant Professor, Soil, Water, and Climate are part of the team.

Bottom: Gary Feyereisen, an adjunct professor and agricultural engineer with the USDA-Agricultural Research Service, works with Sadowsky.



Everything's Coming Up Orchids

Project aims to catalog and conserve Minnesota's native orchid species

As the curator of endangered plants at the Minnesota Landscape Arboretum, David Remucal is used to dealing with rare native plants. But his newest project has him working with one of the most popular and widely known species in the world—orchids.

Thanks to a new research grant from the Environmental and Natural Resources Trust Fund (ENRTF), for the next two years Remucal will be out collecting seeds from Minnesota's wild orchid populations to create a conservation bank of native orchid species and then attempting to propagate them back at the Arboretum.

While orchids have long been a favorite of floral enthusiasts, few realize how many orchids exist and how many of them can be found in Minnesota.

"Of the roughly 200 species of orchid in the continental United States, Minnesota alone has 48 or 49 native species," explains Remucal.

One may no longer exist in the state as it has not been seen for several years.

Significantly, wild orchids grow in all the state's native biomes, but each species has its own requirements. While some are common and easy to find, others may only grow for a short period in specific conditions and others may be difficult to distinguish from their surrounding plants.

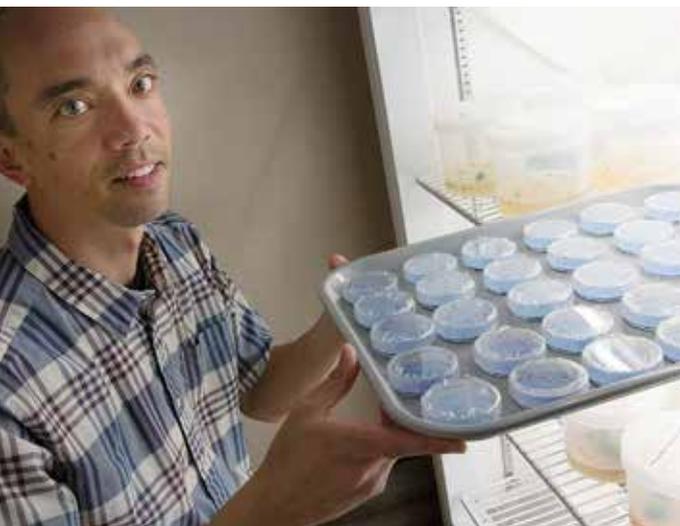
"Twenty percent of Minnesota's native orchids are on the rare or endangered list," says Remucal. "But even those that aren't considered endangered can be hard to locate as they are not a dominant species in the state."

The unique combination of their rareness, mixed with their popularity, makes them an ideal project for Remucal, who joined the Arboretum about three years ago. While long-term the main goal of the project is conservation, he hopes this research will

lead to increased permanent native orchid installations on the Arboretum grounds and in its conservatory for the public to enjoy and learn about these beautiful and native flowers.

The project has three key components: seed banking, propagation and education. During this initial three-year phase of the project, Remucal is focusing on banking and successfully propagating and cultivating a minimum of 15 selected species. Results from the first year are promising, as seeds from 24 species were collected and banked for further research. Additionally, early success in propagating a few species from seed has Remucal cautiously optimistic about meeting his goals by the June 2018 deadline.

"While tracking some of these species down can be a challenge in and of itself, the propagation is especially challenging," explains Remucal. "Each species is unique



Left and center: At the Arboretum, Remucal and his team have had initial success in propagating a couple of species from seed including *Cypripedium reginae* (showy lady's slipper), *Calopogon tuberosus* (grass pink), *Platanthera obtusata* ssp. *obtusata* (bluntleaved rein-orchid), *Goodyera repens* (lesser rattlesnake plantain), and several others.

and we need to develop an understanding of how best to grow each of them individually.”

In time, Remucal hopes to refine their successful techniques to use on additional species and, ultimately, to increase survivability and decrease germination times. Notably, more information is also needed on the long-term effects of banking orchid seeds. New freezers at the Arboretum are assisting with this process but little data exists on how long orchid seeds can be stored and remain viable.

Getting the project off the ground will help bring public awareness to long-term conservation efforts at the arboretum, and to the importance of ensuring future generations of Minnesotans can enjoy the plants.

—Michelle Gustafson



*Right: This tiny, green orchid called *Malaxis unifolia* (green adder's mouth) is among Remucal's favorite finds to date. Its size and color can make it difficult to notice among the moss and foliage of its native forest habitat.*

*Minnesota's state flower, the showy lady's slipper (*Cypripedium reginae*) has been protected by state law from picking and uprooting since 1925.*



Tate Award recognizes advising excellence

Eric Watkins, associate professor in the Department of Horticultural Science, is one of four people honored in 2015-16 with the John Tate Award for Excellence in Undergraduate Advising. The award recognizes high-quality advising at the University of Minnesota. It calls attention to the contributions academic advising and career services make in helping students formulate and achieve intellectual, career, and personal goals.



Photos by Scott Beyers

Minnesota's food history takes flight



A familiar figure to Solutions readers is on display at the Minneapolis-St. Paul International Airport through Nov. 15. "The Art of Food: A History of Minnesota Food Production" is a fun, fact-filled look at how Minnesota cultivated an important role in global food production. The exhibit opened in April and includes a statue of Norman Borlaug, as well as historical photos and information about the University of Minnesota's role in the state's food industry. The display is open to the public in the Thomson Reuters Concourse C Art Gallery, near Gate C12.

OVER HEARD

"People have mixed feelings about the crows," Menken says. "I personally think they're really cool. They're very, very smart, and do learn how to interact with people and what we leave behind."

—The Bell Museum's **Jennifer Menken**, talking about Minneapolis's thriving crow population.

"When the professors themselves are disagreeing over the answer to a question like that, imagine how the students are approaching this and what they're thinking. That's the fun of a class like this is that we cannot tell students the answer but rather allow them to discover it for themselves."

—**Jason Hill**, Bioproducts and Biosystems Engineering, interviewed for a Minnesota Public Radio story about the U's grand challenge classes this semester.

"Who doesn't love a good bear story?"

—**Mark Dittmer**, Conservation Science researcher, talking about all the media attention he received last year for a study showing bears' heart rates increase in the presence of drones. A new study this summer is expected to yield more details.

Siehl Prize for Excellence in Agriculture laureates honored

An internationally renowned bee expert, the former leader of one of Minnesota's most diversified dairy companies and an innovative leader in pork production are this year's recipients of the prestigious Siehl Prize for Excellence in Agriculture. The prizes were awarded on May 26 at McNamara Alumni Center.

The prize is awarded annually by CFANS. Recipients are chosen in three categories: knowledge (teaching, research and outreach); agribusiness; and production agriculture. This year's winners, pictured here from left to right, are:



Marla Spivak (knowledge):

Her tireless advocacy for bees and what they do for the world's food supply has made her a well-known speaker, but at its core her work is about understanding how bees behave, breeding new lines of disease resistant bees and finding the causes behind Colony Collapse Disorder and other threats to bees. She's been a U of M faculty member since 1992 and thanks to her leadership a new bee and pollinator research center will open on the U's St. Paul campus later this year.

Mark Davis (agribusiness):

The former chairman and CEO of Davisco Foods International started as a milk truck driver for his family's creamery and eventually led the company's expansion into a multinational agribusiness. Davisco is known for its innovations in the dairy industry, including new products and markets as well as a state-of-the-art dairy educational partnership with the U of M's College of Veterinary Medicine at its farms near New Sweden, Minn.

Don Buhl (production agriculture):

The Tyler, Minn., pork producer has been a leader in state and national pork organizations over the past three decades, helping to develop programs for people new to the industry and to expand U.S. pork exports. He began farming in 1976 and has grown operations significantly since then. He was a founding member of the "Pipestone System," a production model aimed at allowing independent family farms to remain competitive through shared ownership and increased efficiencies.

Symposium highlights solutions in global food safety security

A day-long event this fall will highlight how CFANS is working to address the challenges of a growing world population and ever-increasing food needs. "9 Billion and Counting: Solutions for Abolishing Hunger" will include discussions with global food experts including a keynote address by 2016 World Food Prize Laureate Jan Low from the International Potato Center. Additional presenters will include food industry leaders and University of Minnesota food and agricultural scientists. Following the symposium, the new campus Eldon Siehl Garden and Plaza, which honors winners of the Siehl Prize for Excellence in Agriculture and features a bronze statue of Borlaug, will be unveiled. The events take place from 9 a.m. to 3:30 p.m. on Monday, Oct. 17 on the St. Paul campus. For details, visit z.umn.edu/9billion.

9 BILLION AND COUNTING

www.cfans.umn.edu

SAVE THE DATE!

SEPTEMBER 15

Community Open House

Southern Research and Outreach Center, Waseca

OCTOBER 14 - 16

1970s Forestry Reunion

Green Hall, St. Paul Campus and Cloquet Forestry Center, Cloquet

OCTOBER 15

University of Minnesota Alumni Day of Service

Various locations

OCTOBER 17

9 Billion and Counting: Extending the Vision of Norman Borlaug

St. Paul campus

OCTOBER 21

University of Minnesota Homecoming, featuring Beer and Brats at the Bell Museum and the U's Homecoming Parade

Bell Museum of Natural History, Minneapolis

More at www.cfans.umn.edu/outreach/events

BY THE NUMBERS

CFANS Undergrads Class of 2016

9

Graduates named Matthew, the most popular name for men

20

Graduates named Kate, Katelyn, Katherine, Kaitlyn, Caitlin or Katie, the most popular name for women

10

People named Alec, Alex, Alexander or Alexandra

Graduates with the surname Pederson or Peterson, tied for most common with Lee or Li

7

48

Number of graduates who earned 'with distinction' or 'with high distinction' honors

16

Majors represented in this year's graduating class

120

Animal Science graduates, the largest number of any major



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Find the survey at z.umn.edu/solutionssurvey

Thank you!

Interim department heads named in Food Science and Nutrition, Forest Resources

Two longtime faculty members have taken on interim department head roles this summer. Dan Gallaher will lead the Department of Food Science and Nutrition while a search is under way to replace Francisco Diez-Gonzalez, who left the university in late June. Mike Kilgore is leading the Department of Forest Resources after Alan Ek, who had headed the department since 1983, stepped down in June.



IN MEMORIAM

Jason Beddow, assistant professor in the Department of Applied Economics, passed away suddenly on April 14. He joined the faculty in 2013 after completing his Ph.D. at the U of M and did his post-doctoral work in the InSTEPP and Harvest Choice initiatives in CFANS. He was one of a dozen early-career faculty featured in the "The Future is Now" winter edition of Solutions magazine and one of the first MnDRIVE Fellows, selected to be a key leader in discovering new paths to solving the problems of food insecurity. A memorial fund has been created in his name; contributions may be made out to University of Minnesota and mailed to Jason Beddow Memorial Fund #21442, University of MN Foundation, P.O. Box 860266, Minneapolis, MN 55438

Bell Museum + Planetarium hires new director; construction is under way



A veteran university-based museum and planetarium administrator will become executive director of the Bell Museum + Planetarium this fall. Denise Young, director of education and planning for the Morehead Planetarium and Science Center at the University of

North Carolina at Chapel Hill, will assume her new role at the Bell on September 12. She will oversee programs, research and facilities at a crucial time in the Bell Museum's 144-year history, as it prepares to move to a new, state-of-the-art facility with improved exhibits space, a versatile 120-seat planetarium/digital theater and expanded educational areas on the university's St. Paul campus. The new building, now under construction will open in 2018. You can see live construction updates at z.umn.edu/newbellcam.

New state funding will boost agricultural productivity research, teaching and Extension

A nearly \$5 million state investment in agricultural productivity at the University of Minnesota will be used this year to hire scientists and improve infrastructure across seven areas of collaboration across CFANS and its partner colleges.

The plan covers the first years of a multi-year investment known as the Agricultural Research, Education, Extension and Technology Transfer Program (AGREETT). The program was established by the state legislature in its 2015 session and funding was established with the Minnesota Department of Agriculture to support the program.

Under the plan, new faculty, technicians and graduate students will be hired to work in these seven key areas: crop and livestock productivity; microbial science; advancing soil fertility and water quality; agricultural technology and decision-making; nutrient recycling and management; agro-ecological innovation; and technologies aimed at managing pest resistance and climate change.

In each area, hires will be complementary; for example, a new CFANS research and teaching faculty member specializing in manure management and water quality will collaborate with a new Extension Educator in those areas.

"AGREETT allows us to efficiently achieve long-term agricultural productivity increases," said Brian Buhr, CFANS dean. "This investment by the state will help producers and the food and ag industries across every platform take advantage of the technological changes that are transforming agriculture. And at the same time, it helps us train the workforce of the future, which is a crucial need for the industry."



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PLATES

A Lot on their

by
Sara Specht

Interns learn about more than just food through unique immersive program

“All foods fit.”

It’s a mantra Carrie Peterson repeats describing the dietetic internship she directs for the Department of Food Science and Nutrition. It’s not something you might expect to hear from a dietitian, and it’s not what nutrition students learn in class. But the lesson that all foods fit is especially important for her interns as they learn to counsel and treat people who suffer from eating disorders.

The eating disorder-track Dietetic Internship (DI-TEP) partners with The Emily Program, a nationally

recognized eating disorder treatment program based in St. Paul. The competitive 36-week DI-TEP internship is the only one in the United States with an eating disorder focus, including nine weeks of immersive training at The Emily Program along with standard clinical training. Other internships might include a day or even a week of eating disorder education, but Peterson says her program’s level of training is invaluable.

“It’s important because eating disorders aren’t going away,” Peterson says. “There are many adults, and

children as young as six or seven, who develop eating disorders. As a society, we need to address how to help these people. Dietitians are an integral part of the healing and recovery process.”

An estimated 20 million women and 10 million men in the country suffer from eating disorders. Up to 60 percent of elementary school girls surveyed in the U.S. admit to being concerned about their weight, and anorexia continues to have the highest mortality rate of any psychiatric disorder. Jillian Lampert, the chief strategy officer at The Emily Program, manages



a national organization of residential eating disorder facilities, which offer only about 1,200 beds for treatment nationwide.

“There are probably 200 eating disorder programs around the country that hire dietitians, and they all want ones who are trained in eating disorder treatment,” says Lampert. At The Emily Program, “we end up training the majority of our new hires ourselves because there’s just not an easy way to get trained dietitians—after six weeks people are maybe ready to start working.”

Peterson says she had more than 150 applicants for the DI-TEP track internship this year, though she only had room to admit 14.

“There are over 100 medical nutrition therapy focused internships, including our other internship track here at the university,” she says proudly. “And there’s over 100 food service ones. There is only one dietetic internship which specializes in eating disorders—ours.”

Eating therapy

During the eating disorder rotation, DI-TEP interns shadow working dietitians at one of The Emily Program’s nine Twin Cities locations, which serve a variety communities and treatment levels. While the details of individual treatment may vary between an outpatient adult and a residential adolescent, interns learn that the foundation for care revolves around therapy and eating.

“That’s where we come in,” says Lampert. “It’s a totally different education. You need to not just know about nutrition or about eating disorders, which are complex mental health illnesses, you also need to know about anxiety and depression, borderline personality disorder, bipolar disorder and panic disorder.”

Every patient has regular private appointments with a therapist and with a dietitian, along with a variety of other group sessions. Haley Snell, a recent DI-TEP graduate, says observing, and then participating in, patient and group therapy sessions was



Carrie Peterson's partnership with The Emily Program makes the unique DI-TEP track internship possible.

particularly beneficial. Hearing clients’ stories and learning the process of treatment is something she couldn’t get from coursework.

“The most surprising thing was how very different each eating disorder is, and it didn’t ever fit into one category,” Snell says. “I always assumed from textbooks, if someone has anorexia, this is how you define it. But I found that people can go from one extreme to the other. Maybe it started off just about restricting food, but then all of a sudden the disorder evolved to include bingeing. There’s a lot more behind the reason for a person’s relationship with food, as opposed to ‘it just started with dieting.’”

“Everyone kind of takes an eating disorder and personalizes it in a different way,” agrees Riley Larson, another graduate from the spring internship. “Classes just scratch the surface compared to working with clients for 9 weeks. In therapy, we’re helping people overcome fears and food judgments, to recognize their eating disorder when it comes up in their head not as them, but as

their coping mechanism. It’s their anxiety saying, ‘this is how I should eat or not eat.’ That’s not good for their bodies—they’re dying and we need to help change their behavior.”

That behavior work doesn’t just happen in therapy sessions at The Emily Program. They also eat together. A lot.

“We eat meals together, and we eat snacks together. As a dietitian here, you have to be able to eat and talk and work at the same time,” says Lampert. “A lot of people show up thinking, ‘Oh, I know what to do.’ And then, ‘Oh, wow, people are crying at lunch, why is this happening? How do I help someone not cry at lunch? Or is it ok that they cry at lunch as long as they eat?’”

The interns get practice in the planning and preparation of clients’ food and calorie exchange requirements, which is standard fare for dietetics work. Less standard is the mealtime experience. They spend a lot of time correcting food and table behaviors that commonly develop with eating disorders, like taking tiny bites or picking



DI-TEP spring graduates Riley Larson (top) and Hayley Snell both hope to continue to work with eating disorders.

food apart, or using silverware for things that are usually considered finger food—cutting up pizza, a donut or a sandwich and eating it with a fork. They also learn to spot tricks clients might use to hide food—in cuffs or, in the case of peanut butter, on the underside of the table—to disguise their habits.

“It’s kind of incredible how crafty they can be,” Larson says. “It’s hard to see, because you want them to get better. But it’s not them doing these things, it’s their eating disorder. It’s the only way they know how to cope with the anxiety and the fear they feel. So you have to think of it that way, and not be mad at them. They’re not happy.”

That is exactly the kind of insight Peterson tries to instill in her interns, whether they go on to work with eating disorders or find work in another area. They leave the DI-TEP track program with a different perspective on food and eating and, she hopes, an understanding for how society views and judges food. She says graduates will find that

knowledge useful when dealing with almost any kind of client, since they’ll likely work with an eating disorder at some point.

“Students go through this training, and they take away an entirely different perspective on food than they’re taught,” Peterson says. “Eat healthy, low fat, dessert once a day—all this stuff we go around preaching and talking about, with eating disorders, it is *all foods fit*. We live in a society where food is all around us and we need to learn how to eat it, deal with it and understand it. How do I fit into that eating, and how does that eating fit into my world? Does a Snickers bar fit? Absolutely! Have one!” ●

Birth of a unique internship

Through happenstance and hard work, the Dietetic Internship (DI) at the University of Minnesota capitalized on what seemed to be a daunting task, turning it into the nation’s top—and only—program focusing on working with eating disorders.

Started in the 1990s, the DI at Minnesota was strictly for graduate students, housing just three to four individuals per term. Current Dietetic Internship Director Carrie Peterson (’00—M.S., Nutrition) took over the reins in 2000 but in 2011, the Academy of Nutrition and Dietetics issued new DI guidelines that forced her to look critically at the direction the internship was heading.

Besides increasing the number of hours each student was required to complete, all programs were required to develop a major emphasis area.

Enter serendipity.

Peterson was catching up with former student, dear friend and The Emily Program Chief Strategy Officer Jillian Lampert, when the two had a light-bulb moment. While sharing the new guidelines and quest for an emphasis area, Peterson and Lampert looked at each other and agreed simultaneously that Minnesota should make eating disorders its major emphasis.

The duo started working out the details the same day, and the rest is history.

According to the National Eating Disorders Association (NEDA), many cases go unreported, and those who do seek treatment may have difficulty trying to find a safe place. However, The Emily Program is working to change that.

“We help patients by addressing not only nutrition skills, but behavioral, emotional and psychological needs in addition to making sure they have the support from their network to seek treatment and continue after they leave the program,” said Lampert.

Graduates have gone on to successful careers after completion of the program, and their success also raises awareness and name recognition for the DI.

“If you search for ‘eating disorders’ and ‘dietetic internship’ we’ll be the first ones to show up,” said Peterson. “But we now go beyond that because we have previous interns who are spread across the country sharing their experience, driving an increase in interest. The passion and drive they demonstrate shines with their employers, so those individuals are also looking at our program and connecting students with us.”

Diversifying opportunities for its students, the DI added a second track in medical nutrition therapy last year. In addition to leveraging its relationship with The Emily Program, the program is also working with University of Minnesota Health and several other high-profile organizations in the Twin Cities.

“Our program is well entrenched in the community,” said Peterson. “So no matter which path our students take, they know they will be getting a top-rate education and experience.”

—Rachel Reisig

DISCOVERCFANS



Photo by David Hansen

“Itasca” is the newest member of the U of M’s cold-hardy wine grape family. The new grape, which will be used to make dry white wines, has lower acidity and high sugar levels, coupled with high resistance to common grape diseases and pests, says grape breeder Matt Clark. Itasca produces a wine that is light yellow to straw-colored and has aromas of pear, quince, violet, melon, minerals, and subtle honey notes. It will be available from licensed nurseries in 2017.

Forward Steps

There's no easy answer to the challenge of meeting the nutritional needs of nearly 9 billion people around the world in just a few decades.

One piece of the puzzle, though, is training the next generation of scientists who will have to keep up with evolving demands. That's the idea behind the MnDRIVE (Minnesota's Discovery, Research and Innovation Economy) Global Food Ventures Graduate Fellowship program. Now beginning its fourth year, the program is designed to give fellows a better understanding of food systems and policies, so that the fellows can better apply their specific expertise to solve food problems in Minnesota and beyond.

Extending the strawberry season

If you've ever tasted a strawberry right from the patch, you know that most store-bought berries are bland in comparison. They also tend to spoil within days of buying them. That's because strawberries spend most of their lives on a truck, then in a warehouse, then on an airplane, then on store shelves, before they finally make it to our homes.

This issue is especially close to home in Minnesota, where the strawberry growing season lasts just six weeks or less, from June to early July. The rest of the year, most of our berries come from California or Florida. Fortunately, there may be a way to solve this problem in a sustainable way—one that benefits both the environment and the local economy.

Through new cultivars and techniques, MnDRIVE fellow Andrew Petran has been able to extend the season through late October. He's growing day-neutral strawberries, which differ from the June-bearing types usually grown here, because they are insensitive to day length.

"We've been treating them as annuals and using plastic mulch and low tunnels (i.e. miniature greenhouses), versus treating them as perennials and using

straw mulch," explains Petran, who earned his doctoral degree in applied plant sciences in May.

"This approach helps to keep the leaves dry, which reduces disease and protects them from the elements, including wind gusts of up to 80 miles per hour."

Petran grew the plants at two sites, St. Paul and Morris, on organically certified land using organic fertility practices and drip-tape irrigation, which can reduce water expenditure by up to 75 percent compared to overhead irrigation.

After two years, he's seen an average rate of more than 20,000 lbs./acre/year, using plastic mulch with low tunnels. That's a lot more strawberries than the region's average 5,500 lbs./acre/year.

Moreover, the strawberries are delicious. "They taste like they were already rolled in sugar," says Petran, adding that each variety has its own unique flavor.

It seems Minnesotans are happy to pay extra for them, too. "We donated a lot of fruit to University of Minnesota students to sell at the farmer's market," says Petran. "They sold them all for \$5 a pint, which equates to more than triple what retailers get."



in Food Security

by Eve Daniels

Resisting rust fungi

Growing up in Yingxian, a small village in northern China, Feng Li saw the effects of plant disease first hand. "My aunt was a farmer, and when she would have a bad year in the field, I wanted to do something to help," says Li.

Today, as a graduate student in plant pathology, Li is getting a chance to help farmers like her aunt, across the globe. Following in the footsteps of Norman Borlaug and notable researchers like him, she's advancing our knowledge of stem rust, one of the world's most devastating plant diseases.

As part of her MnDRIVE project, Li is investigating the factors of stem rust resistance in *Brachypodium distachyon*, a grass species

from southern Europe, northern Africa and southwestern Asia. This grass is related to cereal grain species including wheat, barley, oats and maize.

Her findings will not only increase our knowledge of non-host resistance against rust fungi, but also help to establish *Brachypodium* as a model for studying cereal disease resistance.

"I would like to have a better understanding of the plant microbe interactions so that we can develop novel strategies for plant protection," she says. "Advancing our knowledge in this field can make translational research and innovations possible."



Photo by Thanwalee Sooksa-nguan



Photo by Andrew Petran



Photo by David Hansen



Photo by Dylan VanBoxtel

Fighting foodborne illness

Listeria is a worrisome word for the food industry. The infection, caused by eating food with the bacterium *Listeria monocytogenes*, is responsible for 1,600 cases of foodborne illness each year in the United States. Of those cases, about 255 people die.

So, finding ways to control the infection is truly a matter of life and death. It's also a financial matter, as the impacts of listeria cost the food industry nearly \$3 billion annually, according to a recent USDA analysis.

To tackle this critical issue, MnDRIVE fellow Zach Metz is combining his undergraduate training in chemical engineering with his graduate work in food science.

"I'm using genome-scale metabolic models, which are created by downloading publicly available genome strains of *Listeria monocytogenes*, and then I upload those genomes to an online database to create a base model," he explains.

"I take those models and run computer simulations, and try to predict what compounds listeria can use as a source of carbon, nitrogen, phosphorus and sulfur." From there, he tries to grow listeria on those compounds in the lab, and to make those results agree with the model as much as possible.

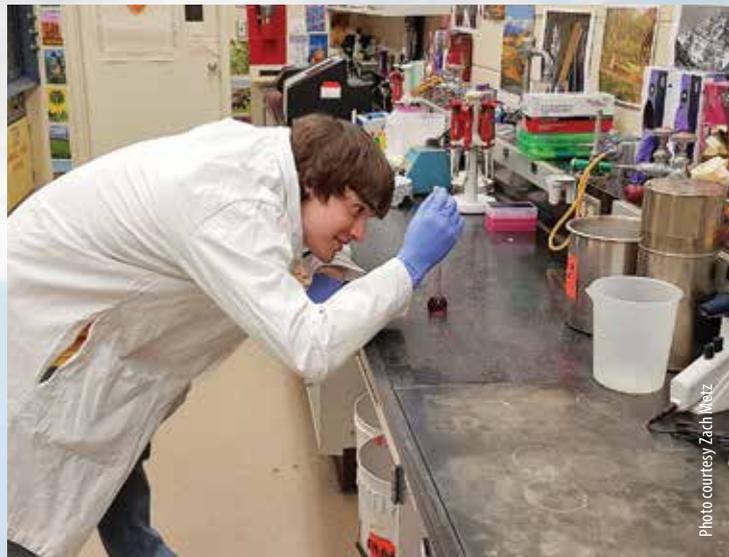


Photo courtesy Zach Metz

"After doing the experiments in the lab and adjusting the models, I got them so that they agree about 85 percent with experimental results, which is pretty standard for a published version of one of these models," says Metz.

The ultimate goal is to provide a more accurate predictive tool to aid in the prevention and treatment of listeria.

Protecting animal feed



Photo by Marta Nanclores

Since its appearance in the U.S. in 2013, porcine epidemic diarrhea (PEDv) has quickly spread within the swine industry. The virus has killed millions of pigs and has boosted pork prices to all-time highs.

Speculation continues about the origins of the virus, but experts believe that animal feed is one way it can enter pig barns. That's where Mickie Trudeau's research comes into play.

"I focus on how long the virus survives in different feeds and what can be done to limit its survival and make the feed safe for the farms," she explains. "This includes heating the feed or using different feed additives, such as organic acids, to reduce virus survival."

Early research trials show that plant-based meal may be an ingredient to

watch more closely. "Originally, animal byproducts were blamed because they come from pigs, but we're seeing soybean meal and even corn have high survival rates, so we're trying to figure out what's causing that," says Trudeau.

After defending her master's thesis later this summer, Trudeau plans to stay at the University of Minnesota to pursue her PhD in swine nutrition. Over the past year, she says the MnDRIVE fellowship has not only paid her salary, but has also given her a more balanced perspective on food systems in general.

"As fellows, we've all taken classes in food production, food security and other relevant topics, so instead of being really good at just one thing, we have a broader sense of how our project fits into everything." ●



Global food ventures

Six graduate students from CFANS are part of the fourth cohort of Global Food Ventures Fellows. During the 2016-17 academic year they'll participate in activities designed to help build their skills in communications and problem-solving along with pursuing individual research projects.

The new CFANS Fellows and their research projects are:

Adriana Liceth Alvarez De la Hoz, "Microalgal Biofilm Growth on Agricultural Runoff: A Recycling System to Support Sustainable Food Supply." Adviser: Rob Gardner, Department of Bioproducts and Biosystems Engineering and West Central Research and Outreach Center

Julie Hess, "Effects of white button mushrooms on satiety and gut health markers, specifically the ability of mushrooms to function as prebiotics and impact the gut microbiome." Adviser: Joanne Slavin, Department of Food Science and Nutrition

Kari Wolf, "Evaluating the challenges and effectiveness of using industrial resins to strip nitrate from agricultural tile water under field conditions." Adviser: Satish Gupta, Department of Soil, Water, and Climate

Tyler Nigon, "Leveraging the advantages of both remote sensing and soil nutrient modeling to determine the optimum rate and timing of in-season nitrogen fertilizer in corn." Advisers: Ce Yang and David Mulla, Department of Soil, Water, and Climate and Bioproducts and Biosystems Engineering.

Ryan Merry, "Improving soybean production for Minnesota growers by breeding soybeans to be tolerant to abiotic stresses." Advisers: Aaron Lorenz and Robert Stupar, Department of Agronomy and Plant Genetics

Natalia Calixto Mancipe, "Study of Adsorption Behaviors of Fungal Spores for Control of Food Infection." Adviser: Ping Wang, Department of Bioproducts and Biosystems Engineering

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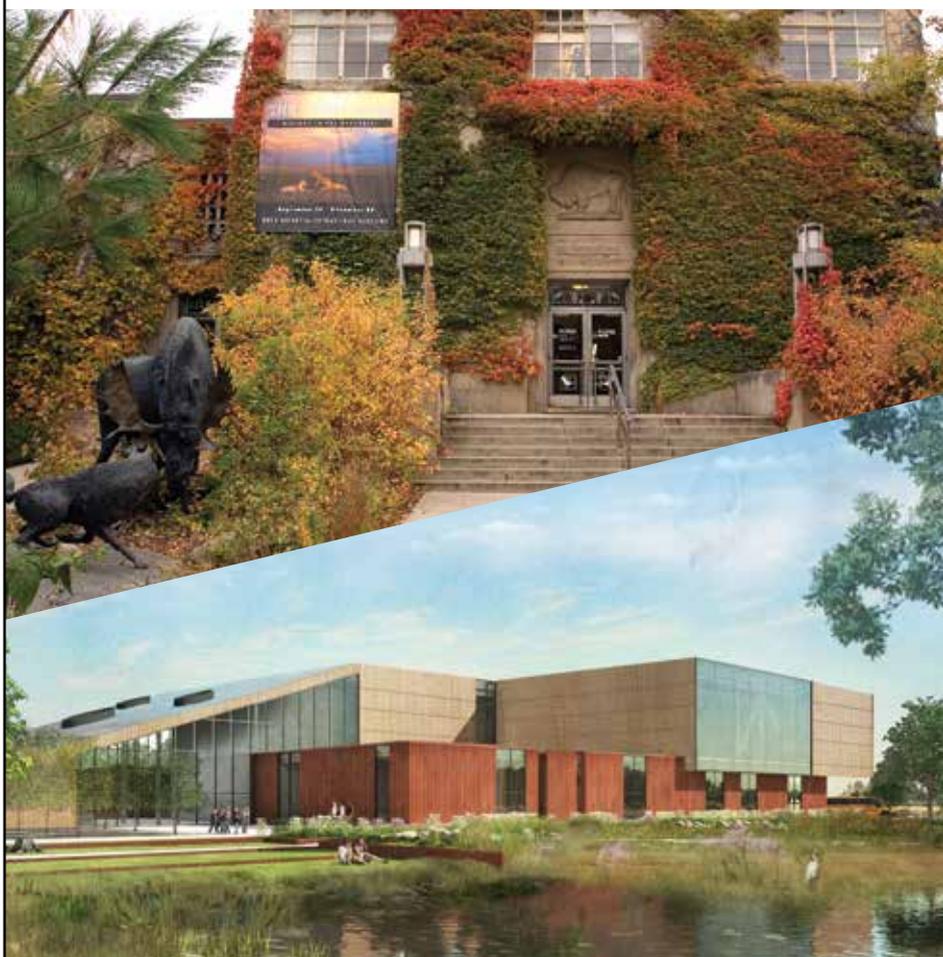
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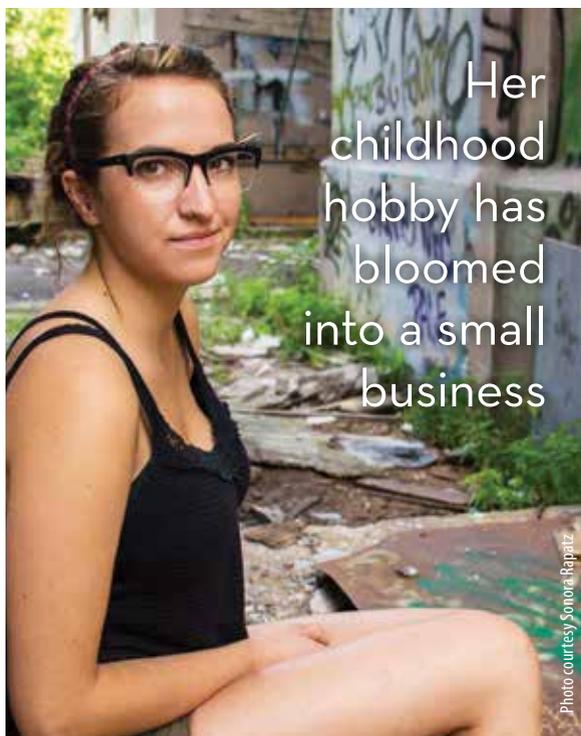
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Dreams in Bloom

Scholarship winner grew up growing flowers, plans a career in the floral business



Sonora Rapatz started growing and selling flowers at a farmer's market when she was just nine years old. Rapatz acknowledged that her mother helped a great deal at first, buying the seeds and helping to decide where to plant, how to grow and when to harvest.

"Each year, I started doing more and more of the work myself," Rapatz says. "I learned from each year's experience, and I started researching and reading books. Every year, I made more money, gained more experience and continued to see my business expand."

Rapatz is all about variety. She began by growing pumpkins to sell, along with handmade beaded jewelry and healthy dog treats.

She sold at several different farmers' markets over the years, eventually expanding to doing weddings by order. Rapatz's wedding orders varied from simple table arrangements to growing and arranging bouquets and boutonnieres for entire wedding parties.

"I continued to grow and sell cut flowers until I graduated high school, moved out of my parents' house and away from their farm," Rapatz says.

Her floral business has allowed her passion to bloom and grow into a future career. Rapatz is looking forward to taking a floral design class next semester. While her track within the Plant Sciences major is Nursery and Floriculture, having a floral business is most exciting to her. She also says

Development Team

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Find out more: www.cfans.umn.edu/about/giving-to-cfans

Engage, share and... remember the "and"!

that working for a botanical garden or nursery, or seeking work in "new interest crops," are also possibilities.

Rapatz was the first one to attend the University of Minnesota from her family, and is the only person in her immediate family to earn a college degree. She currently holds an Associate of Arts degree from Lake Superior College, and is working toward earning her bachelor's degree in CFANS. The Land O'Lakes Multi-functional Agricultural & Food Systems scholarship is helping her reach her goals.

Although the University of Minnesota is in the Twin Cities, Rapatz loves the small-town environment that CFANS exemplifies. She chose the University of Minnesota because she wanted to attend a large and respected university that had various options for degrees, classes, and other opportunities. The location and the beautiful campus secured her choice.

"I love that CFANS offers a close and personal feel and has a lot of unique attributes. I like the small class sizes in comparison to the huge general chemistry lectures. I've also gone on quite a few field trips. The labs, which are hands-on and sometimes outside, have been some of the most enjoyable parts of classes," Rapatz says.

After graduation, Rapatz plans to travel and seek a new career. Her friends describe her as motivated, adaptable and energetic. She loves keeping busy and going on adventures to visit new places, trying new foods and experiencing the outdoors.

Rapatz works in the Plant Growth Facility which "has been a really interesting experience." She enjoys the St. Paul campus in general, especially the Trial and Display Garden.

"My favorite things about going to the U of M are my job as an undergraduate research assistant for the horticultural science department, and the people I've gotten to meet here," she says.

—Becky Church



A message from 2015-16 Alumni Society President Myah Walker

Greetings alumni and friends,

This has been such a wonderful year of reflection for the CFANS Alumni Society. A significant part of that reflection was evaluating how we as a society can better serve alumni, the college, students, and friends. As a result, we developed a strategic plan outlining a new mission and four key focus areas for future society service and programming. Areas for focus include assisting with increased enrollment; cultivating a sense of belonging for our diverse CFANS community; increasing alumni engagement; and developing sustainable systems, structures and support services for our society programming.

As we continue to grow and strengthen our society programs, we are also continuing to grow our sponsorships. We are so thankful to our sponsors for supporting the efforts of the Alumni Society because without them our reach would be limited. As a result of sponsor funding, every year our scholarship program has grown, with 21 scholarships awarded in 2015-16. It is so rewarding seeing the impact these scholarships have on our students.

As I conclude my year as president, I have three requests of you, our CFANS community:

First, continue to stay engaged and connected with CFANS and the university. Staying engaged with the college provides you an opportunity to pay it forward whether it is through mentoring a student, contributing to scholarship funds, or advocating on behalf of the college.

Second, I ask you to share your story. Each of you has a unique story of why you chose CFANS and how it has enriched your journey. Your story has the power to encourage and motivate others to taking the next step to accomplishing their dreams. You are now a CFANS alumni ambassador. You never know whom your story may inspire along the way.

Lastly, remember the "and." I have often heard Dean Buhr ask students "what is the most important word in the name of our college?" The responses are always, "Food," "Agriculture," "Natural Resources" or "Sciences." Dean Buhr reminds us that the most important word in the name of our college is "AND." Although we study different disciplines and are divided by departments, we are all connected through our mission.

I encourage each of you to reconnect if you haven't, or continue to stay engaged if you are connected. There are many opportunities to do so, including serving as a CFANS mentor, alumni ambassador, or society committee member. It has truly been a pleasure serving as your Alumni Society president and I look forward to seeing the accomplishments that lie ahead under the direction of your new president Larry Thomas.

Sincerely,
Myah Walker '10

Tracking food security by asking

THREE QUESTIONS WITH ANNE WALLESER KEPPLER

Editor's note: Anne Walleser Kepple (B.S. nutrition, '81) is a food security and nutrition specialist with the Food and Agriculture Organization of the United Nations (FAO) where she promotes use of the Food Insecurity Experience Scale in 140 countries as a measure of global food security. She answered our three questions from her home in Sao Paulo, Brazil.



Photo courtesy Anne Walleser Kepple

How does the Food Insecurity Experience Scale change the way food insecurity is perceived by policy leaders (or how might it change over time)?

For decades, hunger was associated in people's minds with the adequacy of the food supply. Eventually this gave way to awareness of unequal access to food, which was often in abundant supply. Measurement of hunger and food insecurity traditionally used indicators of food production, poverty, nutrient deficiencies and child weight and stature.

However, the undeniable existence of hunger in wealthy, food-rich countries like the United States, and growing evidence that many food-insecure people are overweight rather than underweight, made it necessary to rethink the way hunger and food insecurity were measured. FAO's Food Insecurity Experience Scale descended from the U.S.

Household Food Security Survey Module. The questions that compose it, derived from conversations with women who said they had experienced hunger, are universal: "Due to a lack of money, have you worried about running out of food, eaten a less healthy diet, skipped meals, gone a whole day without eating?" This way of measuring hunger focuses policy makers' attention on the lived experience of people rather than on food supply alone or malnutrition. It can help policy makers understand the diverse causes of food insecurity and its potential consequences.

What led you to this kind of global-scale work? Was there an event or turning point in your life where you decided to pursue nutritional issues as a social/public policy concern?

As is often the case, the path was rather circuitous and serendipitous. After

graduating from the U of M and doing a one-year dietetic internship in California, I was in the Peace Corps in the Dominican Republic where I lived in a rural village. That experience brought home to me the fact that U.S. government policies often contribute to poverty and poor nutrition in countries like the Dominican Republic. Upon my return, after working for two years in an international nutrition project in Washington, D.C., I decided to go to graduate school to study hunger and food security issues in the U.S. I felt compelled to address hunger in my country and to hold my own government accountable for its actions affecting food insecurity inside as well as outside its borders. So the Peace Corps was a turning point, learning with great minds in graduate school at Cornell University was another and the third turning point was meeting my Brazilian husband in graduate school—which ironically took me back to Latin America,



the people who eat

in spite of my conscious choice years earlier to focus on hunger in my own country.

The history of the Food Insecurity Experience Scale paralleled mine in many ways, from its origins at Cornell University, to the U.S. Household Food Security Survey Module, to the Brazilian Food Insecurity Scale, before FAO decided to take it to the global level. I was more of a close witness, and in many ways, even a naysayer, as I did not believe that a set of questions designed to measure hunger in the U.S. would be culturally appropriate elsewhere. As you can see, I changed my mind.

What would you be doing if you weren't doing this work?

I would probably be engaged in research on food security in Brazil, either as a collaborating researcher on a project or as a consultant to the Brazilian Ministry of Social Development. Currently I am helping to organize a national meeting of food and nutrition security researchers in Brazil with the objective of forming a scientific association. One positive effect of more than ten years of government prioritization of ending hunger and improving food security is that there is now an impressive cadre of people at all levels who understand food insecurity and its many dimensions—researchers, policy makers, even local government and community leaders.

BONUS:

You've lived in Brazil for more than two decades. This summer, the Olympics will have put your adopted home country in the spotlight. What's the biggest misconception Americans have about Brazil?

Most Americans have a mistaken image of Brazil as a Third World country. In fact, the Brazil and the U.S. both have areas within their borders that could be characterized as Third World and others as First World—often in the same city. Most Americans are not aware that Brazil has a universal health care system, that public universities are free and that, although income inequality is still very high, it is perhaps the only country in the world where the gap between the rich and the poor has narrowed over the past ten years. Brazilian scientists, intellectuals and artists are respected around the world and play an important role in the global scenario—in my field, in particular! The policies implemented by the Brazilian government to fight hunger have served as a model promoted by FAO today.

—Becky Beyers

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