College of Agricultural & Life Sciences University of Wisconsin–Madison



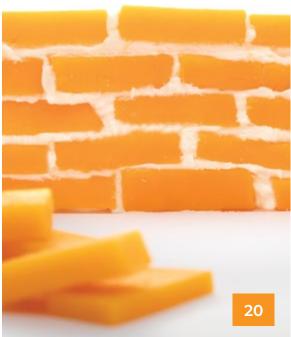
Dairy cows graze as the sun rises over a spring pasture in Ireland. The image was captured by Conor Holohan, a Fulbright Scholar from University College Dublin. Holohan joined the CALS Department of Animal and Dairy Sciences as a visiting researcher in 2022 to explore ways to improve the nutrition and production of grass-fed cows on dairy farms in the Midwestern United States. The photo was selected as one of the winners of UW's Cool Science Image Contest. Photo by CONOR HOLOHAN

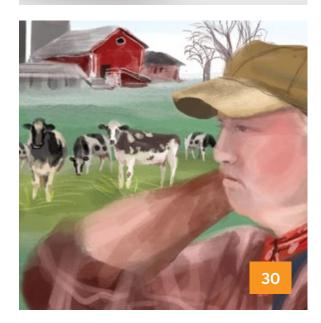




Wisconsin's Magazine for the Agricultural and Life Sciences







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ON THE COVER A path and tree cut from blocks of Babcock aged cheddar adorn a milk carton house. Image concept by JANELLE JORDAN NAAB and NIK HAWKINS Photo by MICHAEL P. KING With special thanks to STACY KUNESH

Images, from top, by MICHAEL P. KING (2) and ANNIE BAKST



Photo by MICHAEL P. KING

DEAN GLENDA GILLASPY

First Impressions and Future Successes

t's been a little more than half a year since I joined CALS, and I'd like to share some thoughts and impressions as a relative newcomer to UW–Madison. I'd also like to highlight some programs that will ensure a successful and resilient future for CALS.

First and foremost, I have learned that CALS and the state of Wisconsin have an important symbiotic relationship. This relationship yields significant social and economic benefits for the state, resulting in a deep connection between CALS and the people of Wisconsin. This probably should not have surprised me: I came here from a land-grant institution, so I understand very well how land-grant institutions such as UW serve and partner with the citizens of their states. However, Wisconsin has some unique elements I have not experienced before.

One of the most interesting and impactful differences is our agricultural community's investment in environmental stewardship, which involves both an intellectual commitment and a focus on improving practice. I have received so many insightful and well-informed questions about how the work we do at CALS will help make agriculture more sustainable. A dedication to environmental stewardship is evident in the state's dairy community. I have seen firsthand the special relationship that dairy farmers have with their animals. And I've seen their keen interest in various technologies that can increase animal comfort, animal and soil health, and overall productivity and environmental sustainability.

A second unique factor in Wisconsin is the close relationship between the Division of Extension and CALS — a partnership that sustains Extension-funded faculty who make a tremendous impact in our state. These faculty excel at putting research into practice, and they interact with many different types of stakeholders to solve practical problems. And their ability to run world-class research programs with high-achieving students is certainly an important contributor to their overall excellence.

A third impression I've come away with during my time here is closely linked to this issue's feature story on the mental health of farmers (see "From Hardship to Hope," page 30). Agriculture is changing. New technologies and other tools have increased productivity, so fewer people are needed to raise the same amount of food. For many rural Wisconsinites, this means the traditional elements of farm life and culture are slipping away. It's a complex issue that CALS will be working to address, in collaboration with Extension, using a \$9.3 million investment by the U.S. Department of Agriculture.

Part of this Wisconsin Rural Partnership program will focus on developing a network of weather stations across the state, which will collect and provide vital information for farmers. A second part will support research aimed at improving the social, educational, and economic facets of rural life in Wisconsin. Please look for updates on this important work through our web and social media presences and in future issues of *Grow*.

We can ensure a successful and resilient future for CALS by fully exploring our ability to use our expertise in agriculture and the life and social sciences to positively impact the lives of Wisconsinites. Bolstered by its many unique assets, the college is poised to do just that moving forward. You will be hearing more about this work in the future as well.

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Five Counterintuitive Facts for the Conscientious Lawn Owner

By DOUG SOLDAT BS'01, MS'03

Healthy lawns can prevent phosphorus from entering lakes and streams, where it causes problematic algal blooms.

Phosphorus is an important element for plant growth. It binds tightly to soil, and it can be lost when hard rain detaches soil particles and carries them away with flowing water (otherwise known as runoff). The dense ground cover of a healthy lawn protects soil particles from detachment and increases the lawn's ability to absorb water. Research by the late CALS soil scientist Wayne Kussow BS'61, MS'63, PhD'67 and others has shown that fertilized lawns (with or without phosphorus fertilizer) can decrease the amount of phosphorus that's lost. This is because the nitrogen in lawn fertilizers increases the density of the grass and keeps the phosphorus in the soil.

Phosphorus fertilizer can't be applied to lawns in Wisconsin without a soil test showing the need. Many Wisconsin lawns contain enough phosphorus for healthy plant growth for

decades. The nitrogen in lawn fertilizer is quickly assimilated into the lawn leaves, and studies have consistently reported low levels of nitrogen loss — often 10 times lower than nitrogen losses from corn, despite similar levels of fertilization.

Like native prairies and other perennial grasslands, lawns can fight climate change by taking carbon dioxide from the air and locking it in the soil in the form of organic matter.

Many studies have documented increases in carbon-rich soil organic matter when agricultural areas are converted to lawns. However, maintaining a lawn by mowing, irrigating, and fertilizing emits carbon dioxide. To maximize soil carbon storage, lawn owners should consider using robotic or electric mowers, which use much less energy than traditional mowers. They should also avoid or reduce irrigation because it consumes electricity for pumping, and they could consider incorporating clovers, which convert atmospheric nitrogen to plant-available nitrogen.

How you mow your lawn matters. The "one-third rule" states that no more than one-third of the leaf blade should be removed during each mowing. For example, if you plan to mow your grass to a height of 3 inches, mow it before it reaches 4.5 inches (1.5 is exactly one-third of 4.5). Mowing more than one-third of the blade stresses the grass, thins the canopy, and reduces the function of the lawn. Also, in general, the shorter you mow your grass, the faster it grows. Lawn owners who don't enjoy mowing should raise their mower decks; then they can mow less frequently and still follow the one-third rule. Another benefit to mowing high is that, according

Speaking of weeds, lawn owners may want to reconsider their stance on these "undesirable" flora.

Plants like dandelion are traditionally considered weeds in lawns, but they can be important sources of food for pollinators in urban areas in early spring. A movement called "No Mow May" began in Wisconsin and has gained traction nationally. The purpose of not mowing in May is to allow pollinators access to dandelion and other early blooming flowers in spring lawns. However, not mowing for the entire month of May can cause lawn maintenance and plant health problems in June. To achieve No Mow May goals while preventing June challenges, lawn owners should consider mowing as high as possible in May and throughout the growing season. Flowering lawn plants such as clover, dandelion, and creeping Charlie produce most of their blooms below 4 inches. When you mow high, you can have your cake and eat it, too.

Doug Soldat is a professor and extension specialist in the Department of Soil Science. He received his bachelor's and master's degrees in soil science from CALS and a Ph.D. in horticulture from Cornell University.

Photo illustration by JANELLE JORDAN NAAB; UNSPLASH.COM/ S_TSUCHIYA; iSTOCKPHOTO.COM/AVALON_STUDIO, ZBYNEK POSPISIL, TSEKHMISTER, VENAKR

GWEN KELLEY

Full Plates for Food Justice

A recent nutritional sciences grad pursues equity and sustainability through the lens of what we eat.

By NICOLE SWEENEY ETTER

wen Kelley BS'22 learned to cook by her mother's side, amid the scents and seasonings of Thai curries, vegetable lasagna, and spanakopita. Those experiences encouraged her to relish new tastes and global cuisines. And they made her certain that the path to preventive health begins in the kitchen — with delicious home-cooked meals.

Kelley's belief led her to CALS, where she majored in nutritional sciences and earned certificates in Chicana/o and Latina/o studies and global health. Her classwork helped her connect the science of nutrition with broader global and social issues.

"Between the STEM side of nutritional sciences and the broader social justice and environmental focus of global health,

What is STEM? It stands for science, technology, engineering, and math.

I feel I have received a well-rounded education from UW-Madison," says Kelley, who graduated in December.

Her zest for food justice flavored her life outside the classroom as well. During her sophomore year, Kelley joined Slow Food

UW. The nonprofit organization serves 200 meals per week to students, staff, and community members. It also works with South Madison-based programs focused on food access and education for people of many ages.

As a "Family Dinner Night" intern, Kelley planned, cooked, and served evening meals weekly, with most ingredients sourced from local farmers. The next year, she transitioned to working as Slow Food's codirector for dinners. By fall 2021, she had become the organization's co-executive director.

On Monday nights, Slow Food offers meals on a pay-whatyou-can basis. "We play an important role in food access, along with several food organizations on campus," Kelley says. "We know food insecurity exists on campus, and it's important to provide access to warm, nutritious food. It's also great that people can come sit at a table with others in a community-based setting to share a meal and conversation."

When the world went virtual during the early part of the COVID-19 pandemic, Kelley took to the fields. She tended broccoli, Brussels sprouts, and other crops at Troy Farm, an urban, certified organic operation just off campus. "That was really important to me - to get outside and feel like I was doing meaningful work and having a direct involvement in the food system," she says. "It's one thing to talk about it, but to actually help grow the food was an inspiring experience."

She also gained new perspective during her internship with the UW Office of Sustainability, where she served on

the Social Sustainability Coalition, Green Labs team, and Food Sustainability Working Group. One of her favorite tasks was assisting with monthly "Amplifying BIPOC Voices in Sustainability" events.

"All together, the work I am doing shares similar motivations: Make sure all students have access to good food, highlight the relevant voices in the environmental movement who face the disproportionate effects of

What is BIPOC? It stands for Black, Indigenous, and people of color.

climate change, and focus on equity and inclusion throughout," Kelley says.

And her work has been meaningful. "Gwen has become a leader at the Office of Sustainability and in the UW-Madison campus community - someone who leads by example and draws others to the cause," says Tim Lindstrom, the office's student intern program manager.



Photo by MICHAEL P. KING

Now that her time at UW is done, Kelley plans to continue her studies in urban planning and sustainable development. Her immediate goals: transform the front and back yards of her family's Minnesota home into native plant prairie and continue to find new ways to fill plates.

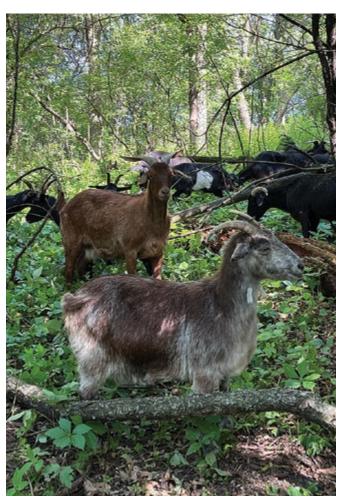
"There's such a unique food justice environment in Madison," Kelley says, "I'm thankful for the connections I've formed, and I'm excited to bring my passion for food justice back home to Minneapolis."

Can Goats Take a Bite Out of **Invasive Plants?**

CALS scientists look to ruminant grazing as a potential method for nonnative shrub control in oak woodlands.

By CAROLINE SCHNEIDER MS'11

Goats graze on invasive shrubs at a wooded test site in Sun Prairie, Wis. Photo courtesy of STEFANIA CARTONI CASAMITJANA



n a walk through the woods in Wisconsin, you might expect to see a few squirrels, a variety of birds, and maybe even a whitetail deer. Goats, on the other hand, don't make that list. But goats might be spotted among the trees more often if ongoing CALS research shows they're useful for controlling invasive species.

Invasive shrubs pose problems for wooded areas, whether they're used for agricultural production or managed as natural areas. In cases of silvopasture, where trees and grazing livestock are integrated, the shrubs create a dense canopy that prevents forage growth. The shrubs also outcompete native species, reduce wildlife habitat, and change the soil's ability to absorb water, all of which can hinder the restoration of woodlands as natural areas.

For these reasons, Stefania Cartoni Casamitjana MS'21 and Mark Renz are looking at the grazing prowess of goats as one possible method for controlling invasive shrubs in oak woodlands. They're conducting research at two southern Wisconsin locations. One is a degraded oak woodland in need of restoration at the American Family Insurance headquarters in Sun Prairie. The other, situated 30 miles west in Prairie du Sac, is a plot slated for conversion to silvopasture.

"Woody shrubs likely have a greater impact in Wisconsin than all other invasive species combined because they completely dominate wooded systems, transform the plant and animal communities, and change ecosystem processes that Wisconsinites rely on," says Renz, a professor and extension specialist in the Department of Agronomy.

"A healthy oak savannah should be pretty open and allow a lot of light through," explains Cartoni Casamitjana, a doctoral student in agronomy. "But there's no open space in our sites anymore, and they're invaded by mostly buckthorn and honeysuckle."

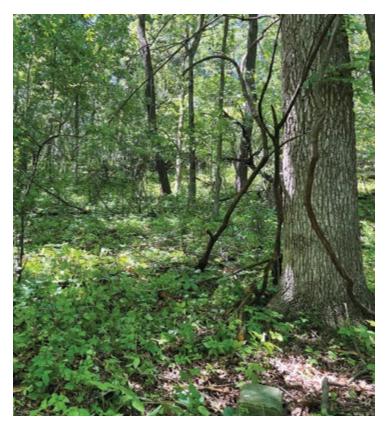
To control these nonnative shrubs, the team is exploring the relative effectiveness of several techniques. In addition to goat grazing, they're studying two widely used methods: herbicides and large mowers that can remove the aboveground portion of the shrubs. Goats, however, may bring special abilities.

"A unique thing about goats is they will preferentially feed on woody species, so their impact is more on the shrubs," says Renz.

"Also, goats are useful in areas where you can't go in with machinery or you don't want to go in with herbicides," adds Cartoni Casamitjana. "If you have steep terrain, for example, you can't go in with machinery, but goats are very able to take that on."

The researchers are in the early stages of a multiyear effort in which they will apply various treatments. In the first year, the team mowed, introduced goats, or left the woodlands untouched. In the second year, each of the first-year treatments will be split in two, with half treated with herbicide and the other half grazed by goats. To determine the effectiveness of each treatment, the researchers are measuring understory plants and the amount of light that can reach the forest floor.

In the first year of the study, the team saw immediate effects from both goat grazing and mowing, but the shrubs regrew as



the season went on. By summer, the team saw no difference between the goat grazing areas and untreated woodland in terms of light interception, but the mowing treatment allowed more light to hit the forest floor. When surveying the plants to see how much vegetation remained and regrew, there was no difference in shrubs between the goat and mowing treatments and the area that was untreated.

"It's not a surprise," says Renz. "These are shrubs that have lived five to 50 years, probably. We knew we were going to need to do multiple years of management."



A wooded test site in Sun Prairie, Wis., before and after goats grazed on invasive shrubs. Photo courtesy of STEFANIA CARTONI CASAMITJANA

Renz and Cartoni Casamitjana are also considering the expense associated with each treatment and what that means for farmers and landowners. "Cost of implementation of each of these techniques is very important," explains Cartoni Casamitjana. "Yes, one method might be more effective, but if it's many times more expensive, will anyone use it? We want to be able to give useful recommendations. That's the goal."

FINDINGS

HOW TELOMERES STAY TIDY

Telomeres provide vital protection for the ends of human chromosomes. However, these defensive caps degrade over time through the process of cell division. This degradation can lead to cellular dysfunction unless the telomeres are properly maintained. Scientists have long known that an enzyme called Pol α -primase plays a key role in this maintenance operation, says assistant professor of biochemistry **Ci Ji Lim**. But the underlying mechanisms have remained elusive — until now.

An advanced imaging technique called cryo-electron microscopy single-particle analysis has changed the game. Lim and his team used the method to discover how $Pol\alpha$ -primase works in conjunction with a protein complex called CST to maintain telomeres and preserve the integrity of DNA. Their study, a big breakthrough in understanding DNA synthesis, was published in the August 2022 issue of *Nature*.

LACK OF CIVILITY ERODES TRUST IN SCIENCE

When science is covered in the news, it can sometimes become contentious. Research has found that the disagreement and incivility surrounding science news can affect people's attitudes about the topics covered. A recent *Science Communication* study, coauthored by assistant professor of life sciences communication **Sedona Chinn**, reinforces this idea by showing incivility may cause news consumers to pay less attention to science issues — or even be less likely to accept them. Perhaps more alarming, the study also found that incivility can lead to increased mistrust of scientists and scientific methods.

+ EXPLORE ONLINE

Read about more CALS research at news.cals.wisc.edu.



Native Knowledge Revitalized

The horticulture department serves up a satiating course on Indigenous foodways.

By NICOLE MILLER MS'06

n a frigid February afternoon, around 60 UW students gather near Dejope Residence Hall on the west end of campus. Their modern gear protects them from the elements, but they're here to learn how Indigenous people survived Wisconsin's harsh winters long before present-day amenities.

"Let's pretend we're in precolonial times," says **Jon Greendeer** (Ho-Chunk and Oneida), a diabetes educator and former president of the Ho-Chunk Nation. "If we have to survive out here, how are we going to do this? What are we going to eat tonight?"

Sixty heads swivel, scan the frozen landscape, then turn back to Greendeer with expressions of uncertainty and consternation.

"You look around; there's nothing to eat. You guys are going to starve, aren't you?" Greendeer banters. "To survive, [our people had] to draw upon our wisdom, a wisdom that comes from generations."

Guest lecturer Jon Greendeer (at lower right), a tribal member and former president of the Ho-Chunk Nation, speaks with students in a Horticulture 380 Indigenous Foodways: Food and Seed Sovereignty class as they gather around a campfire outside Dejope Residence Hall. Photo by JEFF MILLER

It's a wisdom that was almost forgotten, Greendeer explains to the rapt crowd — and it's a wisdom he's working to revitalize.

After being forced off their lands in the 1800s, many tribes lost their traditional foodways. To help restore this knowledge, Greendeer leads classes and workshops for tribal community members to teach them how to hunt, gather, preserve, and cook traditional foods — from bison, deer, and fish to corn and wild rice. And on this February day, he's serving as a guest speaker for a CALS course called Horticulture 380 Indigenous Foodways: Food and Seed Sovereignty. It's a role he has embraced enthusiastically for the last three years.

Greendeer is just one of several powerful guest speakers for Hort 380, which introduces students to the foods and foodways of the Indigenous peoples of the Upper Great Lakes area through multiple perspectives - historical, legal, biological, and social. Students learn how settler colonialism and subsequent agricultural practices and policies damaged tribal foodways, and they explore current efforts by tribes to reclaim their agricultural traditions and food sovereignty (the control of one's own food production and distribution).

"It was really cool to hear from [Greendeer] while we were all standing around the fire and the bison meat cooked in front of us," says senior Emma Mechelke BS'22, who graduated last December with a double major in horticulture and plant pathology. "He works to bring back these culturally appropriate foods and ways of cooking them and serving them to his community. His visit brought together a lot of what we were talking about in class."

The course features fun, experiential learning opportunities, such as cooking with Indigenous foods, tapping maple trees for syrup, and spearfishing methods. Perhaps the most popular class activity is the trip to the UW Arboretum, where students learn about the Native American traditions of tree tapping and boiling sap to make syrup. The visit includes opportunities to sample saps and syrups.

"I remember going maple syruping as a kid, so it was impactful to actually study syruping and

Students help construct a temporary lodge as a class project for Horticulture 380. Photo by JEFF MILLER

hear from experts about it, including the cultural significance that maple syruping has for Indigenous communities," says **Ryan Meeker**, a senior majoring in computer science who grew up hunting and fishing in northern Wisconsin. "Tribal members would get together at the sugar bush and collect maple syrup together and celebrate the end of the winter. They worked really hard to collect enough of this important food source to last another full year."

Hort 380 is co-taught by Irwin Goldman PhD'91, a professor in the Department of Horticulture, and Dan Cornelius (Oneida), an outreach program manager with positions in the Department of Plant Pathology and the UW Law School's Great Lakes Indigenous Law Center.

"Having Irwin's scientific perspective and having Dan's Indigenous tribal law knowledge was really helpful in framing our conversations," says Mechelke.

"Dan always seemed to have personal experiences that he'd connect to what he was teaching, so we could see how it is actually happening in real life and not just what the textbook says," says Meeker. "We were talking about things that are going on today, how the tribes are working with the federal government — and each other — to try to support their local farmers, and how they're trying to bring back a lot of their food sovereignty."

The course was designed to teach students about Indigenous approaches to and perspectives on agriculture, which have been largely absent from college curriculum options. Its creation was funded by the Ira and Ineva Reilly Baldwin Wisconsin Idea Endowment, a competitive grant program designed to help the university contribute knowledge and resources across the state. It's open to all UW-Madison students and fulfills a social science breadth credit.

"The class instilled a lot of compassion and awareness," says Mechelke. "It was a really heartening experience."



Win-Win-Win in Hawaii

A marine protected area in the Aloha State benefits fish populations, the tuna fishing industry, and Native people.

By **ELISE MAHON**

arefully placed no-fishing zones can help fish populations thrive. And these zones, despite restricting where fishing is allowed, can help the fishing industry prosper as well.

These findings stem from a recent study coauthored by **Jennifer Raynor** PhD'17, a professor of natural resource economics in the Department of Forest and Wildlife Ecology. Raynor collaborated with researchers from the University of Hawaii to investigate how the creation of the world's largest fully protected marine protected area (MPA) in Hawaiian waters affected the local tuna fishing industry.

In 2006, the Papahānaumokuākea Marine National Monument was established to preserve important cultural sites for Native Hawaiians; the protected area was expanded to about four times its original size in 2016. The monument was a major victory for conservationists but raised concerns among local fishers about losing access to these fishing grounds.

The study was published in October 2022 in the journal *Science*.

Commercial fishing vessels at Honolulu Harbor in Hawaii.

Photo by SARAH MEDOFF

"The intention for creating this space was not necessarily to protect tuna; the fact that it did was in some ways a happy accident," Raynor says.

There are both cultural and economic factors wrapped up in the monument and the tuna fishing industry in Hawaii. Tuna is a central part of Hawaiian diet and culture; protecting Hawaiian cultural sites is central to the MPA. But tuna fishing also generates \$40 billion a year for the global economy and supports millions of jobs.

In some ways, Raynor says establishing these no-fishing zones with a cultural motivation rather than a scientific motivation of protecting tuna populations makes it more difficult to justify the MPA to fishers. That's why it was important to show through this study that, despite the upfront costs, fishers are already starting to benefit from the MPA. And those benefits are expected to grow in the future.

What makes this MPA a win-win-win for the environment, Native people, and fishers is a concept called "spillover." The idea is that protected waters give the species a chance to flourish, causing an increase in overall population that can spill over beyond the MPA and increase fishers' catch rates and profits.

"I am a big fan of evidence-based policy," Raynor says. "I think the best way we can make good policies that are efficient, effective, and sustainable is to understand the science that tells us what direction we should be going in."

To show that the MPA actually caused the increase in tuna populations, Raynor and her collaborators applied a statistical technique called





"difference-in-differences." This technique compares catch rates for fish near the monument to areas farther away both before and after the monument expansion in 2016.

The results showed that catch rates in waters close to the MPA increased by about 54% for yellowfin tuna, about 12% for bigeye tuna, and about 8% across all fish species.

Since many tuna remain within 200-400 miles of the Hawaiian islands during their lifetime, the team also looked at how catch rates change in 1-mile increments up to 600 miles away from the MPA

border. They found that catch rates rose as they moved closer to the monument.

Seeing increases like this in migratory species is significant because similar results had previously been seen only in resident fish populations.

"This is a great thing for Native Hawaiians," Raynor says. "This protected area that they were fighting so hard for actually creates benefits for ecosystems and benefits for other people in the region too. I think it's a really wonderful thing."

Raynor believes the best way to solve challenging, multifaceted issues is to bring together experts who can add a variety of experiences and perspectives to the conversation. This partnership with researchers from the University of Hawaii was an example of that belief in action.

Raynor is a recent addition to CALS who brought her expertise in the intersection of ecology, management, and economics to the college in fall 2022. She earned her Ph.D. in agricultural and applied economics at CALS in 2017 before going on to work at the National Oceanic and Atmospheric Administration and later at Wesleyan University.

Returning to UW and its collaborative research environment was an opportunity Raynor knew she couldn't pass up.

"People from lots of different disciplines are focusing on one thing: natural resource use and management," she says. "I was really excited about being in an interdisciplinary department with a great group of people who I have a lot of research synergies with."

Tuna for sale at the Honolulu Fish Auction in Hawaii

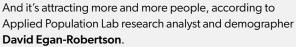
Photo by SARAH MEDOFF



■ NUMBER CRUNCHING

"THE 608" HAS **OUTGROWN ITSELF**

The region represented by the 608 area code encompasses the south central and southwest parts of Wisconsin and is home to cities such as Beloit, Janesville, Madison, and La Crosse.



He says the 608 area has experienced the largest percentage increase in population of any of the state's five regions in the last 20 years. That's 18% growth vs. 8% for the rest of Wisconsin combined. The area is now expected to run out of unique combinations of "assignable prefixes" (which are the three-digit sequences that follow an area code) by the first quarter of 2024. After that happens, customers will be assigned phone numbers starting with a new 353 area code.





t's a Saturday morning at the farmers market. You check in with the grower at your favorite tomato stand, stop to enjoy the folk music streaming from the plaza, and then chat with the flower vendor about joining next week's blood drive. It may feel like a regular visit to the market — a little socializing, a little entertainment, a little food — but you might not realize you're participating in something more.

"Farmers markets are more than just local outdoor grocery stores — they're also places where you can register to vote, learn about community organizations,

interact with neighbors and local farmers," says **Bret Shaw**, an associate professor of life sciences communication and environmental communication specialist for the Division of Extension. "They are places where people can get in touch with their local food systems and build connections within their communities."

These are just some of the features of farmers markets that allow them to serve as centers of communication and enhance a community's levels of civic engagement, according to new research by Shaw and **Laura Witzling** PhD'18. Using two Wisconsin-based surveys —

one targeting farmers market leaders and the other distributed to Wisconsin residents — the study expands on previous work about the community benefits of farmers markets.

By buying locally grown food and interacting with vendors at farmers markets, community members participate in "civic agriculture," which supports a community's economic and social development. Other forms of civic agriculture include community-supported farms, urban community farms, and farm-to-school programs. Witzling and Shaw's survey results reveal that farmers markets



Photo by JEFF MILLER

bridge the gap between civic agriculture and civic engagement by acting as communication infrastructures.

Communication infrastructures are networks of communicators — community members, organizations, and local media. A strong communication infrastructure can facilitate civic engagement because it helps community members connect and address local issues.

Witzling and Shaw's work shows that farmers markets possess the ability to act as communication infrastructures, and, in turn, promote civic engagement. In their study, more than half of the

Wisconsin farmers markets noted existing partnerships with local media, with high percentages also working directly with many types of organizations. These relationships allow farmers markets to amplify community stories and connect residents to other community stakeholders, such as schools, local government, chambers of commerce, and nonprofits.

Additionally, farmers markets act as communication infrastructures by supporting social interaction through amenities, such as music and seating. They also work to make themselves accessible financially: Many farmers markets accept electronic benefits transfer cards, which allow Supplemental Nutrition Assistance Program participants to put federal benefits toward the purchase of healthy foods.

So, taken together, what do these findings mean?

"Civic engagement typically means being active in your community by voting, volunteering, or participating in community meetings," says Witzling, who is currently working as a consultant for the national Farmers Market Coalition. "But participating at farmers markets is another great way to make your community stronger."

Now that their work has shown the value of farmers markets in Wisconsin, Witzling and Shaw hope to spread the word about how these markets foster communication and civic engagement in other places.

"Farmers markets are valuable community assets as they can bring together people that come from different backgrounds for various issues of shared importance," Shaw says. "So we hope to expand on our successes in Wisconsin and do the same thing at a more national level."

This study was published in March 2022 in the International Journal of Sociology and Social Policy. It builds on previous studies authored by Shaw and Witzling in 2019 in the Journal of Extension (with coauthors Alfonso Morales, chair and Vilas Distinguished Achievement Professor in the Department of Planning and Landscape Architecture, and UW alum Marlie Wilson) and Agriculture and Human Values (with coauthor David Trechter, professor emeritus of agricultural economics at the University of Wisconsin–River Falls). The farmers market manager survey was supported by funding from the U.S. Department of Agriculture's Hatch Program.

■ FOLLOW-UP **FOOD FLAW FIGHTERS**

By **NIK HAWKINS**

In "The Promise of Safe Food for Billions" (Grow, Fall 2021), Jori Skalitzky BS'22 highlighted a new food safety product called D-Tox, which was developed by a CALS research team. Applied in a clear liquid form, D-Tox breaks down dangerous mycotoxins into non-harmful forms, making the foods and animal feeds they contaminate once again safe for consumption.

This same team of scientists — bacteriology professor Jae-Hyuk Yu, former postdoc Ahmad Alshannaq PhD'18, and food science graduate student Dasol **Choi** — has now developed two novel food-grade antimicrobial products called Natural Preservative (NP) 1 and 2. They make the products by growing food ingredients in culture media alongside a safe fungus called Aspergillus oryzae. The fungus, also known as kōji mold, has been used in food and beverage fermentation in East Asia since ancient times. When applied to food, the products provide a strong safeguard.

"NP 1 and NP 2 have proven effective against a broad range of food-borne pathogenic bacteria and food-spoilage molds," says Yu. "And they have very strong antimicrobial effects on various MRSA strains and common, opportunistic human pathogenic fungi, including Aspergillus fumigatus and various Candida species."

The Wisconsin Alumni Research Foundation has filed an international patent for NP 1 and NP 2, and the products have drawn interest from major food companies, Yu says.



Corn inoculated with Aspergillus flavus is shown being treated with D-Tox during a demonstration in Jae-Hyuk Yu's lab. Photo by MICHAEL P. KING



In the search for better ways to fight disease, Jing Fan is pushing the boundaries of immunometabolism.

By MARIEL MOHNS

Jing Fan recalls the first science experiment she ever performed. She was a kindergartener in Beijing, China, and her class made glue out of flower petals. After soaking the petals in water for some time, their components broke down into a sticky solution.

"It's about chemistry," she says, reflecting on the process and what she observed. "The world is fascinating, and I just want to ask 'Why?'"

As an assistant professor of nutritional sciences in CALS and an investigator at the Morgridge Institute for Research, Fan continues to pursue that question through the exploration and understanding of metabolism. Metabolism refers to the chemical reactions that create the energy and resources needed to sustain life. It is a fundamental process that occurs in every cell of every living organism. When the process is impaired, it can become the underlying problem in many health issues, from diabetes to cancer.

"Understanding metabolism in specific systems will give us insights into general metabolic regulation," says Fan. "It's a very fundamental process; but, in terms of how cells use metabolism and their metabolic resource, it's very diverse. It takes an interdisciplinary approach to study it, so it's very fun."

Dynamic Changes

Living cells contain many metabolic pathways, which are connected series of biochemical reactions that serve important functions. Fan compares these intracellular pathways to the ways in which cities control roadways. Just as roads contain markings, traffic signs, and signals, cells have specific enzymes, signaling molecules, and other regulatory components. In both contexts, different situations will affect how a path is regulated. Fan's interest lies in the traffic flow. Sometimes the roads are clear. At other times, construction or an accident might bring traffic to a halt.



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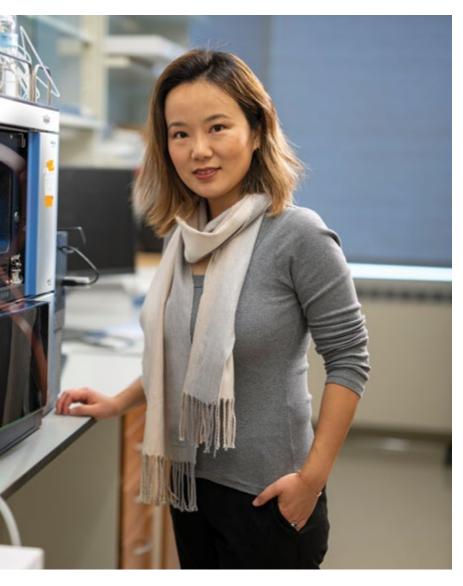
The Morgridge Institute for Research is a private, nonprofit organization dedicated to improving human health through interdisciplinary biomedical research. It's housed in UW's Discovery Building, along with the public Wisconsin Institute for Discovery and the first-floor community space called the Town Center, managed by the Wisconsin Alumni Research Foundation. The Morgridge Institute uses mechanisms unique to a private entity to help recruit top scientific talent and build powerful research collaborations. Many faculty from CALS and across the UW campus serve as Morgridge investigators and affiliates and leverage the institute's resources to advance their research. More at morgridge.org.



"Metabolism is fundamentally a very dynamic process," Fan says. "Whether you are a cell undergoing stem cell differentiation, immune cell activation, or cancer proliferation, you respond and keep sensing the environment. You figure it out."

Fan discovered her fascination with metabolism while completing her undergraduate studies at Peking University. But after 22 years in China, she was ready for a big change. So, she moved across the globe to pursue a graduate degree in chemistry at Princeton University. After earning her Ph.D., and following a postdoc appointment, she took on her current role at the Morgridge Institute and in the Department of Nutritional Sciences in 2017. Fan began her research career with a focus on cancer metabolism. But, just as science is constantly changing and evolving, the focus in Fan's lab also shifted.

"I consider myself a metabolism researcher — anything metabolism. I never saw myself as just a cancer metabolism researcher," Fan says. "What made me start to think about immune cells is how metabolism and cell function are related."



While cancer research is obviously important, Fan says immune cells are interesting because they are functionally flexible. Cancer cells proliferate because of improper regulation, but they do little else other than grow. Immune cells are far more active — they have different functions depending on the environment.

"Immune cells go through a dynamic change that is really fascinating," she says. "From killing to healing, one cell type can be doing all of this — it's a complex spectrum. It's a perfect platform to figure out how dynamic metabolic regulation and functional changes are connected."

Macrophages and neutrophils are cells within the innate immune system, the nonspecific first line of defense against infectious agents such as viruses and bacteria as well as injury and wounds. Innate immune cells are relatively understudied compared to T cells and other immune cells involved in adaptive immunity, which is a specific response to an infection from a repeat offender.

Fan and her team ventured into this new territory

ling Fan, assistant professor of nutritional sciences at CALS and investigator at the Morgridge Institute for Research (MIR), in her MIR lab at the Discovery Building on the UW campus. Photo by MORGRIDGE INSTITUTE FOR RESEARCH/ DAVID NEVALA

with studies published in the July 2019 issue of Nature Metabolism and the October 2022 issue of Nature Chemical Biology, which investigate how changing metabolism can regulate the different functional states in macrophages over the course of an immune response.

The immune system requires a delicate balance and must be very precisely controlled. Too little response and the pathogens won't be defeated; too much of a response and the body attacks its own cells and can cause tissue damage. Immune cells are activated by different stimulants, and each stimulation spurs its own dynamic response. Immune cells also communicate with and are influenced by one another, which adds another layer of complexity.

Using the city roadway analogy, the team zoomed in to look at specific regulation points and stimulants that influence the pathways in activated macrophages. "We're measuring the traffic, the flow of metabolism, and examining how these pathways are regulated and controlled," Fan says.

Gretchen Seim MS'16, PhD'22, lead author of the studies, completed her Ph.D. in Fan's lab and now works as a scientist at Genentech, a Californiabased biotechnology company. Seim says the biggest takeaway is that the metabolic response of these immune cells is dynamic, so studying the process over time is important.

"It's more dynamic and complicated than previously thought, and if you study its change over time, you can find new insights into how metabolism is supporting function," Seim says. "It's not a binary, on-or-off state, and looking at only one time point is really insufficient to capture the complexity of what's going on, not just in metabolism, but across the board."

Future studies would include examining other regulation points of the pathway, as well as the many other metabolic pathways involved in the complex cellular system. "The more we know about where those particular regulation points are, the better we can find ways to alter them, to change the flow and ultimately the function of the cells in diseases where the immune system is not behaving in the way that we want it to," Seim says.

Fan notes that the jump from cancer metabolism to immunometabolism isn't that big of a leap. Macrophages happen to be some of the most abundant non-cancer cells within a tumor environment. The ultimate goal is to define and understand the regulation points of all metabolic pathways to inform the development of immunotherapies for diseases, including cancer.

"I feel very flexible in terms of what I'm going to do," Fan says. "I'm always very attracted to interdisciplinary work that connects many pieces together."

An Interdisciplinary Approach

As an undergrad with many interests, Fan remembers the difficulty of settling on a research direction. Her initial interest was in physics and math, but those fields led her to engineering, then chemistry, and, naturally, biology. Through biology, she found metabolism, "the perfect playground," she says, "where I can do a little bit of everything. Intellectual freedom is a huge draw for me."

She explains that, at its most fundamental level, metabolism is simply chemical reactions, how atoms move around. Zoom out one level, and it's a biochemical process: how proteins work and are regulated. Zoom out further, and it's an engineering problem: how pathways within the network are controlled. And the lab work involved utilizes a variety of tools and methods, from cell culture and molecular biology techniques to quantitative analysis and network modeling. So, by its very nature, the study of metabolism requires interdisciplinarity in terms of both topics and approach, which suits Fan well.

"Jing is a perfect example of why people who are driven by curiosity make such stupendous scientists," says Morgridge Institute CEO Brad Schwartz. "She is endlessly inquisitive, she loves what she's doing, and she's never afraid to follow the data to see where it leads. This is a great recipe for making exciting discoveries."

When Fan began thinking about exploring the role of metabolism in immune cells, she started with the literature. But because little published research existed on topics such as neutrophil metabolism, she turned to experts on campus.



CALS graduate student Nick Arp and postdoc Gretchen Seim MS'16, PhD'22 collaborate in Jing Fan's lab space at the Morgridge Institute for Research.

Photo by MORGRIDGE
INSTITUTE FOR RESEARCH/

"When she approached me about collaborating, I was excited to interact with her," says Anna Huttenlocher, a physician-scientist and professor of pediatrics and medical microbiology and immunology in UW's School of Medicine and Public Health. "Jing is a thoughtful researcher who is pushing the boundaries in immunometabolism."

Huttenlocher's lab studies the mechanisms that regulate innate immunity, with a focus on tissue damage and wound healing, through a zebrafish animal model that mimics biological processes in humans. Her lab is also interested in the migration and invasion of cancer cells. Fan's and Huttenlocher's labs collaborated on a study, published in the March 2022 issue of *Nature Metabolism*, exploring the metabolic pathways that power neutrophils.

As the first line of immune defense, neutrophils need to activate quickly to recognize and react to infectious pathogens. Billions of these cells are produced in the bone marrow each day, so the cells are plentiful but also short-lived.

Fan's graduate student, Emily Britt (Huttenlocher is a member of her thesis committee) was first author on the study. She mentions how the lab began to think about neutrophils in a different way: "Because they are so fast-acting, it probably means they change their metabolism really quickly, and we thought it would be worth pursuing."

When neutrophils are activated, they undergo an "oxidative burst," through which they convert oxygen into a reactive form that can damage pathogens. This is a metabolically demanding process.



They found that the oxidative burst was being powered by a dynamic shift from metabolizing glucose through glycolysis to using the pentose phosphate pathway, a unique metabolic mode that helps power the neutrophil to quickly turn on and attack pathogens at the immunological front line. And not only was glucose diverted to the pentose phosphate pathway, but some steps of glycolysis were reversed so that the glucose molecules could be recycled to pass through the pentose phosphate pathway again.

"As we saw those core changes, the next question was, if we mess up those changes, are the cells still able to perform their functions?" says Britt.

Indeed, when the team experimentally blocked the pathway, there was no longer an oxidative burst, and the neutrophils lost the ability to kill pathogens.

Fan emphasizes how brave it is to start something new, and it was Britt's enthusiasm that played a huge role in getting the lab to begin work on neutrophil metabolism research. Britt's perspective: "Jing has been a great mentor in building my confidence as a scientist."

A major challenge for the researchers was the onset of the COVID-19 pandemic, which brought some of their initial work to a halt. But Fan motivated Britt to embrace the "mix of fun and challenges" to push forward as they learned how to connect remotely and work in a whole different way.

Fan adds that this work demonstrates the beauty of having an unbiased approach to discovery, especially in a relatively new field such as neutrophil metabolism. "And we're seeing that anything is possible," she says.

As a private research institute, the Morgridge Institute is structured to be interdisciplinary by nature, and Fan says this gives her and other researchers the flexibility to pursue potentially paradigm-shifting science. And the partnership between Morgridge and UW, she says, is critical for her career and her lab's success. "We can have an expert on campus bring the immunology piece, and I bring the metabolism piece; then something interesting happens," she says.

"This is what makes science fun," Huttenlocher adds. "Where new discoveries happen because you are allowing collaborations across fields."

Into Unexplored Territory

With her lab and continued collaborations, Fan hopes to continue expanding her knowledge in the immunometabolism field. As the development of immunotherapies to treat diseases continues to grow, so does the need to better understand the complexities of the immune system and its metabolic processes.



Jing Fan and CALS graduate students Laura Steenberge and Jorgo Lika analyze metabolites from a sample using liquid chromatographymass spectrometry in Fan's Morgridge Institute lab. Photo by MORGRIDGE INSTITUTE FOR RESEARCH/ DAVID NEVALA



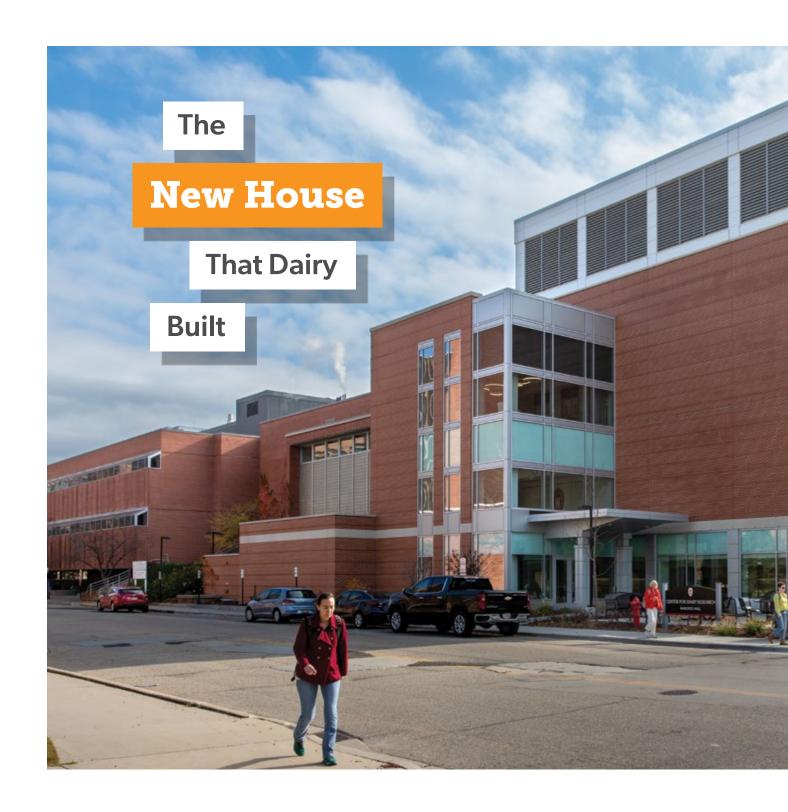
"Immune cells are a huge area with so many things to study," she says.

Right now, the lab is focused on the metabolism of macrophages and neutrophils individually; but inside a living organism, there is a lot of interaction between different cell types.

"We're very interested in expanding into cell-cell interactions, like how macrophages and neutrophils interact," she says. "There's also obviously the interaction between immune cells and microbes, the pathogens and harmless bacteria alike in the microbiome. Immune cells need to figure out how to deal with that."

Fan's lab has just started to gather metabolic data looking at myeloid progenitor cell differentiation, how precursor cells (derived from stem cells) mature into macrophages, neutrophils, and other innate immune cells. UW and the Morgridge Institute have strong regenerative biology and stem cell research expertise, which Fan is ready to tap into if the opportunity arises. She'd also like to explore the interaction between immune cells and cancer cells, the area of research where her lab got its start.

And she continues to look ahead with an interdisciplinary approach in mind. "There's enough science to study. I can't spread myself too thin, but I just can't stop," Fan laughs. "And I know the collaborations will be fun."



The Babcock Hall Dairy Plant and the Center for Dairy Research get major updates in form and function.

Story by Jori Skalitzky BS'22 | Photos by Michael P. King



Campus community members walk along Linden Drive, past the newly remodeled Babcock Hall and the Center for Dairy Research, at UW-Madison.

hen it was first constructed in 1951, Babcock Hall — UW's beloved producer of ice cream, cheese, and other famous dairy goods - was a

welcome improvement. Its 60-year-old predecessor, Hiram Smith Hall, was putting serious constraints on the faculty and students working there. And sometimes, as the saying goes, history repeats itself. Once again, Babcock Hall is getting a major (and much-needed) upgrade.

Long considered a state-of-the-art facility, the Babcock Hall Dairy Plant satisfied the needs of the Department of Food Science and the Center for Dairy Research (CDR) for several decades. But their goals were becoming too great for the outdated equipment and limited space. This recent overhaul, now in its final stages, remodels the dairy plant and includes a brand-new, three-story addition for the CDR.

The UW Board of Regents initially approved the remodeling and expansion plan in 2012. Their endorsement included some state building dollars and an expectation for private fundraising to provide matching funds. The CDR worked with the dairy industry to quickly raise \$16 million from donors. Following approval by the Wisconsin State Building Commission in 2013, budget and design considerations delayed the construction until July 2018, when contractors began working on the site. The project wraps up this spring.

Classic Babcock Products Made Even Better

Thanks to the dairy plant, Babcock ice cream has become a campus staple and a popular treat statewide. One core function of the plant is to provide this signature frozen dessert and other dairy products, such as its award-winning cheeses, to the adjacent Babcock Dairy Store. Babcock Hall and its manufacturing plant have also served as vital spaces for the university's dairy-related research and training. With the completion of construction, all of these functions stand to be greatly improved.

"It has been a long process renovating the dairy plant," says plant manager Casey Whyte, "and I am really excited for how it has turned out."

One of the most highly anticipated features, according to Whyte, is the brand-new freezer space. The size of a modest banquet room, this single unit is a significant upgrade from the old facility's three smaller freezers. The large space, which will hold rows upon rows of Babcock ice cream stacked in an orderly fashion, brings many benefits.

"It may not seem as exciting as a new piece of equipment," says Whyte, "but it provides a lot of flexibility in how we operate on a day-to-day basis." With a better freezer system, the dairy plant can be more efficient with its ice cream making. Instead of having to prepare frequent, smaller batches to refill the freezers, larger batches can be made, allowing employees more time to develop products, including new ice cream flavors.

Ice cream may be Babcock's most well-known product, but you can't make ice cream without milk. Another essential aspect to the Babcock renovation includes a modernized raw milk receiving bay, outfitted with new pumps, pipes, and holding tanks. From there, the milk can undergo different processes to create a wide variety of products.

The dairy plant project also brings the latest equipment for milk processing, ice cream churning, milk bottling, and cheese making. "This new facility will allow for Babcock Dairy to meet new food safety standards and produce the high-quality dairy products that the campus community has come to know and love," says Whyte. "With the renovation complete, Babcock will still be able to produce all these products, but in a more technologically driven way."







[Top] Workers install piping and equipment under the observation deck in the Babcock Hall Dairy Plant.

[Bottom left] Babcock Hall Dairy Plant supervisor Greg Turner, far left, and plant tech Jim Moccero, right, wrap up accepting roughly 8,000 pounds of milk from a truck in the new drive-through intake bay that is shared by the dairy plant and the Center for Dairy Research. At center, a truck driver climbs down after closing a hatch that must be opened to vent the tank as milk is pumped from it. The intake bay also features a staircase, harness, and cage to facilitate the task safely, without ladders.

[Bottom right] Turner, left, and Moccero operate a control panel to collect milk from a truck in the drive-through intake bay.









[Top left] Plant manager Casey Whyte, left, and Rick Montana, engineering manager with contractor Membrane Process and Controls, try to keep up with the rapid output as they test the operation of an ice cream filling and packaging machine for pint and smaller cups at the Babcock Hall Dairy Plant. They are using containers with the old Babcock Dairy logo, now being phased out.

[Top right] Plain, unflavored ice cream sits in three-gallon containers after a test run of new ice cream freezing, filling, and packaging equipment. The fine-tuning process requires much trial and error: These containers show varying fill levels and a freeze point slightly under target. The dairy plant aims for more ice crystal formation, which would result in a drier, less shiny appearance.

[Bottom] New separating and pasteurizing equipment, tanks, and piping. The painted floor is part of a color-coded system (green, yellow, red) that indicates the level of hygiene required to meet food safety standards in a given area.

To learn more about the Babcock Hall renovation and the Center for Dairy Research addition, including an open house to be held at the CDR on April 14, visit babcockhall.cals.wisc.edu.









A Tasteful New Babcock Dairy Logo

By Jori Skalitzky BS'22

To make way for the Babcock Hall remodel, the dairy plant had to shut down production for more than three years. Fortunately, a large inventory and contracts with other manufacturers allowed limited varieties of ice cream and cheeses to be available during that time. Even so, it's been a long wait for the Babcock Dairy faithful.

But good news has arrived: In-house production is scheduled to resume in spring, and it will eventually bring back the full array of Babcock Dairy products. Ice cream flavors not seen for some time will once again fill the freezers at the Babcock Dairy Store, a favorite haunt of generations of Badgers. And the familiar products will boast the same great taste — but in a whole new package. That's because, to mark this new era of dairy production on campus, Babcock Dairy operations is releasing a new logo for its products.

Designing a logo isn't an easy task. How do you encapsulate your brand's identity in a singular image? To take on this challenge, the Babcock Dairy team worked closely with UW designers Danielle Lamberson Philipp and Kelly O'Loughlin.

Babcock has always offered signature dairy products on the UW campus. That connection is reflected in the new logo's use of Badger red and white (UW's primary colors) and the university's name along the top. Icons representing the signature dairy products — cheese, ice cream, and milk — are prominently displayed above the word "Babcock," emitting rays of light reminiscent of the university's Numen Lumen seal.

Although the production facilities have received a well-deserved upgrade, the plant will keep presenting its traditional products along with some novel offerings. The original Babcock ice cream recipe was developed in 1951 when the hall was first built, and it hasn't changed since. "Our ice cream is one of many products that makes us unique," says store manager Kari Backes. "Customers keep coming back for the memories of our original, signature flavors." As a nod to this original recipe, the logo includes the establishment date at the bottom, and the ice cream cone icon appears front and center.

A few dairy store products are already sporting the new logo, such as nut mixes, coffee bags, and mugs. The full transition will take place once renovations are complete and production resumes.

More Dairy Research, More Dairy Products

On the west side of Babcock Hall stands the new three-story addition, now home to the CDR. Since its founding in 1986, the CDR has contributed its expertise to the dairy industry through research, product manufacturing, support of entrepreneurs, and more than 20 short courses for cheesemakers and other dairy professionals each year.

The CDR staff help producers refine and improve traditional dairy products, such as cheese and butter, but they often lend a hand with more out-of-the-box ideas. For example, GoodSport, an innovative sports drink based on ultrafiltered milk, was formulated with help from the CDR (see "A Dairy Venture into the World of Sports Drinks," Grow, Fall 2021). And the center's new facilities are equipped to handle ever-growing industry demands.

Among the areas of growth in the Wisconsin dairy industry are specialty and artisan cheeses, which require different processing and aging methods than your average cheddar or brick. In addition to its new cheese processing equipment, including raw milk silos, a pasteurizer, a separator, cheese vats, and cheese pressers, the CDR has just the thing for specialty cheeses cheese caves. Also called ripening rooms, these caves are where dairy magic happens.

Each of the CDR's 10 ripening rooms has its own set of environmental controls that create specific conditions, such as temperature, humidity, and air flow, for aging cheese. Depending on what conditions are set, the CDR staff can make any type of cheese they desire.

"My hope for the next 10 or 20 years is that we are doubling the amount of specialty cheese made here in Wisconsin," says John Lucey, food science professor and CDR director. "We have the best cheesemakers here and top-quality milk — we just need to keep working on innovation and looking at new products."

The cheese making happens on the CDR's main floor, but the specialty dairy products can be found upstairs. This floor is equipped for further processing of milk, such as filtration, concentration, and evaporation. Up here, the CDR can work on anything from cream cheese to Greek yogurt and other fermented dairy. With a new, two-story, three-stage dryer, the center can produce dry products such as whey and milk powder. An aseptic line, a unique collection of equipment and packaging is used to develop shelf-stable beverages, further expanding the CDR's research capabilities and, thus, who it can serve.

"One thing that's amazing to me is the range of products we can now make," says Lucey. "Really, almost anything we want to make, we can make here now. We have the space and the flexibility to be able to do that."

It's not just CDR staff that can use the plethora of new equipment — on almost any given day, industry professionals can be seen conducting trials and attending short courses. On the first floor of the CDR addition, short course participants shift between the Sargento Training Center auditorium for lectures and the Hilmar Cheese Dairy Applications Lab for hands-on learning and tasting. The auditorium, lab, and cheese making areas are equipped with a camera system to accommodate virtual distance learning and to showcase real-time activities to participants in the auditorium.







[Top] Cheesemaker Gary Grossen, background, and chemical engineering student Noah Shelander, foreground, stir around the edges of open vats during a cheddar trial in the new specialty cheese making room at the Center for Dairy Research.

[Bottom left] In the new Hilmar Cheese Dairy Applications Lab, participants in a Dairy Protein Beverage Application short course engage in a tasting session for a plethora of beverages made with dairy ingredients.

[Bottom right] Dean Sommer MS'81, cheese and food technologist, explains the mozzarella manufacturing process during a cheese grading workshop in the Sargento Training Center.







[Top left] Dean Sommer, cheese and food technologist, leads a session on pizza cheese performance in the new Hilmar Cheese Dairy Applications Lab during a cheese grading workshop.

[Top right] Shelby Anderson, communications specialist at the Center for Dairy Research, closes the door to a cheese ripening room, or cheese cave, while giving a tour at the research facility. The room contains an experimental bloomy rind cheese in the early stages of aging. Bloomy rind cheeses are soft-ripened varieties, such as brie and Camembert.

[Bottom left] In the new applications lab, associate researcher Susan Larson leads a demonstration on dairy ingredient functionality during a Dairy Protein Beverage Application short course.

[Bottom right] John Jaeggi, cheese industry and applications coordinator, leads a session on blue cheeses in the new Saputo Atrium during a cheese grading workshop.





To get a greater sense of the grand scope and enhanced capabilities of the new, world-class Babcock facility, visit go.wisc.edu/Babcock-Project.









From Hardship to Hope

A team from CALS and the UW-Madison Division of Extension cultivates communities that can contend with farm stress together.

Story by JIM MASSEY Illustrations by ANNIE BAKST

eon Statz used to get stressed about almost everything on his Sauk County farm. He worried about the weather, the bills, the crops. And when he sold his milk cows, he fretted about whether he could successfully transition to something other than dairy farming.

Eventually, the stress built to a level that Leon couldn't handle, and he took his own life.

"He thought he was a failure and he did everything wrong," his wife, Brenda, says. "He let the anxiety get the best of him."

Stress has been a pervasive emotion in the farm community for as long as farmers have grown crops and raised animals. But there are signs it's getting worse. In a 2021 American Farm Bureau poll, 61% of farmers and farm workers said they were experiencing more stress and mental health challenges compared to the previous year. Some farmers can take the ups and downs of their profession in stride, but others struggle with the uncertainties and the multitude of decisions they have to make each day.

But they don't need to endure it all alone. Two experts from CALS and the UW-Madison Division of Extension are helping Wisconsin farmers deal with the occupation's stressors before they can take a heavy toll.

John Shutske is a professor in the Department of Biological Systems Engineering at CALS and an agricultural health and safety extension specialist, and Joy Kirkpatrick is a farm succession outreach specialist with the UW Center for Dairy Profitability. Together, they've been working on farm stress-reduction programs for about six years. Little by little, they believe their efforts are improving lives.

One of the extension programs they've adapted for agricultural applications is called "WeCOPE" (COPE stands for "Connecting with Our Positive Emotions"). The program was developed by staff in the Division of Extension's Health and Well-Being Institute in early 2021. Later that spring, Shutske and Amanda Coorough, at that time an extension health and well-being educator in Sauk County, created an agriculture-friendly version with the help of a grant from the U.S. Department of Agriculture and a partnership with the Wisconsin Department of Agriculture, Trade and Consumer Protection.

Through an exploration of 11 emotional skills, the sevensession WeCOPE (available in-person and virtually) helps farmers and agricultural professionals practice ways to improve their emotional and physical well-being while decreasing the negative feelings and emotions connected to stress.

"Often, programs focus on telling farmers they have stress farmers know that," Shutske says. "WeCOPE instead focuses on high-impact, proactive skills we know measurably improve one's sense of well-being while improving all aspects of health. A person who is able to live and work with more positive emotions will see less of an impact on the stressful conditions and issues that affect farmers, and they can also more effectively make decisions for success when times are challenging."

Kirkpatrick, who has been UW's go-to person for farm succession planning for more than two decades, began devoting more of her time to farm stress in 2016 when milk prices plummeted and farm stress soared. It was easy for her to tie her farm succession specialty to the topic of farm stress since transitioning out of farming is often an arduous task. She recalls asking Shutske to do a presentation titled "This is Your Brain on Stress," which encouraged farmers to think about chronic stress and how it affects their decision-making ability.

"A lot of the time, farmers don't like to plan too far ahead because they think it boxes them in," Kirkpatrick says. "But it can really give them a roadmap to know what decisions to make as they're moving forward. The value of planning hasn't been



emphasized enough to realize how much of a stress reducer that can be."

Coorough, who is now working in a new role with the Extension Institute of Health & Well-Being, has been collaborating with Shutske and Kirkpatrick locally and statewide on WeCOPE and other farm-stress initiatives. After working together on a series of workshops with farm audiences, Coorough developed a seven-episode podcast series that emphasizes the positive emotions of the WeCOPE program. They also plan to record a series of short videos to deliver the messages in another format.

Coorough says some programs reach a saturation point, where everyone who is interested in the program has participated. But WeCOPE continues to be popular.

"Sometimes I have people take it more than once," she says. "They like having a community of people who they can share their experiences with."

fter Leon Statz died by suicide in 2018, a group of people met in a church basement in Loganville to consider how they might address the problem of farm stress and suicide. Dorothy Harms BS'81, who farms with her husband, Don, near Reedsburg, attended that meeting and eventually became one of the organizers of a local group they call the Farmer Angel Network.

"Leon's death was a call to action," Dorothy says. "We decided we couldn't just stand by — we had to do something. We are focusing on providing education and resources to farm families who need support."

Dorothy says she attended the initial meeting because she and Don were going through a difficult transition from dairy farming to beef farming, and she was concerned that the change would be especially hard on her husband. The Harmses then took advantage of free mental health vouchers offered by the Wisconsin Farm Center, an arm of the Wisconsin agriculture department, to meet with a mental health professional and discuss what they were going through. They also met with Kirkpatrick to talk about transitioning their farm to their daughter.

Brenda Statz speaks openly about her husband's suicide in an effort to help others understand that it's okay to seek help. "I want people to realize they're not alone," she says. "If a neighbor stops by and you are stressed out, tell them you haven't been feeling too good. After you get done talking about the weather, talk about what's bothering you. Sometimes I've had people say, 'After I talk about it, I feel a lot better. I think I'm going to be OK.' It just makes them feel better to know somebody cares."

And she's learned that sometimes it's best to ask a person point-blank if they are considering suicide. "That might snap them out of it," Brenda says. "They might think, 'Maybe I'm OK, and I can work through this.' Sometimes all it takes is someone who's willing to listen."

Shutske says while the blunt question is often appropriate, the people asking the question should do so within the context



of knowing what to do next. This is why university officials have been offering programs on suicide prevention, such as Mental Health First Aid (MHFA) and QPR (Question. Persuade. Refer.). MHFA helps people assist someone experiencing a mental health or substance-abuse challenge. QPR teaches participants how to recognize the warning signs of suicidal thinking and refer people at risk for help. Shutske is a certified trainer in QPR, and Kirkpatrick in MHFA, so they are well prepared should such a situation arise.

hen the first meeting was held in the church basement in response to Leon's death, about 40 people came, some from as far away as 100 miles. Brenda recalls one woman in attendance who mentioned that three members of her family had died by suicide. She suspects the rise in suicides may be tied to a growing sense of isolation.

"Back in the day, neighbors worked together to plant and harvest their crops," says Brenda. "As farms have gotten bigger, we've kind of lost that community. Now everybody is so busy they don't even take five minutes to stop and talk."

Dorothy Harms says farmers often tell others about the pain in their hip or knee, but they don't feel comfortable talking about the pain they're feeling inside their heads. "We all need to take a moment to talk to our farm neighbors and say, 'How's it going? No, really, how's it going? I'm here to listen,' " she says.

Kirkpatrick has made presentations to the Farmer Angel Network about stress and transitioning to emphasize to farmers their high levels of employability. Many farmers have plumbing,

carpentry, welding, electrical, and mechanical skills that will help them find jobs quickly, yet they often feel a career outside of agriculture is not an option.

Farmers sell their family estates for a variety of reasons, and many consider it a personal failure, Kirkpatrick says. They don't blame government farm policies or buyers who don't pay them enough for their products — they often blame themselves. The decision can weigh heavily on a farmer, especially if he or she is the last in a line of family members to run the operation.

Kirkpatrick is working on connecting people with the MHFA training program. She says it's important to get the information to agricultural organizations, agricultural service professionals, pastors, or anyone who comes in contact with farmers to give them the skills they need to identify people who might be in crisis. In some cases, physicians and other healthcare professionals might need the training to help them understand farming and ask their patients better questions.

"An example we use is a farmer might come in and finally have worked up the courage to talk to his doctor about how stressed out he is, and the prescription from the doctor is to take a vacation," she says. "That does not go over well."

yan Sullivan, who runs a small, diversified crop and livestock farm north of Manitowoc, enrolled in a workshop organized by Kirkpatrick this past summer called "Cultivating Your Farm's Financial Future." It provides farmers with tools to address fiscal challenges and other stressors related to their farms.

Sullivan, who recently retired from a career as an Air Force technician, says he was all too familiar with the perils of stress during his military service.

"We got a lot of training dealing with stress and suicide awareness; it's a big issue in the military," Sullivan says. "There are a lot of different types of stresses in farming. We've been building our farming operation, and as we've been doing so, a lot of our personal savings have gone into the farm. There are a hundred different things that could go wrong and cause you to lose a lot of money real quick."

Sullivan says it's a "very great, specific therapy" to be able to talk to other producers at these workshops, and it's a stress reliever just to hear that other farmers face similar

issues and find ways to deal with them. He says he's been working on shifting his mindset from negative to positive, and he's refusing to let one setback send him into a tailspin. He's also come to realize that paying attention to his mental health is just as important as crunching the numbers that make his farming operation successful.

"I'm really working on taking full, deep breaths," Sullivan says. "You can slow down your heart, your anxiety, and your stress. When you start to think that everything's terrible, realize that there's way more going right than this one thing going wrong."

t Farm Technology Days in Clark County this past summer, Kirkpatrick set up a booth and put six jars on a table. Each jar had a label: farm succession, time pressure, unpredictability (weather or commodity prices), financial pressure, interpersonal conflicts, and isolation. She gave three navy beans to farmers who stopped by and asked them to put beans in the jars that represented their top stressors.

The financial pressure jar earned the most beans, although unpredictability came in a close second. Employee recruitment has also been a big problem for farmers in recent years, as it has been for many employers.

Shutske has had a strong personal interest in helping farmers deal with stress like this since the 1980s, when he saw his parents and other farmers struggle with high interest rates and drought. He completed training that gave him the tools he needed to respond appropriately in his early career. During the drought of 1988, he became deeply involved in stress and mental health management programming as a farm risk education specialist for an Illinois Farm Bureau-based insurance company.

"It was an area I was super interested in," he says. "I have the family background in it, and I have a passion for it."

Shutske worked as a farm safety specialist in Minnesota for nearly 18 years before joining the CALS faculty in 2008 as an associate dean and extension program director. During that time, he worked on unique educational programming using theater and the arts for more than 8,000 farmers and

agricultural service providers in several Midwestern states. Shutske again became immersed in the farm stress and suicide prevention issue in 2016 when he left his administrative post

> and moved to a role as a professor and director of the UW Center for Safety and Health. He held that position until mid-2022, after which the center shifted over to the Division of Extension.

Shutske and Kirkpatrick worked together on a variety of programs from 2016 to 2018 but realized quickly they needed to expand their efforts. They devised a plan to get more Extension personnel up to speed on available programming so they could spread the message beyond the agricultural realm.

"We were pleasantly surprised by how people were really willing to jump on the

bandwagon — and not just those involved with agriculture," Shutske says.

...realize that there's way more going right than this one

- RYAN SULLIVAN

He has also taken the message to large groups, such as online and in-person training sessions he helped conduct for about 500 federal Farm Service Agency professionals over a period of about six months.

"Bankers, loan officers, front office people, and farm consultants all need to have communication skills for dealing with farmers," Shutske says. "How do you ask a person if they are contemplating suicide? That's a really important question if you sense somebody is on that edge. We aren't trying to make these people mental health professionals, but we want them to be able to think through what that next level of referral might be, who the resources in their community are."

Some people might surmise that stress would be low on farms in recent days given commodity prices are at relatively



high levels. But many of the stressors have not gone away.

"Even in really good times, things can be super stressful," Shutske says. "Things are good now, so should we expand? Where will we find help? What is going to happen with fertilizer and fuel costs? What happens if commodity prices go down again? All of that uncertainty leads to anxiety."

A five-year Community Impact Grant, awarded as part of the Wisconsin Partnership Program in conjunction with the UW-Madison School of Medicine and Public Health, is helping Shutske and Kirkpatrick collaborate with colleagues at the Southwestern Wisconsin Community Action Program (CAP) to build farmer wellness coalitions within a five-county area. A team from Southwest CAP, CALS, the Division of Extension, and the Center for Community and Nonprofit Studies at the UW School

of Human Ecology will work with farmers, community leaders, health professionals, and others to develop a range of activities and resources for building resilience and knowledge in rural communities.

The goal is to form small groups of farm families in the region who can take up the mantle of farm stress, mental health, and suicide prevention. Shutske says answers to some of the concerns, barriers, and challenges in Wisconsin's farming communities are already embedded in those communities.

Some of the training programs Shutske and Kirkpatrick develop are as simple as helping farmers and those who work with them recognize the symptoms of someone who is facing a mental health crisis.

"Let's do some of the same things we would do if your neighbor had a broken bone or if there was a death in the family," Kirkpatrick says. "We can't quickly or easily address the gap in support services, but let's be our own resource and learn how to be better listeners and talk about mental health challenges the same way you would if someone had cancer or was in a car accident."

Farmers more than likely already have the skills to determine if a neighbor might have a problem, she says. For example, they have the intuition to notice if a calf is sick, if pests have invaded, or if their crops are struggling.

"If they can take that instinct and turn it to the neighbors, they may realize that maybe the neighbors aren't coming to church or the kids' 4-H programs like they used to and not just write it off that they're busy," she says. "Instead, they might reach out with a visit or phone call to see what's going on."



hutske believes he and Kirkpatrick have a knack for critical conversations, an ability to listen, and the tools to help others learn some needed skills. He says the younger generation's willingness to talk about mental health is a positive thing that could help break the stigma that the older generation often feels.

"I think we're good at sitting around the table and having conversations with farmers and farm families," he says. "I think that's a big part of it."

And others are glad to be having those conversations alongside them. Coorough says it has been gratifying to work with Shutske and Kirkpatrick to deal with the farm stress issue in Sauk County and across southern Wisconsin.

"Being able to work with specialists like John and Joy is amazing," she says. "They are such a great talent, and when they invite educators like me to work with them, it is really rewarding."

Brenda Statz, who is now running the family beef farm with her two sons, Tom and Ethan, says groups such as the Farmer Angel Network and farm stress programs offered statewide are all signs that people are recognizing the seriousness of the issue.

"A lot of people with depression are trying to farm out there," she says. "Farming is a wonderful way of life, but the challenges can be overwhelming when we feel we are alone. The stress level is just tremendous. Our pastor told me that Leon lost his joy in what he did, and it became more of a burden. If people can get help, hopefully they can get back to enjoying what they do." g



Photo by THERESA DIMENNO, photo below courtesy of LEE CLIPPARD

Champion of Wildflower Wonders

Lee Clippard promotes conservation one native plant at a time.

By ANDREW FAUGHT

here are few places like central Texas in the spring: Bluebonnets, paintbrushes, and primrose emblazon the hills and flatlands like an endless magic carpet. Travelers come from hundreds of miles around to bask in nature's colorful rebuttal to winter.

For Lee Clippard MS'02, executive director of the Lady Bird Johnson Wildflower Center in Austin, one species of flowering shrub brings particular joy. The Texas mountain laurel, a member of the bean family, evokes childhood. Its purple bloom clusters smell like — depending on your memory — grape soda or grape bubble gum.

"Sometimes it can almost be too sweet, but I love it," Clippard says. "It's just a wonderful smell."

Underlying the olfactory delights, however, is cause for concern. Climate change, land development, and invasive species are threatening the future of the Texas mountain laurel and other native plants, which are critical to maintaining ecosystems and supporting the work of pollinating insects.

In Texas, home to 5,000 wildflower species (about 900 of which can be seen at the wildflower center), a dozen varieties



have gone extinct. Nearly two dozen more are endangered. Evidence of the plight can be found in a multitude of front yards.

"There's been a real trend over the last century to mimic landscapes of England, France, and Italy, and to bring a bunch of plants from other places to do that," Clippard says. "When there's a yard in Arizona that looks like a yard in New York or South Carolina, it might be using plants that aren't adapted to the region that require more resources. There are abundant plants native to each region that are worthy of use and celebration."

Native plants, he adds, by their very nature are well adapted to their environments; they thrive in a region's normal rainfall without requiring "extra" pesticides.

Clippard became the center's new executive director in March after a brief stint as interim director in 2021. He had worked as the center's director of communications since 2014. Before that, he was director of communications at the College of Natural Sciences at the University of Texas (where he earned his undergraduate degree in biology). The 284-acre center was founded by the late first lady in 1982 as an independent research organization. The university took over operations in 2006. The center is the official botanic garden and arboretum of Texas. Clippard, for his part, counts plant evangelism among his duties.

"The role we play," he says, "is to bring an awareness of native plants to the world. Our mission is inspiring the conservation of native plants."

The center maintains an online plant database for people interested in growing sustainable gardens. But efforts to encourage awareness don't stop there. The center hosts a popular biannual native plant sale, and Clippard is looking beyond the treetops. Nearly 240,000 people visited the center in 2021; plans are to expand the center's facilities with the hope of boosting annual attendance to 400,000. Clippard hopes the expansion will help spread the message that change comes one native plant at a time.

"You really just need a small bed of native plants, and then, all of a sudden,

you might have monarchs and other butterflies appearing in this sort of ecological desert that we've created," he says. "We really can turn our backyards and front yards and green spaces into ecological habitats that are supportive of species facing various threats."

The insects he's helping protect today are actually what brought him to UW in the first place. Though he wasn't naturally drawn to bugs as a kid, Clippard developed a fascination in college, when he considered being an illustrator. "I drew birds and all kinds of things, but I especially liked drawing bugs," he says. Clippard enrolled in a master's program in entomology at CALS, figuring he wanted to be a college professor, but research didn't entice him.

Clippard's thesis centered on the behavior of yellowjacket foragers — the bane of many a picnic. He considered the arcane question of whether the aggressive scavengers exit and enter their nests randomly over time or in clusters.

"It had already intrigued investigators for 90 years," says Robert Jeanne, professor emeritus of entomology at Wisconsin and Clippard's advisor. "Some, finding evidence for clustering, concluded that it indicated some kind of social facilitation among workers, while others concluded that clustering was only apparent, a statistical artifact."

By videotaping nests and analyzing sophisticated statistics, Clippard's work supported the hypothesis that social interactions are the cause. The regular stings the pair suffered were offset by the quality of the findings.

"Lee was a quick learner and a cheerful workaholic," Jeanne says. "His positive outlook and enthusiasm made him a joy to have as a member of my lab group."

Clippard, who over the years has made colored pencil drawings of bugs, relishes the mutual benefits shared between insects and plants. He quotes Lady Bird Johnson's spirited mantra: "Where flowers bloom, so does hope."

"It's really wonderful to come to work every day with a community of people who are inspired to make change," Clippard says.



Yellowiacket illustration by LEE CLIPPARD

ENGAGE

SAVE THE DATE FOR GIVING

Day of the Badger returns on March 28–29! It's a day for all UW alumni, students, and friends of UW to give to their passion, show their pride, and stay connected to the university. More details and updates at dayofthebadger.org.

ACCOLADES

COLLEGE FACULTY-ALUMS RECOGNIZED

Many CALS alums earn distinction in their fields. And, sometimes, they just happen to be CALS faculty. Some recent honors:

- lo Handelsman PhD'84, fellow, National Academy of Inventors
- Anna Pidgeon PhD'00, fellow, American **Ornithological Society**
- John Ralph PhD'82, **Highly Cited Researchers** 2022, Institute for Scientific Information
- Steve Ricke PhD'89, Career Achievement Award, College of Agricultural, Consumer, and Environmental Sciences, University of Illinois

DOUBLE AWARD IN AGRONOMY

This summer, the American Society of Agronomy (ASA) elected Bala N. Devisetty PhD'75 as a fellow, the highest recognition it bestows on its members. The society also selected Devisetty as the winner of the ASA Industry Award, which recognizes outstanding performance by a private sector agronomist.



Five Decades of Student Support

By PEYTON MUELLER BSx'24

he first time the Wisconsin Agricultural and Life Sciences Alumni Association (WALSAA) awarded undergraduate scholarships, back in 1974, it dispersed \$1,800 to six CALS students. In 2022, that amount had reached \$25,000, and the number of students had grown to 18.

"WALSAA has a long history of raising funds from alumni and others to support student scholarships," says Taylor Fritsch BS'14, the organization's immediate past president and a 2012 scholarship recipient. "Growing those opportunities is an area of focus for us."

WALSAA is a charitable organization, founded in 1972, that connects students, faculty, alumni, and friends of CALS. Having just celebrated its 50th anniversary, the organization continues to grow, now boasting more than 1,600 members. It's led by a 20-person board of directors. WALSAA's board and its members have created a community that gives back continuously to support the educational goals of CALS students, Fritsch says. Scholarships are a big part of that effort.

Most recently, in 2021, WALSAA created the Senior Impact Award. The recipients of the award aren't selected based on academic achievement alone, explains David Cooper BS'89, chair of the WALSAA scholarship committee. "Instead, it's about what they have given back to the CALS program, and what they've offered to the community, relative to their time in Madison," he says.

WALSAA, visit walsaa.org. WALSAA introduced its Outstanding Sophomore Award in 1994. The scholarship helps students as they approach their third year, when the financial support they carried over from high school tends to dwindle. Stipends are \$2,000, and they're typically given to 10 students each year. Recipients of this award demonstrate exceptional academic achievement and involvement in CALS.

Gabi Conidi BSx'24 is a junior studying animal sciences on a pre-veterinary medicine track. She received the sophomore award in 2022 and says the financial assistance is greatly appreciated.



WALSAA Outstanding Sophomore Award recipients Gabi Conidi, left, and Nicole Broege, right, and WALSAA Farm and Industry Short Course Award winner Halei Heinzel, center, take a moment for a photo while volunteering at WALSAA's Football Fire-Up, a tailgate and scholarship fundraising event held every fall. Photo courtesy of WALSAA

"And it's nice to feel like my hard work is being recognized," says Conidi, who also serves as a CALS Ambassador, a student mentor, and an assistant researcher at the Comparative Orthopedics and Genetics Laboratory at the UW School of Veterinary Medicine.

In a typical year, WALSAA also offers \$2,500 in scholarships for Farm and Industry Short Course (FISC) students who excel in academics, activities, and leadership. However, those awards are on hold until FISC completes a restructuring process.

Besides scholarships, WALSAA supports students through several other programs. This includes "Impact Grants," which have provided more than \$40,000 to student organizations

and student life programs over the last five years. WALSAA also runs a speaker's bureau and a mentorship program.

Conidi says the scholarship she received offers more than monetary value. Through WALSAA events, she's met alumni in the animal sciences and other related fields who have provided her with guidance and support.

"They have been very valuable to me," Conidi says, "and they've reminded me that

it will all be worth it in the end."

+ INVEST IN CALS STUDENTS

To celebrate 50 years and continue its gift-giving legacy, WALSAA is hosting a

50/50 campaign. The money raised will

be evenly distributed between the Senior

Impact Award and a fund to support future

scholarship opportunities. WALSAA's goal

is to raise \$50,000 by the end of the year. To contribute or become a member of

> Conidi is also an example of how WALSAA brings students into the fold and creates long-time proponents of CALS. She now serves as a WALSAA student representative and plans on continuing with the organization post-graduation.

She explains, "I found my place in CALS, so I will continue to be involved in CALS."



dayofthebadger.org

#dayofthebadger



Strong Start at CALS

On March 28-29, 2023, we will direct all gifts to the college to "strong start" programs. These crucial programs – such as undergraduate learning communities, CALS QuickStart, and First-Year Interest Groups – help students explore different areas of study, learn how to access student services, and develop a network of mentors, classmates, and friends.

UW-Madison BioHouse Learning Community photo by Claire Zettle



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