

grow

Wisconsin's Magazine for the Life Sciences • Fall 2016

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College of Agricultural & Life Sciences
UNIVERSITY OF WISCONSIN-MADISON

STUDENT ORGS, STUDENT GROWTH • MYSTERIES OF MITOCHONDRIA • MANAGING CROPS FROM SPACE





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Wisconsin's Magazine for the Life Sciences

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Photo courtesy of Rosecrance Health Network

Beauty before bottling:
Wine grapes growing at the
West Madison Agricultural
Research Station.

PHOTO BY SEVIE KENYON BS'80 MS'06

Dean Kate VandenBosch

New Facilities Sharpen Our Cutting Edge



“As budgets tighten, it has been more important than ever for the college to prioritize its needs.”

To learn more, visit:
<http://meatsciences.cals.wisc.edu>
 and
<http://supportuw.org/giveto/plantbreedinglab>

Our researchers in the meat, plant and dairy sciences have for years been making cutting-edge discoveries in facilities that were anything but. Through their dedication and ingenuity, they have managed to do pioneering work in buildings that have not seen significant updates since the mid-20th century.

We’re addressing that problem now with a state-of-the-art Meat Science Building that breaks ground this fall and a Plant Breeding Lab for which we have launched a vigorous capital campaign. These facilities, along with others now in planning, will greatly enhance the college’s research, teaching and public service work in disciplines that are crucial to meeting our world’s food, energy, health and economic development needs.

Grow readers may remember our spring 2013 cover story about plans for the Meat Science Building. Located near the Natatorium between Observatory Drive and Linden Drive, this facility will serve to advance research on all aspects of meat production, quality and safety. It will also allow researchers to develop high-value nonfood products for use in human and veterinary medicine, among other applications. Fans of Bucky’s Butchery can look for a name change to Bray’s Meats, in honor of our late beloved faculty member Bob Bray. The Meat Science Building is slated to open in 2018.

Meanwhile, the Plant Breeding Lab will find its home in the current Meat and Muscle Biology Lab, which will be repurposed into a sophisticated facility to process, analyze and store plant germplasm. Safe and reliable storage for seeds is a critical foundation for research in everything from plant breeding and genetics, plant physiology and molecular biology to crop protection and management and climate science. The Plant Breeding Lab will replace both the Seeds Building, which will be torn down this fall to make room for the Meat Science Building, and the Horticulture Annex. It will bring together plant scientists and their lab groups from agronomy, horticulture, genetics, biochemistry and plant pathology into one updated facility—an arrangement that will serve to increase both collaboration and cross-training among these disciplines.

The Plant Breeding Lab will include such features as storage chambers allowing for different temperature and humidity levels, seed treatment and cleaning labs and a grinding room to prepare plant tissues for chemical analysis. We seek to raise \$3 million in private funds to support this significant renovation and remodeling effort.

As budgets tighten, it has been more important than ever for the college to prioritize its needs—and to invest our resources where we can have the greatest impact in both advancing research and meeting global challenges. These two facilities rose to the top through a long process that included consultation and partnerships with a wide range of stakeholders throughout the CALS community.

Neither venture would have been possible without alumni support. On behalf of the college, I offer you our heartfelt thanks.

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Editor
Joan Fischer

Writers
Nicole Miller MS’06
Caroline Schneider MS’11

Editorial Assistants
Rebecca Bock, Gilliane Davison,
Victoria Khoo

Design
Diane Doering

Photography/Multimedia
Sevie Kenyon BS’80 MS’06
Uncredited photos are either stock or nonprofessional photography

CALS ADMINISTRATION

Kate VandenBosch, Dean and Director

Richard Straub, Senior Associate Dean

Jed Colquhoun, Interim Associate Dean for Extension and Outreach

Rick Lindroth, Associate Dean for Research

Sarah Pfattheicher, Associate Dean for Academic Affairs

Heidi Zoerb, Associate Dean for External Relations and Advancement

INTERACTING WITH CALS Alumni:

Office of External Relations,
1450 Linden Drive, Madison,
WI 53706
Phone: (608) 262-1461
Email: alumni@cals.wisc.edu
www.cals.wisc.edu/alumni/

Prospective students:
Office of Academic Affairs, 1450
Linden Drive, Madison, WI 53706
Phone: (608) 262-3003
Email: undergrads@cals.wisc.edu
www.cals.wisc.edu/students/

Business contacts:
Office of Corporate Relations,
455 Science Drive, Suite 230,
Madison, WI 53711
Phone: (608) 263-2840
Email: inquiries@ocr.wisc.edu
www.ocr.wisc.edu

To make a gift to CALS:
Ale Nicolet, UW Foundation,
1848 University Ave., Madison, WI
53726-4090
Phone: (608) 308-5141
Email: ale.nicolet@supportuw.org
www.supportuw.org

To contact the magazine:
Grow Editor, 136 Agricultural Hall,
1450 Linden Drive, Madison, WI 53706
Email: grow@cals.wisc.edu
www.grow.cals.wisc.edu



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From Space to the Field

Farmers are testing a new technology that can help them better predict crop yields

Images captured from satellites orbiting 440 miles above the Earth tell a powerful, richly detailed story about crop yields—revealing the lushness or deficits of fields with surprising precision.

With the help of about 100 farmers so far as part of a citizen science project, researcher Phil Townsend and his team hope to coax even more valuable information from the satellite photos and change how farmers' yields are reported and analyzed.

"The reporting of crop yields is now done at the county level with information confidentially reported by farmers to the USDA," says Townsend, a professor of forest and wildlife ecology. "Counties can be very large. We now have the ability to analyze yields at the field level with these images, giving us much more accurate and granular data."

By tracking the greenness of fields from the satellites and analyzing climate data, researchers hope to identify impacts of insect pests, crop diseases and weather events like frost, tornados or hail.

First, however, they needed to test their yield estimates against farmers' actual yields. So Townsend's team developed a website—yieldsurvey.wisc.edu—that allows researchers to confidentially crowdsource crop yield information. Townsend is encouraging even more submissions.

Farmers can enter their field's location by dropping pins on a Google map, along with the type of crop and the actual crop yield for as many seasons as possible. The information is then analyzed and compared to estimates developed in Townsend's lab.

"Our yield estimates are within about 15 percent of what the farmers report," Townsend says. "Our target is to get that down to 10 percent. If you're a farmer, the closer you can get to that could be the difference between making money and breaking even."

Citizen science is a two-way street—it helps researchers tweak their estimates based on real data, and those more accurate numbers can help farmers be more productive and better managers.

Ultimately, Townsend says, the satellite technology and climate data, refined by knowing the actual

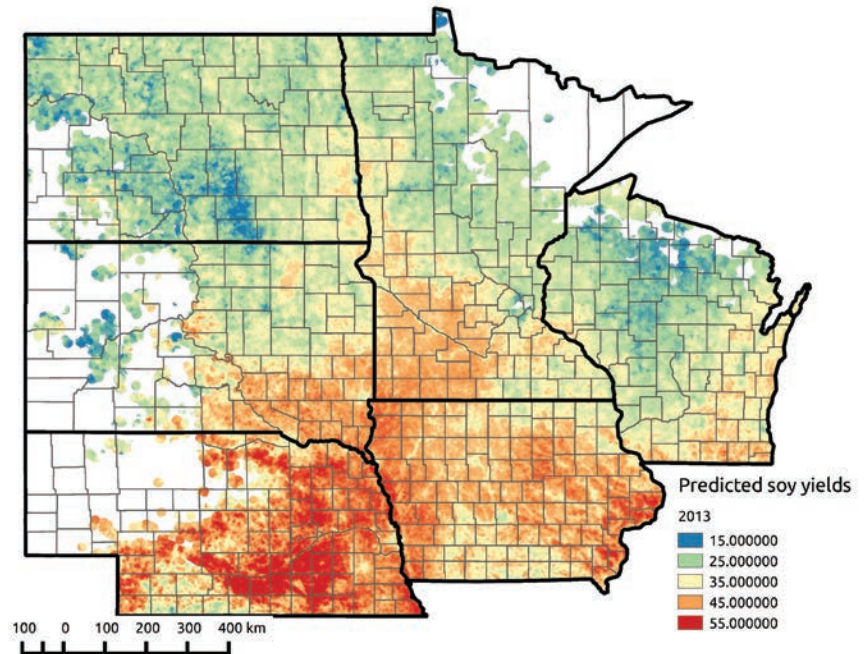


IMAGE COURTESY OF ADITYA SINGH/UW-MADISON CALS

yields from participating farmers, have the potential to predict crop yields well before harvest time.

Farmers see promise in the new approach, says Kevin Erb, a UW-Extension agronomist based in Green Bay.

"Farmers benefit from using remote sensing technology," Erb says. "If we know early in the season that we have the potential for above-average yields, that can affect the types of pesticides and fertilizers that you use during the season."

Being able to make decisions during the season based on this sort of predictive data could increase profits \$50 or more per acre, Erb says.

Townsend's team is cooperating with the USDA and hopes to snag funding to broaden the project. The effort is an example of the Wisconsin Idea at work, Townsend says.

"We have to connect with our constituents, and that's where crowdsourcing and citizen science comes into play," he says. "Farmers are participating in the science, and they see the benefits. It's building trust."

—DENNIS CHAPMAN

This map looking at soybean crops in the Upper Midwest shows how yields are predicted to vary even within the same county. Researchers are trying to verify their estimates by working with farmers to determine their actual yields.

The Inner World of Athletes

Students in a CALS capstone course used cutting-edge technology to explore a microbial medical mystery

So many things typically distinguish accomplished athletes from the rest of us—greater strength and endurance, better balance, faster reactions—but one of the more surprising differences is that, according to dental studies, they also tend to get more cavities.

This intriguing phenomenon was the subject of a capstone course in microbiology this past spring, offering undergrads a chance to be part of a burgeoning worldwide scientific effort while using cutting-edge technology.

students conduct meaningful research with these modern techniques makes them more competitive in the job market and better able to navigate the field of microbiology.”

Students were tasked with comparing the oral microbiomes of athletes and nonathletes, using saliva samples. They sampled a range of students, from UW athletes to occasional exercisers to students who hadn’t exercised for at least five weeks. Once students collected and prepared the samples—including their

own oral microbiomes—they sequenced the DNA and determined which microbes were present in each sample.

With so many samples, the students were able to look beyond the question of exercise to test other hypotheses they developed themselves.

“We wound up taking the same data set and asking other questions,” explains Samantha Gieger, who graduated in May with a BS in microbiology and genetics. “In groups of four or five, we looked at the effects of dairy, caffeine or using an electric toothbrush.”

Students presented their projects at a poster session last semester, and their work is currently being analyzed for publication. Their findings will become part of the growing research into microbiomes. Student Sophie Carr BS’16 and Christopherson were invited to the White House last spring for a summit announcing the launch of the National Microbiome Initiative.

As a capstone class, the course offered a research experience requiring students to integrate diverse bodies of knowledge to solve a problem. And it quickly proved invaluable as students considered next steps in their careers.

“I’ve learned so much—how to go about research, what to do when encountering a problem. Troubleshooting is such an important technique,” says Isaiah Rozich BS’16, then a senior majoring in microbiology and Spanish. “Figuring out which solution is best takes a lot of time, and it opened my eyes to what life as a researcher will be like. While it’s overwhelming, I think the end result is gratifying.”

—CAROLINE SCHNEIDER MS’11

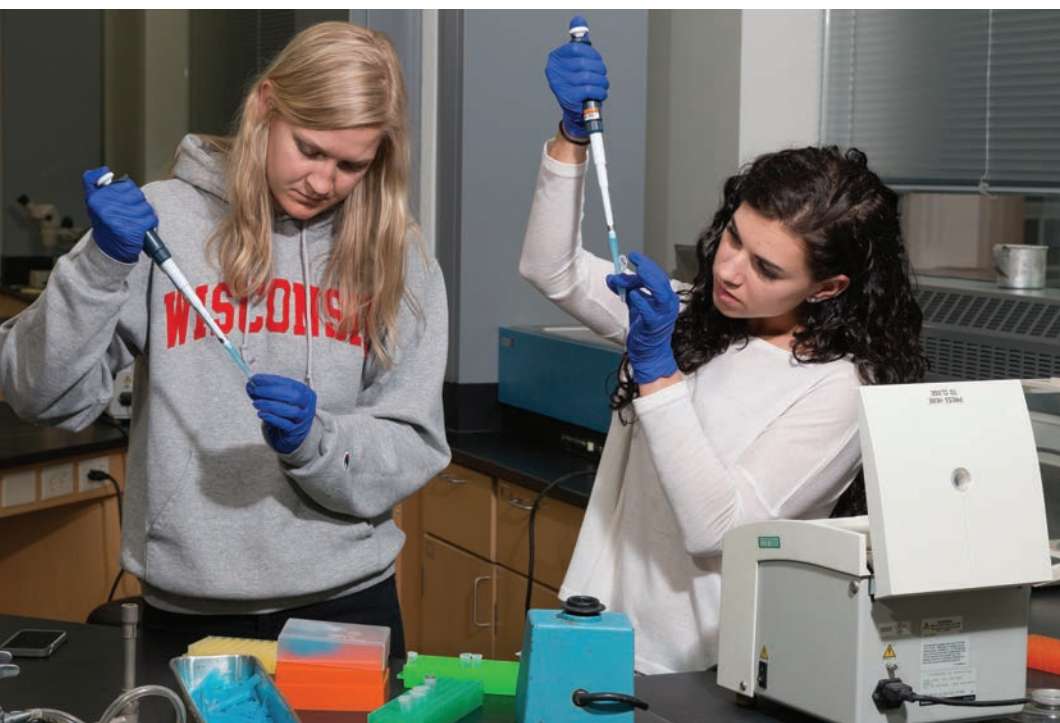


PHOTO BY SEVIE KENYON BS’80 MS’06

On the case: Students compared the oral microbiomes of athletes and nonathletes to figure out why athletes get more cavities.

There are trillions of microbes in the human body; the community of microbes that lives in each of us is our microbiome. As more and more research focuses on microbiomes, it’s becoming clear they play a significant role in human health and wellness. Microbiology 551 students worked to add to that body of research using a next-generation DNA sequencer manufactured by the California-based company Illumina.

“It’s only our department and maybe one or two in California that are doing hands-on work with undergraduates in teaching this technique,” says instructor Melissa Christopherson, a faculty associate in the Department of Bacteriology. “Having

Antibiotics Off the Beaten Path

CALS' Cameron Currie and his team are looking at microbes associated with insects, plants and marine life as potential sources for new drugs

PHOTOS BY SEVIE KENTON BS'80 MS'06

As more antibiotic-resistant “superbugs” emerge, it’s clear that we desperately need new antimicrobial drugs. Yet, over the past couple of decades, antibiotic discovery has largely been stagnant.

“The reality is there’s almost no new antibiotics that are developed. And that’s because pharmaceutical companies have decreased their investment—in part because of the rediscovery issue,” explains bacteriology professor Cameron Currie.

The “rediscovery issue” refers to the fact that soil has historically been the prime source of new antibiotics—but it seems to be tapped out. When scientists screen soil microbes for new antibiotics, they keep finding the same compounds over and over again.

Currie is part of a team that is looking elsewhere.

Currie and his colleagues have been focusing their efforts on microbes that are associated with insects, plants and marine life from all around the United States, funded by a \$16 million grant from the National Institutes of Health that was awarded in 2014.

“One of the major hurdles is finding new compounds, and that’s where we’re really excelling,” says Currie, a co-principal investigator on the grant. His partner is David Andes in the UW–Madison School of Medicine and Public Health.

At the front end, the work involves some good old-fashioned bioprospecting. Currie’s group, which is in charge of the terrestrial sphere, has gathered more than 2,000 flies, aphids, caterpillars, bees, ants and other insects, as well as mushrooms and plants, from locales near and far, including Alaska, Hawaii and Wisconsin’s Devil’s Lake.

Back at the lab, things get high-tech pretty quickly. Microbes are isolated from the samples and tested for antimicrobial activity. Promising strains undergo genetic sequencing that allows Currie’s group to determine how likely they are to produce novel antibiotic compounds. From there, other scientists involved in the grant go on to test the most promising compounds in a mouse model of infection. This approach has already yielded some exciting drug candidates.

“We have 9,000 strains to screen, and we have already found some new compounds that are effective at combating infections in mice and have low toxicity,” says Currie.



With so many samples to process, Currie’s group adopted bar code technology to help them keep track. They have a bar code reader—like you’d find in a grocery store—connected to a lab computer that they use to scan petri dishes, look up samples and add new data. For each microbial strain they’ve isolated, the database has photos of the “host” insect or plant, GPS coordinates for the collection site, assay results, genetic sequence and much more.

At this point, Currie feels confident that the project will pay off, and he’s eager to see one of the group’s compounds go into human clinical trials.

“If you find one new antibiotic that gets used in treatment, it’s a major success. You’re saving people’s lives,” Currie says.

—NICOLE MILLER MS’06



Caitlin Carlson, an associate research specialist in Cameron Currie’s lab, on the search for new antibiotics. Bar codes help the team keep track of the promising microbial strains they’re analyzing.

Natalie Hogan

Growing Veggies with City Kids



PHOTO COURTESY OF NATALIE HOGAN

Natalie Hogan, a sophomore majoring in dietetics and Spanish, hopes to practice nutrition education in schools, teaching kids about healthy foods. This past summer she honed her skills by gardening and cooking with school-age children in the Young Scientists Club, a program run by the Milwaukee-based Urban Ecology Center. Most of the kids were of Latino and African American backgrounds, and many live in neighborhoods where fresh produce is hard to come by.

In addition to preparing dishes like whole wheat pizza with fresh veggies—a big hit, Hogan says—kids took part in lessons about nutrition, sustainability and climate change, including such concepts as sustainable agriculture and carbon footprints from farm to table.

Hogan and her project partner, sophomore Katherine Piel, developed their curriculum through a Wisconsin Open Education Community Fellowship, an award totaling up to \$6,000 offered by the Division of Continuing Studies and the Morgridge Center for Public Service.

Hogan learned as much from the children as they learned from her. The kids at the Urban Ecology Center's Menomonee Valley branch were excited about gardening—planting, watering, harvesting and even weeding—while kids at Washington Park loved to cook. Hogan and Piel tailored lessons to suit those preferences, recognizing that enthusiasm is a key ingredient in learning.

The experience led Hogan to broaden her career goals. She still wants to teach children, but she'd like to include families and the larger community. "The parents are the ones buying the groceries and cooking the meals," says Hogan. "In order to make a difference, I must work to make an impact on parents, educators, policy makers—on all those who play a role in the health of our planet and people."

And she relished the small victories, like getting 8-year-old Victorio to eat a radish. Initially he made a "yuck" face, but out in the garden, after being the first to spot the red tops, he took charge of harvesting, washing, cutting and adding them to a salad.

"When it came time to eat them, he described them as 'crunchy and spicy, but still pretty good!'" says Hogan. "That was a positive experience because we could see his change in attitude. And he wasn't the only one!"

—JOAN FISCHER



GROUND BROKEN on the site of a new Meat Science Building to open in fall 2018. Donors, campus partners, faculty, staff and friends gathered with **Chancellor Rebecca Blank** and CALS **Dean Kate VandenBosch** on October 14 to celebrate with festivities including a ceremonial salting of hams that will cure until the building's grand opening. The Meat Science Building will be a state-of-the-art facility for advancing research on all aspects of meat production, quality and safety as well as developing high-value nonfood products for use in human and veterinary medicine, among other applications.

BESTOWED with a Lifetime Achievement Award from the National Association of Plant Breeders, horticulture professor **Phil Simon**, based on his cutting-edge research as a carrot breeder and geneticist as well as his distinguished service and leadership on a regional, national and international level.

HONORED with Alfred Toepfer Faculty Fellow Awards, genetics assistant professor **Xuehua Zhong** and plant pathology assistant professor **Erin Silva**. Zhong studies the epigenetic control of gene regulation, while Silva focuses on production practices to enhance the productivity and profitability of organic and sustainable cropping systems. The one-year award is bestowed on pre-tenure faculty whose research benefits agricultural activities within the United States.

NAMED the recipient of an Elton D. and Carrie R. Aberle Faculty Fellow Award, assistant professor of plant pathology **Mehdi Kabbage**. Kabbage, a mycologist, seeks to generate a complete description of necrotrophic fungal pathogenesis that will lead to suitable control strategies. Established by former CALS dean Abe Aberle and his wife, the award recognizes young faculty within CALS, providing a \$10,000 stipend to support the fellow's research.

Number Crunching



48 **BOY SCOUTS** earned merit

badges in the plant sciences in an on-

campus workshop in August. Scouts

took part in hands-on experiments,

lectures and tours of the D.C. Smith

Greenhouse and Allen Centennial

Garden. Graduate students

Kevin Cope (agronomy) and Chris

D'Angelo (horticulture) organized

the workshop in conjunction with the

Plant Sciences Graduate Student Council.

Five things everyone should know about . . .

The Future of Agriculture

By Deana Knuteson, Jeffrey Wyman and Mimi Broeske

1 | Apps are critical to ag. Farmers use mobile technology for many things, including turning irrigation and other equipment on or off, maintaining pest counts from field scouting, identifying bugs, checking field records, reviewing soil types, ensuring site-specific planting or production and keeping track of pest control operations. These apps often link directly to computers, allowing farmers to maintain a complete record of everything that happens on the farm and make critical long-term comparisons.

2 | Big data is helping agriculture. Data is being collected on all aspects of production, and big data analysis can improve our decisionmaking and increase productivity. Ultimately, this big data approach can bring regional and even global improvements to food production, resource conservation and environmental stewardship.

3 | Drones and satellites will help manage farmland as we move forward. Much of the commercial market for drones will be in agriculture. Drones are affordable and can boost productivity and cost-efficiency in agriculture as they scout fields, identify areas of concern, take photos and assist data collection. Satellite imagery and remote-sensing technologies are also on the horizon, allowing growers to identify and gather data pertaining to field-related questions and concerns long before the human eye can see the problem.

4 | Genetically modified organisms and cis-genetics will expand the abilities of plant breeders to create agricultural varieties for specific production and management needs. We have already seen the rapid expansion of genetic manipulation in developing plant varieties with new traits from other plants (GMOs), or having plants with traits that are enhanced and/or silenced to aid in some aspects of the plant's growth and production. We are now on the threshold of a new technology—cis-genetics, where only the genetic material of the host plant is used to create desired characteristics. While many still question the role of these technologies, there is little doubt they will play a role as agriculture faces future challenges.

5 | RNAi technology will take pest management to the next level. We're moving toward completely biologically based technology that uses RNA (ribonucleic acid) to turn off specific enzymes in target pests and silence genes that are essential to the pests' life processes. This RNAi (ribonucleic acid interference) technology will take out only pests that are specifically targeted and will have no impact on other organisms—a truly innovative and safe approach for our next generation of pest management.



Deana Knuteson and Mimi Broeske are with the CALS-based Nutrient and Pest Management Program. Jeffrey Wyman is an emeritus professor with the Department of Entomology.

UGANDA



Soap paves the way in Uganda

Most of us take soap for granted in our daily lives. Not so in the village of Lweza, Uganda, where only a third of the population has access to improved sanitation facilities and women face unemployment and economic opportunity challenges.



PHOTOS COURTESY OF CORINNE PRASKA

way, asking questions and giving comments and suggestions. It was a collaborative effort. They even made up a song to sing while they were mixing the soap. It was so cool.”

For their project, Praska and Carlson received a Wisconsin Idea Undergraduate Fellowship. The fellowships are awarded annually to undergraduate student projects aimed at solving issues identified by local or global communities. The semester- or year-long projects are designed by students in collaboration with a community organization and a UW–Madison faculty or academic staff member. Student recipients receive three academic credits and are invited to present their work at the spring Undergraduate Symposium.

“Assisting people at a community level to improve their health, while at the same time creating greater economic opportunities for them, is what development is all about,” says faculty sponsor and CALS biochemistry professor James Ntambi, who grew up in Lweza. “The project epitomizes what we hope for our students—connecting deeply with the community on issues that are important to them.”

The Soap Project has had a great impact on the community. Through the use of local products, it has boosted the local economy and raised awareness about proper sanitation practices. To ensure its future success, Praska and Carlson are seeking younger students to take it on and continue to work with the people of Lweza. A Go Fund Me account has been set up to help the soapmakers build a workshop.

“We just were blown away by the kindness, inclusivity and appreciation that all the people in the village showed,” says Praska. “When visitors come and the community really likes them, they invite them to be a part of it by assigning them clans and nicknames. We both got clans!”

—BARBARA SANFORD

Corinne Praska (center), Mackenzie Carlson (left) and a group of village residents consider varieties of perfume to add to soap.

Top right: Corinne Praska, Mackenzie Carlson (in third row from bottom) and village residents pose after their first soap-making demo.

To address these problems, CALS genetics major Corinne Praska and gender and women’s studies major Mackenzie Carlson designed and implemented “The Soap Project: Women’s Empowerment & Sanitation in Lweza.”

Last year they traveled to Lweza, where they hosted workshops to teach women how to make soap inexpensively using local products and ingredients—and market it to local vendors. They also educated the community about soapmaking’s positive health impacts, which include sanitation, disease prevention and economic stimulation.

Four women from the community volunteered to lead a soap-making demonstration for the village, Praska says. “What was so neat was that they were talking to us in English, then presenting it to the community in Lugandan as they were doing things,” she recalls. “The community stayed involved that

To learn more about the Soap Project, contact James Ntambi at james.ntambi@wisc.edu or John Ferrick (CALS International Programs) at john.ferrick@wisc.edu.

MALI



Helping women farm in Mali

Women in many industrialized countries are all too familiar with the “second shift”—the domestic duties they still perform disproportionately (compared with their husbands) once their formal workday is over.

That phenomenon is also key to understanding women’s work productivity in a developing country like Mali, according to studies led by Jeremy Foltz, a CALS professor of agricultural and applied economics.

More than farm technologies, family structures determine agricultural productivity for Malian women, Foltz found. Understanding both household priorities and labor allocation for Malian women outside of farming was key to Foltz’s research on generating improvements in agricultural productivity.

Foltz received a seed grant from the Global Health Institute at UW–Madison to explore gender, agricultural productivity and sustainability in Mali. One of Foltz’s graduate students, Julie Collins, focused her research in Mali on issues that cause women’s fields to have lower yields than those farmed by men.

Foltz’s and Collins’ research offers a new perspective on women as farmers in Africa. Women’s duties at home and with their children are their first priorities, the researchers found, leaving women with less time for farming.

“These findings have huge implications for how one thinks about women in agriculture in Africa,”

says Foltz. “Most of the current thinking is that women are inherently less productive, so we need to get them better technology to help them be better farmers. Our data suggest a different story.”

Women can produce as much as men, Foltz says—and those who do either don’t have many children, or they can call upon more labor in the home.

Time-saving features and solutions, including childcare, could make a big difference, giving women more time to farm. So would basic utilities and appliances. “Certainly things that reduce the amount of time women need to spend on household chores—like running water and gas stoves—would have a positive effect on production,” Foltz says.

Creating any new agricultural technologies designed specifically to help women in Mali must acknowledge labor demands in their homes. “Technologies that solve productivity issues for Malian women are not exclusively agricultural,” says Foltz.

Time-saving solutions in the field could also increase Malian women’s crop yields, Foltz says.

“Women I have talked to in Mali are very excited about the possible use of herbicides because weeding labor is the hardest thing to come by in the production system,” says Foltz. “If you can spend money to get rid of your weeds rather than labor time that you don’t have because you are taking care of your kids, you’re ultimately going to save time and improve your productivity.”

—OLIVIA RIEDEL BS’16

Bottom left: Women farmers selling mangos roadside near the capital city, Bamako.

Bottom right: A women’s banking cooperative in central Mali uses money saved by the group to provide members loans to buy and sell grains, cloth and livestock—helping women launch successful businesses.

Below: Ag economist Jeremy Foltz in Mali.



PHOTOS COURTESY OF JEREMY FOLTZ



Upping Our Global Game

CALS faculty and staff already conduct important research around the world—but our new director of International Programs, **Sundaram Gunasekaran**, wants the college to aim higher

Interview by **Sevie Kenyon BS'80 MS'06**

SUNDARAM GUNASEKARAN, a professor of biological systems engineering, was recently selected to serve as faculty director of CALS International Programs.

Gunasekaran—or Guna, as he is widely known—has made his mark as a food engineer. His research focuses on the rheology of food, especially cheese. More recently, he has focused on applying nanotechnology and other methodologies as tools for pathogen detection and processing validation in foods.

But it's his life experiences, along with his research prowess, that distinguish him as ideal for his new position. Guna's international experience is geographically diverse. He received his bachelor's degree in agricultural engineering from Tamil Nadu Agricultural University in Coimbatore, India, his master's degree in food process engineering from the Asian Institute of Technology in Bangkok, Thailand, and his Ph.D. in agricultural and biological engineering from the University of Illinois at Urbana-Champaign. He's been a visiting professor in South Korea, a Fulbright Fellow in Denmark, a USAID Farmer-to-Farmer consultant in Bangladesh and a mentor for a Syrian scientist under the Scholar Rescue Fund.

"I have also traveled widely and enjoy working with individuals and groups from different walks of life and interests," he says.

As leader of CALS International Programs, Guna will identify and pursue international activities consistent with the college's strategic goals. He will lead efforts to identify new resources for international activities and oversee the distribution of seed funding for new projects.

Why are international programs so important for CALS?

The world has become very interdependent, and so have the problems we face. Many of today's scientific challenges and practical problems can be solved not through isolated islands of intellectual pursuits, but rather by seeking out and incorporating ideas and approaches from different disciplines and across state and national boundaries.

Indeed, the scope of research and outreach performed by CALS faculty and staff extends far beyond the boundaries of the state and the nation. In a recent survey we found that more than 200 people in CALS have been working in about 80 countries around the world in various projects at one time or another. We are very engaged internationally.

International Programs can help elevate our international engagement from an "individual project" level to a more cohesive programmatic effort focusing on key areas of expertise in the college and implement a strategic framework for sustaining this activity in the long term.

What is your vision for CALS International Programs?

My vision is for CALS to become one of the leaders among the nation's land-grant colleges in international engagement, and for it to effect positive change in global agricultural, natural resource, energy, environmental and life science enterprises through research, education and outreach. We are a world-class institution, and CALS is among the very best land-grant colleges in the nation. Thus it is very appropriate that we envision an international program of similar stature.

How do we currently compare to other institutions?

Other institutions have much larger international program activities. That's something we want to see happen at UW-Madison.

Most major international collaborations deal with USDA and USAID projects. The United States government has resources to help developing nations solve their problems in securing a food supply, growing more food and developing infrastructure for storage, handling and distribution of food.

For example, the U.S. government has a large grant program called Feed the Future. We are one of the largest agricultural research schools that is not involved with that type of program. We are a player, but we are not considered to be a leader. That's what I would like to help change.

How else is this work funded?

In addition to funding from international agencies, there are local governments and private entities like the Gates Foundation. We also have support from alumni donors and alumni groups.

How has international research been changing over time?

The United States is still a major intellectual and knowledge base—but now, as other countries and regions in the world are also growing their expertise, we can join hands and solve problems together rather than just being the problem solvers ourselves.

What are the hurdles to developing international research?

Building relationships takes time. Normally if somebody is familiar with your institution or you as a person, that is the first point of contact. And then we get to know their strengths and needs, and then figure out how we can plug in our strengths and capacities. This kind of “feeling-out” process takes time.

We have to take time to travel and meet people and learn about their region and identify the problems they face there, and then identify researchers in Madison who have the capacity and the intellectual base to help solve some of those problems.

Does this process take resources away from our research endeavor here?

On the contrary, it actually helps add to our research capacity and resources. Sometimes we develop a solution and international program activities provide additional resources to put that research output into action where it is needed. It takes some effort and capacity from our researchers to be able to focus their attention on international problems, but I don’t think it takes substantial resources away from what we are doing here.

How does international research enterprise affect students?

We, as an institution, are responsible for developing future generations of citizens, and a student who is knowledgeable and well-versed in global issues and is sympathetic to different languages and cultures is a student who is able to solve the problems of the future. In that respect we believe that international engagement for students is critical for them to become future leaders and citizens of the world.



Sundaram Gunasekaran


You held a number of listening sessions with faculty and staff from across the college to hear about their international work and their needs. What did you learn?

The general consensus is: 1) they value international engagement; 2) they’re very active in it already; and 3) they’d like international programs to support their cause so they can do it more and better.

For example, they’d like us to help with their administrative needs so that they can focus on the technical and scientific aspects. Our office can help with budgetary issues, signing MOUs, and dealing with interinstitutional or intergovernmental issues. They also want to be more actively involved in large projects. So we are in the process of identifying opportunities where we can have multiinstitutional, multiinvestigator-based projects. It is something that individual investigators are not able to do, but that CALS International Programs can facilitate.

Beyond funding, are there other ways for alumni to assist in this effort?

Certainly our alumni can be the spokespeople, our ambassadors. Especially our alumni who are internationally inclined, who have gone on a study abroad, or people from different countries who studied here and went back home—or even if they stayed here but still have strong connections back home. They identify with UW–Madison, and this is the institution they think of first when they think of collaborating, and so we become the first point of contact for them.

And when we go to another country, we look for someone who has been here, and they become our first point of contact—a resource center, so to speak, to help us navigate the local bureaucracy or culture. They become very valuable partners in this process. We have a number of examples of alumni we work with in engaging with different countries. 



Green Therapy

*Redesigning landscapes to heal body
and soul—drawing on CALS expertise*



Feel the peace:
A five-acre garden at
the Rosecrance Griffin
Williamson Campus
in Rockford, Ill., helps
teens recover from
substance abuse.

PHOTO COURTESY OF ROSECRANCE HEALTH NETWORK

by Bob Mitchell BS'76

The teens in the rehab

program can't have drugs, so they use the waterfall instead.

That's how Lily Mank BSLA'15 explains the fact that when patients first visit the healing garden at the Rosecrance Griffin Williamson adolescent substance abuse facility in Rockford, Ill., they choose to sit near the cascading water.

"I think the drugs numb their emotions, and when they don't have access to drugs, they become very raw, very sensitive to their thoughts," says Mank. "They need the stimulation of the waterfall, the white noise, to quiet themselves down.

"They move away from the waterfall as they become more comfortable with their thoughts and more able to be balanced within themselves," she says. "That's a sign that they're getting ready to leave the program."

Mank doesn't know if her explanation is right, but she plans to find out in her ongoing research of nature restoration.

The five-acre garden, designed by master Japanese landscape designer Hoichi Kurisu, is incorporated into every part of the highly successful 12-step addiction treatment program at the Rosecrance facility. It's a powerful tool for clearing the minds of the 12- to 18-year-old patients.



PHOTO BY JOAN FISCHER

It was also powerful for Mank. Since working in the garden as an intern in her junior year of the CALS landscape architecture program, she has made healing landscapes her career focus. She went on to do a senior thesis focused on improving nature access at a Wisconsin mental health hospital. She also earned a certificate in health care garden design at the Chicago Botanical Gardens and interned at Ziegler Design Associates, a company owned by Steve Ziegler BS'83 and Joan Werner-Ziegler BS'78, CALS alums who specialize in designing healing spaces.

Mank still thinks about the waterfall. How, exactly, she wonders, does spending time in the Rosecrance garden—or in any peaceful outdoor space—help settle an unsettled mind?

That's a great question, says Sam Dennis. It's right at the heart of what he studies as a professor and director of the Environmental Design Laboratory (EDL) in the CALS Department of Landscape Architecture (LA). While the LA department is best known for its work on environmental restoration—techniques people can

use to heal damaged natural environments—Dennis and his team at the EDL flip that around. They're finding ways to incorporate nature into human-made environments to restore the health of people. Dennis's projects employ thoughtful outdoor design to help people eat better and get more exercise and to create safer, calmer and more cohesive neighborhoods.

Health-conscious design has always been on the department's radar. In 1981, 10 years before the passage of the Americans with Disabilities Act, Steve Ziegler was encouraged to do his senior thesis on barrier-free design in elder care facilities. But today the topic is getting much more attention.

As one example, assistant professor Kristin Thorleifsdottir has been reworking the curriculum to make sure students get a good grounding in the burgeoning area of science that looks at connections between health and the built environment.

The native Iclander offers three classes on the topic, including a new sophomore-level design class in landscape architecture and a graduate seminar that attracts students from landscape architecture, interior architecture, urban and regional planning,

health care and other disciplines. She touches on history—from the cities of the ancient Greeks to the urban squalor of the Industrial Revolution—but most of what she covers starts in the 1980s.

In a 1984 study, Texas A&M design professor Roger Ulrich found that postsurgical patients who had a view of trees from their hospital windows were released sooner, took less pain medication and experienced fewer complications than did patients who had a view of a blank wall.

"Ulrich's study was the first that looked at health and design," she says. "Since then there have been a lot more." Those studies span diverse disciplines—urban planning, public health, pediatrics, psychology, gerontology, neurobiology, art, horticulture and forestry, to name a few—which means those who study the topic must learn several lexicons.

"The fields of public health and design speak very different languages," Thorleifsdottir notes. "Design researchers tend to take a more qualitative approach—they look at how people experience the environment. Public health is very much into quantitative measures."

Her own research focuses on health

Landscape architecture graduate student Lily Mank, pictured here on the Rosecrance campus in Rockford, is exploring how gardens help people heal.

at the community level, including studies on neighborhood design and children's outdoor physical activities. She's embarking on two new studies, one of them on the quality of public city parks and the availability of settings for mental restoration, a collaborative project with research partners in Sweden and Serbia.

Sam Dennis has become pretty fluent in the language of public health. As part of UW–Madison's campus-wide Obesity Prevention Initiative, his partners include researchers in nutritional sciences and family medicine. Body mass index (BMI) is a common research metric, and a recent study involved drawing blood. That project, a collaboration with the Madison-based nonprofit Community Groundworks, used a garden-based curriculum to teach young people to eat better.

"Rather than ask how much the students eat, the researchers took a blood sample. You could tell by levels of serum carotenoids in blood whether they were eating fruits and vegetables," Dennis explains.

Dennis doesn't wield the syringes. While his collaborators collect data on human health, he assesses how well the urban landscape supports it. He works with residents of underserved urban neighborhoods to identify features that either facilitate or impede physical activity, healthy eating and safety.

To collect the data, the EDL team has developed an innovative (and now widely replicated) tool that they dubbed "participatory photo mapping." The researchers ask neighborhood residents—often kids—to photograph things that they see as barriers to healthy living, and then ask them to write stories explaining the photos.

"They tell the stories, then we geo-locate the stories and photos with GIS, so we can overlay their stories and images with, say, traffic data, or data about pedestrians and bicyclists getting hit by cars, or crime rates."

Healing With a Hoe

When Mike Maddox MS'00 signed on as Rock County's UW–Extension horticulture agent in 2003, he thought gardening was about growing plants. Some tough-talking convicts convinced him otherwise.

Maddox was leading gardening workshops at Janesville's Rotary Botanical Gardens when he got a call from the Rock County Jail asking if he could teach some inmates. He figured he'd be working with some tough customers, and he was right—to start with.

"The first time these guys came out, they had this machismo attitude," Maddox recalls. "They were too big and bad to be out there gardening. But after a few weeks, they were talking about how they used to work in the garden with their grandmas. And if they had kids, they were saying, 'I need to get my kids out here doing this.'"

At the same time, Maddox was getting good news from the jail. On the days they'd been gardening, the prisoners were better behaved.

The experience was a career-changer for Maddox. It showed him that working with plants could be a powerful restorative tool, and he wanted to learn more. He got some formal training, first in Minnesota, and then in Colorado, where he earned a certificate in horticultural therapy. Now, as director of UW–Extension's Master Gardener program, he trains 3,000 volunteers, and horticultural therapy is one of his favorite and most popular workshop topics. He's also helping the Meriter Child and Adolescent Psychiatric Hospital staff incorporate horticultural therapy into their treatment program.

Maddox doesn't usually lead horticultural therapy sessions himself, but he likes to keep his hand in it. So on Thursday mornings during the growing season, you'll find him in a courtyard garden at the William S. Middleton Memorial Veterans Hospital in Madison. It features waist-level planting beds and wide walkways to accommodate the patients—many of them grizzled men leaning on canes or sitting in wheelchairs—who are busy planting and watering.

"It's kind of a phenomenal process," says Diane Neal, the hospital's recreational therapist. "There is a positiveness that comes with being able to plant seeds and have them sprout. If the patients enjoy gardening and participate while they're rehabbing, it raises their self-esteem and keeps them from being depressed."

Nearby, Maddox is getting an earful. A U.S. Army veteran named August grew up on a Racine County truck farm, and he's adamant that the VA garden is too small for corn. Maddox loves the give and take. He's thrilled that August is so engaged.

"In this kind of a closed setting, where depression and isolation can be high and self-esteem can be low, you've got to create a spot where they can feel wanted and needed and purposeful," he says.

It's a lesson he learned from the jail inmates. "I thought it was going to be about growing carrots," Maddox recalls. "No. It wound up being about growing individuals, just using carrots as the tool to do it."

PHOTO BY BOB MITCHELL BS'76



Mike Maddox, Master Gardener director, tending plants with a patient at the William S. Middleton Memorial Veterans Hospital in Madison.



PHOTO BY JOAN FISCHER

Why Nature Makes Us Feel Better

The notion that nature can ease our minds is not new. It's reflected in Japanese Zen gardens (an idea that goes back at least 10 centuries) and was espoused by writer Henry David Thoreau and by landscape architect Frederick Law Olmstead, who designed Central Park as an antidote to the stresses of urban life. But in the past 30 years or so, researchers have been digging into the science behind it.



PHOTO COURTESY OF ROSECRANCE HEALTH NETWORK

A hardwired love of life. In 1984, Harvard biologist E.O. Wilson theorized that biophilia, our affinity for nature, is bred into us. He noted that the human race has been in close contact with nature for almost all of its 200,000-year history. Only in the past three centuries of industrialization have we separated ourselves from nature. Until then, a keen awareness of the natural environment was a trait that helped the fittest survive.

Restoring attention. A theory advanced in 1986 by University of Michigan psychologists Rachel and Stephen Kaplan holds that our most exhausting mental work is "directed attention"—when we have to force ourselves to concentrate. The way we recover is to give our minds over to things that are so fascinating that paying attention is effortless. The natural environment fits the bill because it's immense in scale, full of fascinating things and usually removed from the places where we tax our minds.

Reducing rumination. Research published in 2015 by Gregory Bratman of Stanford University and others looks at how exposure to nature influences rumination—repetitive thought focused on negative aspects of the self—which is linked to depression and other mental illnesses. They found that a walk in a natural setting decreased self-reported rumination as well as neural activity in a part of the brain that's associated with behavioral withdrawal linked to rumination. Walking in an urban setting had no such effect.

Often the stories lead to simple fixes, such as repainting crosswalks, adding pedestrian signals or hiring a playground supervisor so that parents feel reassured about their kids using a local park.

But residents also point out problems that are pretty surprising—and tough to solve. Dennis recounts what Latino kids in South Madison had to say about a nearby city bike path.

"They say they're not welcome there because the bike path is for white people—that you've got to be rich and have a special kind of bike," Dennis says. "The literature says the presence of a bike trail significantly reduces the body mass index of everyone around it, but the kids aren't using it because they don't see it as their space. Instead, they ride on busy streets."

"They're very sensitive to where they feel welcome," Dennis notes. "Mapping that is part of mapping their well-being."

Stories like these are important, Dennis says, because they point to health problems that can't be diagnosed by calculating body mass or drawing blood.

"Physiological things like body mass index are important, but so is our mental well-being," Dennis says. "There's a lot of research suggesting that chronic stress experienced by people with low incomes helps explain disparities in health across different environments. As environmental design researchers, we try to figure out the source of that stress and then see what we can do to reduce it through changes in the built environment."

Landscape architect Sam Dennis relaxes for a moment in the just-opened Hilary Grace Healing Garden at UW Hospital, a peaceful place for patients to rest and rejuvenate.

Spending time in a natural setting can relieve stress, but that's not guaranteed. That was underscored by another of Dennis' projects, a survey that looks at the benefits of natural outdoor classrooms at more than 200 early childhood care facilities across the U.S. and Canada.

Rapid staff turnover is a problem among early childhood care providers, due to low wages and very high stress. But according to the teachers surveyed, spending time in a green, natural environment during the workday helped compensate for the downsides.

"Their mental well-being is better supported when they can spend time in these natural settings," Dennis says. He attributes this to a process known as attention restoration: We become mentally exhausted in situations where we have to make ourselves pay attention; our minds recover when doing things that are so inherently interesting that paying attention is effortless. Engaging with the natural world fits the latter category. But you really have to engage.

"The natural environment supports attention restoration if the teachers were using all of their senses to experience the natural environment in a loosely focused way, as opposed to the tight focus they give to their indoor lessons," Dennis says. "It's important that they aren't 'traffic cops' or hypervigilant monitors like they typically are in a traditional playground setting—that they can engage with kids as they play in nature."

Job stress is part of the job for caregivers at the UnityPoint Health–Meriter Child and Adolescent Psychiatric (CAP) Hospital, even though there's plenty of nature nearby. The facility sits on a secluded wooded hilltop on the western edge of Madison. But while things outside are quiet and serene, inside a very different story plays out. The young patients who come here struggle with attention and impulsivity



PHOTO BY JOAN FISCHER

CALS alums Steve and Joan Ziegler included a lovely "stepping stump" garden path for teens to enjoy at Madison's UnityPoint–Meriter Child and Adolescent Psychiatric Hospital.

disorders, anxiety and depression—conditions that have made it hard to function in everyday life. Many, especially the teenagers, are at risk for suicide.

"We hear a lot of hard stories here," says Karen Larson, the CAP program nurse manager. Mental illness in children can be as hard on families and staff as it is on the children, she points out.

Hospital staff members were excited when the program moved to this bucolic spot from its former downtown location in 2004. But they soon realized that there wasn't a way to incorporate the green surroundings into the treatment of their emotionally fragile patients.

"We started looking at the evidence about the impact of a natural environ-

ment on depression, anxiety and well-being, and what it could mean to our patients," Larson says, "and we realized how much better it could be."

With research in hand, the Child and Adolescent team contacted their employer's philanthropic partners—the Meriter Foundation and Friends of Meriter—about raising funds to create a healing space for the patients. She emphasized that she wasn't asking for landscaping.

"I compared it to purchasing an orthopedic tool that would allow somebody to have their hip replaced," Larson recalls. "In psychiatry, one tool is the engagement of patients and staff in their environment. The more beautiful,

A proverbial “babbling brook” at the Rosecrance garden in Rockford—one of several water features that include a lake and waterfall.

less stressful and skillfully planned the environment, the better the tool.”

After a successful fundraising campaign, Meriter hired Ziegler Design Associates to create the healing garden. It was a good fit. The firm has worked extensively with caregiving facilities and has developed many creative outdoor spaces for youth for schools.

“It was a very special opportunity, to be able to bring healing into the landscape for kids and families and staff who needed it so badly,” says Steve Ziegler. “But it was also a complicated design challenge. A typical hospital healing garden wouldn’t work here.”

“In a psychiatric population, safety is a primary concern,” Larson says. “And a psychiatric population of minors is vulnerable on so many levels. We needed to make the space beautiful and usable and child-friendly and calming—and also safe and secure.”

This garden wouldn’t have secluded spots for quiet contemplation. There couldn’t be any trees big enough or grass tall enough to screen a staff member’s view of patients. No sharp edges, no loose objects that could be thrown (bricks were glued together). Joan Werner-Ziegler, the firm’s perennial plant specialist, researched plants for toxicity and potential reactions with medications. Steve Ziegler spent several days looking for nicely rounded boulders with serene colors.

“I stayed away from bright colors,” he says. “If you’re under psychological stress, abrupt changes can trigger a lot more emotion than they would in you or me. Our colors are wonderful, but not jarring. We chose pavements that didn’t reflect glare, because some drugs make patients’ eyes sensitive.”

They ended up with a space that’s compact enough for careful supervision while offering a variety of places to be or wander. There’s a “traditional” garden (to remind patients of home), a stepping garden with pathways through the



PHOTO COURTESY OF ROSECRANCE HEALTH NETWORK

plants, a grass garden, a prairie sensory garden and a separate garden for horticultural therapy.

You can tell the space works, says Larson, by watching the patients: “They just naturally settle. They settle into the chairs, they sit on the boulders, they sprawl on the ground, they kick balls around. They just settle into the space.”

More important, Larson adds, the garden helps get the kids talking.

“When you work with kids who are psychiatrically hospitalized, you’re trying to help them express their feelings,” she says. “If you just start asking questions, they are likely to shut down.

But if you go for a walk, they’re more likely to start talking. It’s true for all of us: If we’re feeling comfortable, we can talk about things that are really hard to talk about. And that’s what we have to do here.”

The healing garden also works wonders for the staff.

“When you work in a caregiving field, you give so much,” Larson says. “Your successes can be small and the challenges can be huge. You have to bring your best self every day. And then many of us go home to stressful lives. So if part of your workday can be restorative, it’s a wonderful gift.”



Meanwhile, Lily Mank is still intrigued by that waterfall.


Now a CALS grad student, she's teaming up with Sam Dennis and Kristin Thorleifsdottir on research to understand how all elements of a garden ease patients' minds as they address their addiction issues.

Her goal is to help designers view healing gardens not just as a collection of streams, pathways, plantings and benches, but also in terms of how those features allow patients to interact with nature. At the waterfall, a patient may

simultaneously be sensing rushing water, the breeze, the coolness of shade, light dappling through the leaves and fish moving in the nearby pool. There are many possible interactions with nature, she says, and they can combine in many ways to evoke different emotions.

"I'm trying to find out how different interactions with nature make patients feel. If I understand that, it can be another way to think about garden design," she says.

And if patients have a better understanding about how their interactions with nature make them feel, they can use that to continue healing when they get back home.

"They won't have access to a garden like the one at Rosecrance, but they can still seek out places that let them encounter nature in ways that make them feel calm," Mank says. "A healing garden can be anywhere." 

Tips for Creating Your Own Healing Garden

Make it personal. Start by thinking about what it is that draws you into your yard, mentally and physically, advises landscape architect Steve Ziegler BS'83: "What's healing for one person may not be healing for another." For example, one of Ziegler's clients likes to walk in the garden at night, so her garden features flowers and paving materials that reflect the moonlight. Another's healing garden includes an attractive, custom-made clothesline, because she relishes the ritual of hanging out clothes. "That's her Zen," Ziegler says.

Mike Maddox MS'00, director of UW-Extension's Master Gardener program, seconds that: "Don't get caught up in magazine images of gardening or what's on HGTV. Go with what's fun. Work with plants you like and that have meaning to you."

Make it lush. A rich diversity of plants leads to a diversity of animals—especially birds and insects—and a variety colors, aromas, textures and shapes. "You want to awaken all of your senses," Ziegler says.

Create transitions. Moving from one area to another should be easy and inviting. That's especially true for transitioning from your house to your garden. "You want it to be easy, not jarring," Ziegler says. "If you have to walk out a south-facing door into the blazing sun, for instance, you might want to add a pergola that provides partial shade."

Offer choices. We get stressed when we feel like we don't have control over our daily lives. That's huge for hospital patients—they can't do much about their situation—and it's true for the rest of us as well. A healing space can ease that by offering a choice of where to sit—in the sun or shade, in a secluded spot or a more social one—and of things to smell, feel, hear and look at.

Add a focal point. A well-composed photo draws your attention to a certain spot, and so can your sanctuary. It could be a water feature. Running water is therapeutic, and there's a wonderful selection of easy-to-maintain fountains available, Ziegler says. A bench or gazebo can serve as a focal point as well as a place to sit. So can a tree or sculpture.

Take care of yourself. "If you want to garden, find tools that fit you well and learn about body mechanics and appropriate techniques for lifting, bending, cutting and pruning to make it easier on your body," says Maddox. And pick tasks that are appropriate to your age and abilities. Pain is not therapeutic.



A Place to Belong

*Student organizations at CALS
offer personal growth, professional
development and a fine way to
create community.*

By Joan Fischer



UW–Madison members of The Wildlife Society worked with the DNR to help build and move large pens as part of an elk restoration effort in northern Wisconsin.

They sell holiday roasts

and turkeys, fix lawn mowers and snowblowers for the public, grow and give away fruits and vegetables and volunteer in school classrooms. They present posters, hold fun runs and bike rides, give talks at national conferences and help manage wildlife around the state. They conduct community service and research projects around the world, doing their part to keep the Wisconsin Idea global.

And for the most part they do it themselves, with minimal assistance from faculty and staff.

These are just a few examples of activities conducted by members of student organizations, the hands-on social and preprofessional groups—nearly 1,000 of them are registered on the UW–Madison campus—that allow students to cultivate significant life skills while also creating community.

And they're a vital part of student life at CALS. Sarah Pfatteicher, CALS associate dean for academic affairs, sees student orgs—along with such activities as internships, independent research and study abroad—as a crucial component for students to take their learning “beyond the classroom,” to make their time at CALS an experience they have tailored by pursuing their unique blend of interests.

They're also a great way to make a big campus feel more like home, Pfatteicher notes. “We tell students, ‘You wouldn't move to a city of 60,000 people and expect to suddenly know everything about the city,’” she says. “You pick a neighborhood within that city, and you get to know your neighbors, you get to know the restaurant on the corner.”

Of all the enriching activities available to students, Pfatteicher notes, the key advantage of student organizations is embedded in the name. “Student orgs are student-organized, right? They allow students themselves to identify interests, develop their own bylaws, set their own membership requirements—to come together and really be in charge of what they're doing. That helps develop student autonomy and maturity in ways that other experiences maybe can't.”

And let's not forget they're a lot of fun. Here's what a half dozen student orgs at CALS are up to.

Helping Wild Wisconsin

Once upon a time, elk roamed plentifully throughout the land that would become Wisconsin. By the late 1800s they had vanished from the landscape, victims of overhunting and loss of habitat. Efforts to reintroduce elk in northern Wisconsin have expanded in recent years—and the UW–Madison chapter of The Wildlife Society (TWS), the nation's premier society for wildlife professionals, has been part of the effort.

Over the past three years, students have worked with elk herds alongside wildlife managers and volunteers. They put their muscles and passion into building fencing for large pens—one of them 1,600 feet long and eight feet high, encompassing four acres—used to contain elk being moved from Clam Lake to vacant elk habitat southeast of Winter. Recently students helped take down that fence and move materials to the Flambeau River State Forest, where a seven-acre pen will be built to quarantine elk brought in from Kentucky.

Laine Stowell, an elk biologist with the Wisconsin Department of Natural Resources, is grateful for the students' assistance. “Their participation provides an abundance of enthusiasm and youthful strength,” notes Stowell. “We get a lot of work done in a short period of time, and all it costs us is food and lodging. We share our experience and time, they share their efficient effort, and we all accomplish excellent things for Wisconsin elk!”

Recent chapter president Lucas Olson BS'16 counts working on elk reintroduction among his most cherished TWS memories. As icing on the cake, he received a scholarship from the Rocky Mountain Elk Foundation in part for his student leadership in that effort.

Like many TWS members at UW, Olson is proud of the group's special legacy in Wisconsin. “Wildlife management's roots can be attributed to one of UW–Madison's own—Aldo Leopold,” he notes. “Leopold's tie to our department gives me a huge sense of pride. Leopold's connection to TWS is one of great importance as well, as he was one of the first presidents as the society was taking off in the late 1930s. My involvement with TWS has been richer because of this, and has made my experience at UW–Madison extremely significant.”

In addition to hands-on wildlife management help, UW TWS activi-

Below: Dietetics and Nutrition Club member Carley Bosshard (second from left) helped out at a REAP local veggie-tasting event at Samuel Gompers Elementary School in Madison.

ties include birding, helping with prairie burning and research projects, participating in regional and national conferences (including an annual quiz bowl at the national meeting), and holding an annual game dinner and fundraiser.

"I am in my major—wildlife ecology—because of the club," says senior Daniel Erickson. "Through all the classes and field trips, I have made such a great group of long-lasting friends and connections with professors. TWS allowed me to realize that I have always had a passion for animals, nature and the great outdoors."

Good Food for All

Students who study nutrition understand the importance of healthy food. And, as members of the Dietetics and Nutrition Club (DNC), they are committed to sharing their knowledge and

excitement about healthy food with people of all ages, from all walks of life.

Hanna Hindt participates in a club program with Porchlight, a Madison nonprofit offering emergency shelter and other support services for the homeless. "We get to talk with members of the community and answer questions about their own diet and food choices and those of their friends and family," she says. "It's a great way to apply what we've been learning in our nutrition classes."

And, since Hindt hopes to have a career working with people for whom buying food is a constant challenge, the experience offers good professional training as well. "I'm able to get a feel for what a typical diet is for the low-income population—the daily challenges they face, and common health problems within this group," Hindt says. "This background will help me approach and personalize nutrition

counseling and offer reasonable and manageable options and advice within their limitations."

Fellow DNC member Jackson Moran participates in club activities with REAP, a nonprofit that strengthens ties between growers, consumers and community institutions. DNC students help out at REAP events including Chef in the Classroom, where local chefs prepare meals with kids, and Family Food Fest, a community farm-to-school event. Moran has learned a lot about getting kids to eat their veggies. "It's important for parents to be on board with a healthy diet, and to keep healthy foods available in the home," Moran says. "Also, children will be much more likely to eat new, healthy foods when they can be involved in preparation, or have some interactive role."

Other DNC activities include running exploration stations at Saturday Science in the UW–Madison Discovery Building and holding nutrition-themed Lunch & Learns—expert talks for faculty, staff and students. The club's biggest annual event is "Dinner with Dietitians," where club members prepare a meal for nutrition professionals at an evening of networking and panel discussion.

Recent DNC vice president Maria Gruetzmacher BS'16 helped plan that event, and cites that experience and many other DNC activities as pivotal to her personal and professional development.

"These experiences have taught me how to be more proactive and work collaboratively, and have strengthened my event-planning skills," Gruetzmacher says. "With each event I participated in, I met new members, each with a different path and unique ideas. I was also able to meet practicing registered dietitians who allowed me to shadow them and provided meaningful advice."

PHOTO COURTESY OF EMILY LATHAM



Right: The UW–Madison Dairy Judging team in action.

Below: UW members of MANRRS pose at a national conference.

Ringing Success

What makes a perfect dairy cow? It takes a trained eye to notice bovine features that hold great promise for the milking parlor. A tight udder, yes, but also the more subtle points: lean thighs, a sweeping rear slant to the ribs, a long neck, a fluid stride. And a skilled judge has to back up numeric scores by stating reasons in terms the dairy industry recognizes.

In other words, dairy judging takes some training. And that's what students receive when they participate in the UW–Madison Dairy Judging Program, run through the CALS Department of Dairy Science. Students hailing from the Dairy State have a long, proud history of success, winning nearly a dozen national dairy judging team championships and scores of individual awards.

That success is extremely gratifying to coach Chad Wethal, who feels that the program offers students benefits well beyond academic credit. Dairy judging, he says, allows students to develop their decision-making and verbal communication skills—and it helps them build confidence.

"I am always amazed at how much they learn from each other," notes Wethal. "There are many life skills that are built through participating in this program, but the key benefit is the camaraderie that is built within the team. Students can expect to form lifelong friendships with their fellow teammates."

Students attest that the benefits run deep.

"When I entered the program I felt as though I saw cows very well, thanks to my 4-H dairy judging coaches and also my parents," says Jordan Ebert, raised on a dairy farm, whose team placed second at a recent National Intercollegiate Dairy Judging Contest at World Dairy Expo. "Once I got into the program, my judging ability and public speaking

expanded and improved. I added more terms and vocabulary, along with having more confidence and energy."

And the rewards last long after students graduate. "You get to see all of your work and determination pay off when you realize just how much you have learned, not only about cows but also about yourself," says Laura Elliott BS'12, reflecting on her team's many honors during her dairy judging time at UW.

A Warm Welcome

It can be tough to attend a school where you're a racial or ethnic minority—and even tougher to choose a major in which others of your background are rarer still.

Enter "Minorities in Agriculture, Natural Resources and Related Sciences"—MANRRS for short—a national professional development society with a vibrant student chapter based in CALS. Through regional and national conferences, scholarships, competitions, service activities and development opportunities that begin in middle school, MANRRS offers a warm welcome and support to students who might not otherwise see themselves in STEM careers.

"On a social level, MANRRS allowed for me to meet and be connected with individuals who looked like me working on higher degrees in academia," says Maya Warren PhD'15, a longtime member and past national officer of MANRRS. "On a professional level, MANRRS has allowed me to



PHOTO COURTESY OF CHAD WETHAL



PHOTO COURTESY OF EMMA LOPEZ



UW-Madison members of the Undergraduate Biochemistry Student Organization at the annual meeting of the American Society for Biochemistry and Molecular Biology earlier this year, where they did exceptionally well in the research poster competition.

hone in on my leadership skills in ways that I would have never expected.”

Warren is now a lead food scientist, aka “tastemaker,” with the food franchising company Kahala Brands, focusing on their portfolio brands Cold Stone Creamery and Pinkberry. She became a highly visible face of UW-Madison—and a role model of grit and grace for MANRRS members—when she and fellow food science grad student Amy DeJong two years ago won “The Amazing Race,” a reality show on CBS with a \$1 million prize.

For many students, MANRRS comes to feel like a second family. Abigail Catania, a junior majoring in agricultural business management, joined Junior MANRRS while attending the Chicago High School for Agricultural Sciences, a public magnet school. Over the years she went on to hold numerous leadership positions, including serving as UW chapter president beginning in her freshman year and also serving as a national officer.

“MANRRS has had a huge impact not only on my undergraduate experience, but on my life in general,” Catania says. “It provided me with a lot of support not only academically but professionally and personally as well. MANRRS has contributed to many of my successes while attending UW, including being offered an internship with John Deere as just a freshman.”

MANRRS secretary Emma Lopez, a senior food science major, credits MANRRS with helping her land an internship with Covance, a contract

research organization providing drug development and animal testing services. Covance is one of several companies that regularly recruit MANRRS members.

“Covance values students who demonstrate a personal investment in their learning and development through participation in organizations such as MANRRS,” says Rebecca Verhulst, a senior manager with Covance in global university and diversity relations. “In our experience, the diverse perspectives and experiences of MANRRS’ talent helps us to think in new, different and insightful ways, delivering innovation in every patient room, at every lab bench and every client meeting.”

Meet Your Major

Here’s a little-appreciated fact about biochemistry majors: they have to be a bit more patient than most students. A long run-up of science prerequisites keeps most of them busy their freshman and sophomore years, so that often their introduction to biochemistry gets pushed back.

They can help bridge that gap by immediately joining the Undergraduate Biochemistry Student Organization (UBSO), which brings biochem students together for faculty presentations and discussion, leads on job and internship opportunities, preprofessional advising, national conference attendance and “just fun” stuff like Picnic Point bonfires and ice-skating socials.

“It’s important for students to begin

understanding their major as soon as possible,” says biochemistry professor Doug Weibel, who frequently gives talks for the group. “The biochem department has been actively reorganizing the curriculum to introduce biochemistry courses earlier. UBSO provides a complementary resource to our majors.”

It’s a resource that students appreciate. “UBSO is the one organization where everyone understands what you’re experiencing academically, as a biochemistry major, in terms of classes, research and applying for grants and internships,” says recent UBSO academic chair Quinn Vatland BS’16. “This meant that it was really easy to receive advice on which classes to take, what scholarships to apply for and even the best way to study the trp operon. The UBSO meetings themselves also let me get a lot of professional advice—resume workshops, career advising and research tips—but they are also pretty casual, so I made friends, too.”

Members take the “pay it forward” approach to heart when it comes to mentoring younger students.

“Every time there is a scared little freshman or sophomore that walks through the door and wants advice about getting into research or about classes, and what to take and how to study, I love it,” says recent UBSO president Amal Javaid BS’16. “I love answering questions and reassuring people that I’ve been through what they are going through, and it will be okay. Past officers did that for me when I was an underclassman, and now I take a lot of pleasure in giving back. This year we, as a board, have helped at least five underclassmen find research jobs, and that is definitely super refreshing and rewarding.”

Faculty members do some serious mentoring as well. Every year biochemistry professor Michael Cox takes a group of seniors to the annual meeting of the American Society for Biochemistry and

Creative nutrition: Students on a food product development team cooking up the Walking Wok in a campus lab kitchen.

Molecular Biology (ASBMB), where they compete in an undergraduate research poster competition.

“Our students always do very well,” Cox says with pride. “Our students this year represented less than 5 percent of the some 230 students from across the country in the competition. However, we took 25 percent of the prizes.”

UBSO is in the process of reorganizing to become a student chapter of the ASBMB, Cox notes. “This will make it part of a national organization, with a number of benefits,” Cox says.

Team Temptations

They bear names like “Blissful Bites,” a vanilla yogurt nugget coated with crunchy oats, flax and puffed rice; “Pixie Dust,” freeze-dried, powdered fruit that becomes a smooth, nutritious drink when mixed with milk or water; and “Walking Wok,” a chicken and vegetable stir-fry wrapped in a gluten-free tortilla.

But as fun and delicious as these treats sound, they required the CALS student teams who created them to draw on everything they’d been learning in food science. The products were developed to compete in national food industry contests sponsored by Disney and Mars, Inc. And they had to meet exacting standards on everything from nutrition, taste and texture to food safety, shelf life, pricing and market appeal.

“Being on a product development team helped develop my critical thinking skills while teaching me more about the industry and how to be flexible, because in the competitions you are responsible for all aspects of the product,” says Amy Parr BS’16, who helped develop the Walking Wok. “It gives you at least a little bit of insight into everything.”

The food product development teams from CALS regularly take top prizes for their work—and no one is

more impressed than food science professor Rich Hartel. “We teach them the basic science for them to apply—but other than that, these teams are completely student-driven. The students form their own teams, develop their own products and submit the product ideas to the competitions.” They also present their products at national conferences, where they have an opportunity to network with industry professionals.

These professionals, too, are impressed by CALS students, according to Tracy Matteson BS’99, an associate principal scientist at the Kraft Heinz Company who spent several years as a company recruiter and as a student competition judge—and who participated on food product development teams while at CALS. “The only thing that looks more impressive to an employer, beyond demonstrating strong communication and leadership skills, is being an engaged member of the product development teams,” she says. 🍳

Learn more about these and other student organizations at <https://win.wisc.edu/organizations>.



A Home for Student Orgs

Student organizations, along with other “beyond classroom” activities that enrich the student experience, will soon get a new home: the former Agricultural Dean’s Residence, familiar to many as the lovely Queen Anne house located in Allen Centennial Garden.

In addition to student organizations, the residence will house career services/corporate recruitment, alumni mentoring activities and international study programs, all of which are currently challenged by a lack of space.

The residence is undergoing renovations to serve its exciting new purpose. To learn more, and to consider making a gift, please visit: supportuw.org/giveto/calsdeanshouse



A woman with long blonde hair, wearing a white lab coat and blue gloves, is working in a laboratory. She is looking down at something on a table. The background is a blurred laboratory setting with shelves and equipment.

The Mysteries of Mitochondria

There's a lot we don't know about the tiny engines that reside in nearly every living cell. But CALS biochemist David Pagliarini is shedding light on more of their functions and behavior—with important implications for human health.

By Brian Mattmiller

Photos by David Nevala

Imagine having your car towed

to the shop for unknown repairs, and watching a trusted local mechanic pop the hood and take a ponderous look inside. Minutes pass as he runs a gauntlet of software and fluid checks, and pokes around the hoses, belts and cords. He finally emerges with a strange-looking broken part in his hand.

“This might be the culprit,” he says. “But honestly, I’ve never seen a part like this before.”

Dave Pagliarini can relate to this feeling. As an associate professor of biochemistry, Pagliarini studies engines of an entirely different stripe—engines called mitochondria, which power biological life. These tiny, grain-shaped organelles reside inside virtually every plant and animal cell type, and perform the critical task of breaking down nutritional elements and converting them into energy for basic cellular function.

**In Pagliarini's lab:
Postdoctoral associate Natalie
Niemi prepares yeast samples
for metabolic analysis.**

The right man for the job:
David Pagliarini is leading the charge to foster collaboration and advancement among metabolism researchers across campus.

Pagliarini says that only two decades ago, science had all but closed the book on mitochondria, assuming all the important pathways and processes had been worked out. But lately, the field of mitochondrial research is being defined more by how little we know about their complex role in maintaining health—and their connection to literally hundreds of diseases when things go haywire.

As one measure of this great unknown, Pagliarini points to “orphan proteins”—more than 300 proteins associated with mitochondria that still have no defined function. In a mechanical sense, they are parts without a defined purpose. A big focus of Pagliarini’s research today

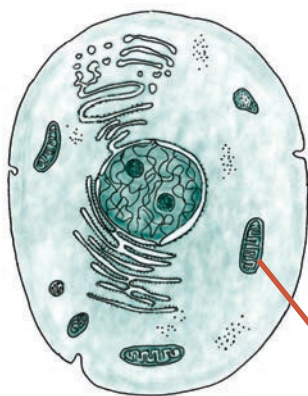


is linking these orphan proteins to their rightful homes and understanding how their dysfunction affects disease.

But as a University of California, San Diego graduate student in the early

2000s, Pagliarini didn’t have mitochondria anywhere on his radar. He was studying a group of proteins involved in cell signaling when he made an entirely unexpected discovery: One of those proteins traced directly back to mitochondria. Later, as a postdoctoral researcher at Harvard Medical School, he produced a seminal work on identifying all mitochondrial proteins, published in the journal *Cell* in 2008, which has been cited more than 1,000 times.

“That set off a whole new direction for me,” Pagliarini says. “To find something that no one expected to be there made me fascinated about what



Mitochondrion in a cell (above) and close up (right). Mitochondria provide cells with energy by oxidizing sugar and fat—and perform many functions that are just now being discovered.



PHOTO BY KEITH PORTER/SCIENCE SOURCE

Biochemistry graduate student Danielle Lohman sets up an enzyme activity plate reader assay. These types of assays are widely used in biochemistry to discover what chemical reaction a particular enzyme performs.

else we didn't know. And as we began to realize there was a lot we didn't know, I just saw a lot of opportunity.

"That's when I became a 'mitochondriac,'" he says with a laugh.

Mitochondria consume about 95 percent of the oxygen we breathe to make a chemical substance called ATP—or adenosine triphosphate—that is the "chemical energy currency" our bodies use to power cellular processes.

But "cellular powerhouse" is only one important function of mitochondria. For example, mitochondria are recognized as key players in cellular signaling and cellular apoptosis, or programmed cell death. They also appear to play a significant but not fully understood role in certain cancers, Parkinson's, Alzheimer's, diabetes and autism. And their composition varies markedly across tissue types—meaning there are many places where things can go awry.

"There are many different ways to break machines like mitochondria," he says.

The Pagliarini lab focuses on establishing a fundamental understanding of mitochondria, with the recognition that we can't cure what we don't understand. There is a dire need to develop therapies for people who suffer from mitochondrial disease, which occur in 1 in 4,000 people and can be fatal or have devastating health consequences.

"There are so many diseases that are rare individually, but collectively affect lots of people," Pagliarini says. "These are heartbreaking diseases for which we can only offer palliative care. I believe that in the long term, a fundamental understanding of how the mitochondria work will give us an opportunity for real cures."



Dr. Philip Yeske, the science and alliance officer of the United Mitochondrial Disease Foundation (UMDF), agrees that mitochondrial diseases pose unique medical challenges. There are about 250 mutations on both the nuclear and mitochondrial DNA that can lead to disease. And any given mutation can manifest itself in entirely different symptoms—heart-related problems for one patient and neurological disorders for another.

"The standard of care for patients affected by mitochondrial disease right now is treatment with vitamins and supplements," Yeske says. "There are no licensed therapies available. And with the vitamin and supplement care, we don't know enough about them to even say they are effective."

But thanks to a rapidly growing body of research, prospects are looking more positive. A decade ago, therapeutics would have been a "pipe dream," Yeske says, but in 2016, four companies are in active clinical trials for mitochondrial disease therapeutics, and many more are in preclinical planning.

"We're at the beginning of an era of mitochondrial medicine, and that's really exciting," Yeske says.

At UW-Madison,

Pagliarini's young career has been on overdrive. Only months after arriving at CALS in 2009, his lab was jump-started by major research support from the federal economic stimulus program, which funded only the top 2 percent of proposals that year. Shortly after, he was named a Searle scholar and helped craft a major grant related to the NIH National Protein Structure Initiative, which further put his work on mitochondrial proteins in the national spotlight.

The past academic year could arguably be Pagliarini's most exciting yet. In fall 2015, Pagliarini was named director of the Morgridge Institute for Research Metabolism Theme, which aims to establish a vibrant group of researchers focused on the basic underpinnings of metabolism. The Morgridge Institute is poised to make strategic hires and investments under Pagliarini's direction that will help UW-Madison grow and thrive in this field.

This year, Pagliarini experienced a pinnacle of recognition as the recipient of a Presidential Early Career Award, given to top scientists and engineers in

Below: Pagliarini (front row, left) in Washington this past spring receiving the Presidential Early Career Award for Scientists and Engineers.

Opposite: Graduate student Mike Veling prepares a yeast knockout culture for analysis.

an array of fields. He and 100 national honorees visited the White House in May, touring its opulent historical meeting rooms and chatting with President Barack Obama and special guest Jeff Bezos, the CEO of Amazon.

"It was pretty special," Pagliarini says. "What really stood out about it was how optimistic and forward-looking it was. You hear so much in science now about problems with funding or rising competition from other countries. This was very much about celebrating what we can do with U.S.-driven scientific research."

Brad Schwartz, CEO of the Morgridge Institute, started getting indications early that Pagliarini was the right person to lead the campus-wide initiative. While meeting with potential recruits in 2014 from leading research universities, Schwartz was struck by how frequently Pagliarini's name came up in conversations.

"After a very thorough national search, it only reinforced that Dave had the innovative thinking and creativity we were looking for," Schwartz says. "He has all the personal characteristics needed to help build stronger community around as many as 500 scientists working on some aspect of metabolism in Madison."

The Pagliarini lab is

focused on a grand question: How do we define the unknown parts that contribute to the fully functioning engine of mitochondria? Pagliarini teamed with chemistry professor Josh Coon to win an award from a UW-Madison and Wisconsin Alumni Research Foundation (WARF) initiative called UW 2020—supporting projects that could change the direction of a field.

The goal will be to develop a "genetic knockout" strategy for a wide

range of human cell lines. By analyzing all of the cellular changes that occur in each "knockout"—cells with a single gene removed—the researchers will be able to define molecular signatures that show an association between orphan proteins and established ones.

The team already has demonstrated great success by applying the same process to yeast, a model organism that is simple and fast growing, and employs cellular processes similar to those in humans. The yeast project, recently published in *Nature Biotechnology*, completed 174 individual gene deletions that helped predict the function of many orphan proteins. Replicating this process with human cells will require CRISPR gene editing technology as well as a private sector partner to create these knockout cell lines in an industrial process, so that the scientists can focus on growing and analyzing the lines.

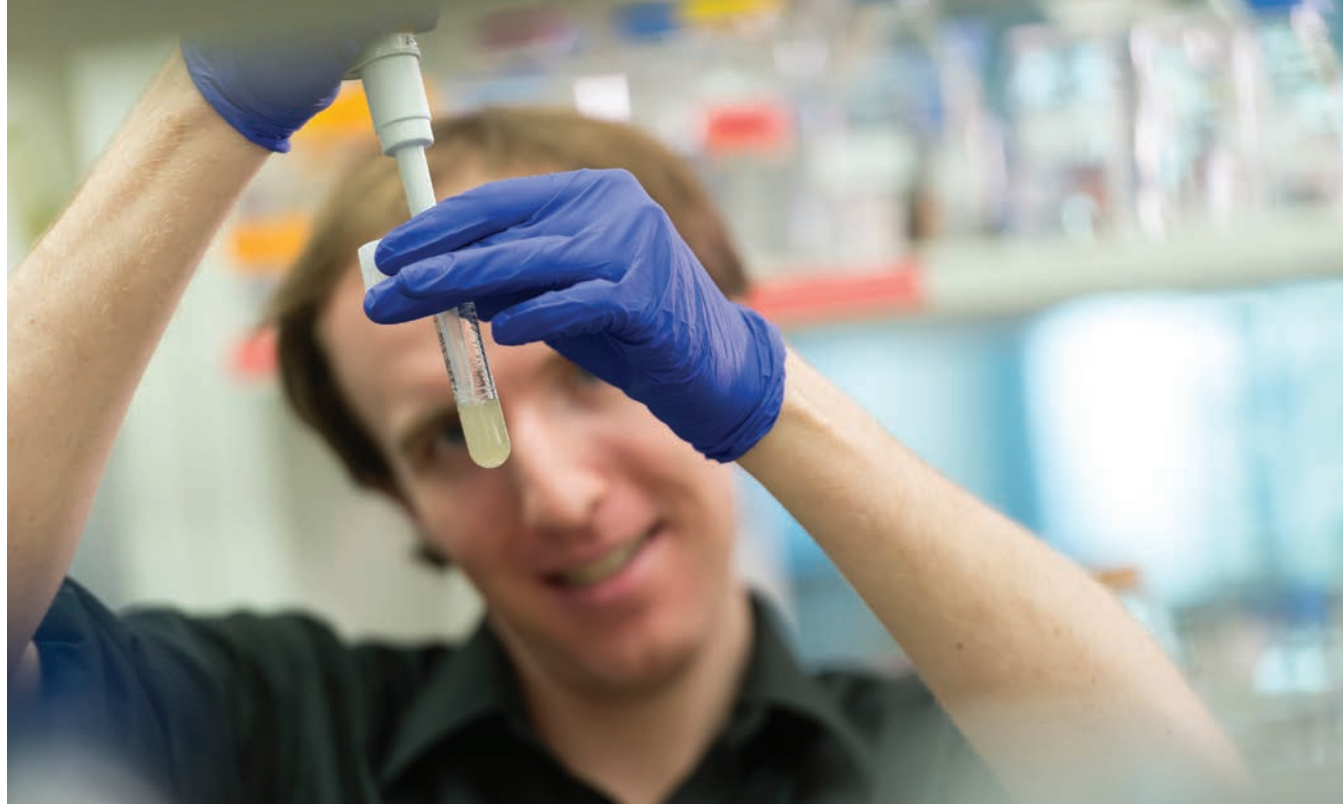
Another research theme focuses

on an important component of the energy chemical ATP production process called coenzyme Q. This lipid was discovered at the UW-Madison Enzyme Institute in the 1950s and was recognized as a key missing piece in the electron transport chain that mitochondria use for ATP synthesis. It is a complex molecule that needs to be made by mitochondria and is not supplied in the human diet.

Coenzyme Q deficiency causes a wide array of problems, from minor muscle disorders



PHOTO COURTESY OF PAGLIARINI LAB



to severe disabilities and death. The research challenge is a familiar one: several steps in the coenzyme Q pathway are accomplished by proteins that have yet to be identified and defined. If the lab can identify the different steps of biosynthesis the body uses to make this important molecule, Pagliarini says, it could lead to breakthrough therapeutics to replace its loss. Some of the precursors for making coenzyme Q follow the same pathways as cholesterol, and statin-based drugs that block cholesterol may provide important insights.

Pagliarini and his 18-member research team now make their home on the second floor of the Discovery Building, which is dedicated to collaborative science that cuts across disciplines. The team includes postdoctorates, graduate students, senior staff researchers and a healthy mix of undergraduates.

They can even claim a bit of celebrity: PhD student Zachary Kemmerer is a former college wrestler and premier athlete who competes on the hit TV competition “American Ninja Warrior,” and is known as the “Science Ninja.” Kemmerer contributes to Discovery science outreach programs, helping kids get pumped up about the possibilities of science. His motto: “Powered by Mitochondria.”

Assistant scientist Jarred Rensvold PhD’15 first joined the Pagliarini lab as

a graduate student at its inception in 2009 and has been there ever since.

In one afternoon just before graduate school began, a parade of biochemistry professors offered “elevator pitches” of their work to new graduate students, hoping to generate recruits. “Dave gave a really energetic talk and I could see he was really excited about starting up his lab,” Rensvold says. “He seemed like he would be an excellent mentor. Even with all of his expanded responsibilities today, he makes time to give to each individual and each project in his lab, which is remarkable, I think.”


Postdoctoral research associate Natalie Niemi’s introduction to mitochondria was remarkably similar to Pagliarini’s, having “stumbled” on a connection in graduate school while doing unrelated protein studies. Today she studies an important process called phosphorylation, which is the turning on or off of enzymes that control energy metabolism. She has funding from the UMDF on this topic, and she gives back by helping organize a Wisconsin “Energy for Life” fundraiser to support UMDF causes.

“I think the potential to have an impact on the future matters,” Niemi says. “We’re working quite a few steps back from clinical trials, but trying to project how your research could have an impact on human health is rewarding.

It’s also rewarding to make discoveries and be the first person to know something.”

The future for Pagliarini is brimming with opportunity. If you think of metabolism research as a living cell within UW–Madison, the Morgridge Metabolism Initiative provides a nucleus—or, perhaps, a mitochondrion!—for the first time. The effort already has produced a monthly symposia series and a major investment in mass spectrometry tools—a gold standard technology for conducting metabolism research.

Part of the challenge is building a sense of community within a very diverse group of researchers, where one finds pockets of metabolism-related work in the medical school, in countless bioscience labs, in chemical engineering, computer science and bioinformatics. The potential for new ideas and collaborations is only beginning.

“We’re in the era of collaborative science, so as our interactions build and gain success, they are bound to attract more people,” says Brian Fox, professor and chair of biochemistry. “Dave’s got a great eye for a problem, he’s very articulate in describing that problem, and he’s an excellent collaborator. That’s the kind of style that will help drive a campus-level project like the metabolism initiative.” 

in the field



Katelin Holm Anderson



Andrew Barrett



Courtney Glettner



Anders Gurda



Noelle Harden

Katelin Holm Anderson MS'09 • Katelin Anderson serves as the water quality specialist and information and education coordinator for Polk County's Land and Water Resources Department. Much of her job involves applying for and administering grants to manage Polk County's many bodies of water. She works with individual lake groups to study and manage their lakes and coordinates a countywide aquatic invasive species program. Anderson also gives presentations and training sessions to school groups as well as lake and river organizations. "My favorite part of my job is spending time studying Polk County's beautiful lakes and rivers and working with all the fantastic volunteers who dedicate time to manage our county's water bodies," she says. "I also enjoy the opportunity to partner with organizations—such as the Wisconsin Department of Natural Resources, the Polk County Association of Lakes and Rivers, the St. Croix River Association and the National Park Service—to expand programming."

Andrew Barrett MS'08 • As program director with the nonprofit Edible Schoolyard NYC, Andrew Barrett works to implement cooking and gardening programs in New York City elementary and middle schools. He also supervises FoodCorps New York—a food-oriented version of AmeriCorps—identifying and supporting local partners to bring FoodCorps service members into city schools and communities. "The agroecology program helped me better understand and appreciate the many

contexts and challenges of our food system, providing a perspective that continues to shape my life and work," says Barrett, who holds master's degrees in both agroecology and horticulture from CALS.

Courtney Glettner MS'13 • As an administrative analyst, Courtney Glettner supports the management of natural resources for the East Bay Regional Park District in the San Francisco Bay Area. Her duties include managing databases of wildlife and vegetation records, collecting survey data on endangered species, conducting data analysis and administering environmental permits, working with biologists, ecologists and members of the public along the way. Her degree in agroecology allows her to thrive in an interdisciplinary line of work, she says, "in which complex issues involving humans and the environment do not always have one clear solution."

Anders Gurda MS'14 • Anders Gurda is an associate researcher in organic and sustainable cropping systems in the CALS Department of Plant Pathology, working in the laboratory of CALS/UW–Extension professor Erin Silva. He has spent the last two years managing the lab's field operations and recently started OGRAIN, an initiative focusing on growing, processing and marketing organic grains. Through his work, he helps ensure that knowledge gained at the university is accessible to farmers throughout the state. "The agroecology program gave me the knowledge base,

the community and network, and the platform to do work that I'm grateful to do," says Gurda. In addition to his work with the university, Gurda manages Turned Earth Media, where he produces videos and other audiovisual material focusing on sustainable agriculture.

Noelle Harden MS'11 • Noelle Harden is a health and nutrition educator with the University of Minnesota Extension, where she describes her work as taking place "at the intersection of access to healthy food, local food development and social justice." Harden works with farmers, nonprofits, government agencies, food networks and other entities around the state to improve access to local food through education, networking and advocacy. Those activities include supporting the development of food hubs, implementation of the Minnesota Food Charter, and other food system initiatives. "The agroecology program transformed how I think about agriculture and food systems, opening my eyes for the potential changes that can be brought about when diverse groups of citizens come together for creative problem solving at the community level," says Harden.

Keefe Keeley MS'14 • Keefe Keeley is executive director of the Savanna Institute, a nonprofit based in Urbana, Illinois, that works with farmers and scientists to advance perennial agriculture through research, education and outreach. His passion for ecological agriculture has led him to work with

Alumni making a difference through Agroecology

By Jacob Knudtson



Keefe Keeley



Emma Pelton



Marie Raboin



Kristina Ralph



Mark Sieffert

farmers on five continents, conducting research and consulting on topics including grazing, agroforestry, wildlife, ethics and marketing. In addition to his work with the Savanna Institute, Keeley serves as board president for Community Conservation, a Wisconsin-based nonprofit.

Emma Pelton MS'15 • Emma Pelton is a conservation biologist for the Xerces Society, an Oregon-based nonprofit that seeks to protect wildlife through the conservation of invertebrates and their habitat. Much of Pelton's work involves protecting and enhancing conditions for monarch butterflies in the western U.S., which in recent years experienced steep population declines. Her work entails making site management recommendations for monarch overwintering sites, documenting the quality of monarch breeding habitat, presenting workshops about best management practices for monarch habitat and analyzing monarch population trends. "I have always been interested in the intersection of private and public lands, working lands and conserved lands. Migratory insects like the monarch butterfly connect these landscapes and require conservation efforts that cross human boundaries," says Pelton, who holds a master's degree in entomology as well as in agroecology.

Marie Raboin MS'10 • As a soil conservationist for the USDA's Natural Resources Conservation Service, Marie Raboin provides both financial

and technical assistance to private landowners through the use of Farm Bill provisions. Her main focus is to provide cost share or incentives for implementing conservation practices. "The best part of my job is working alongside farmers and landowners to do the best conservation work appropriate to the personal and financial goals on their property," says Raboin, who earned a bachelor's degree in soil and land management at UW-Stevens Point before moving on to CALS. In her free time, Raboin and her husband have started a hard cider orchard on their farm near Barneveld, where in the near future they plan to open a cidery.

Kristina Ralph BS '10 MS'11 • As the "Generation Organic" program coordinator at CROPP Cooperative/Organic Valley headquarters in La Farge, Kristina Ralph works with young and beginning farmers. The Generation Organic ("Gen-O" for short) program serves as a network for young farmers to connect and share ideas and experiences. In addition, the program supports farmer members and their children by providing services in planning, education, leadership and other opportunities. Ralph's work orchestrates the development and execution of these services while working directly with the new farmers. "My favorite part of work is connecting with farmers and developing programs that serve them," says Ralph. "Because I work with farmers my own age, I learn a lot and can easily empathize with their struggles in the industry."

Mark Sieffert MS'11 • Mark Sieffert spent nearly four years working as an alliance development specialist in the USAID Bureau for Food Security, which leads the U.S. government's global hunger and food security initiative. Sieffert concentrated on the coffee industry, working to build public-private partnerships to address threats to coffee-growing communities in Latin America and Africa. He co-led USAID's response to a recent outbreak of coffee rust, a devastating disease of coffee plants, focusing particularly on expanding access to finance and promoting collaborative research initiatives. His other work has focused on increasing farmer productivity in East Africa and stimulating private sector investment in climate-smart agriculture. This fall Sieffert joined Winrock International, a nonprofit that conducts development work around the world, where he will manage USDA and USAID rural development grants in South Asia.

About *In the Field*

These alumni represent the depth and breadth of alumni accomplishments. Selections are made by *Grow* staff and are intended to reflect a sample of alumni stories. It is not a ranking or a comprehensive list. To read more about CALS alumni, go to www.cals.wisc.edu/alumni/

Know a CALS grad whose work should be highlighted in *Grow*? E-mail us at grow@cals.wisc.edu

Catch up with...

Signe Brewster BS'12 Life Sciences Communication

PHOTO COURTESY OF SIGNE BREWSTER



Whether it's artificial intelligence, virtual reality, robots, 3-D printing, drones or space exploration, Signe Brewster's got it covered. Brewster puts what she learned during her undergraduate education at CALS to use every day as a freelance science and technology journalist based in St. Paul, Minn.

"I write about emerging hardware, which is anything that's on the fringe, and I think about if it's going to be a viable technology that can impact the world," says Brewster, explaining how she chooses stories. "The Department of Life Sciences Communication really prepared me to write about these topics. In my professional life, everyone does a double take when they hear there is a degree combining science and writing."

During her time in LSC, Brewster took a slew of classes that covered science writing, photography, marketing, communication theory and risk communication. Along the way she picked up skills and theories she now applies to every word of her writing. After graduation, she traveled to Switzerland to intern for six months at CERN, the European Organization for Nuclear Research, writing about physics. She then held a fellowship at the popular tech publication *Wired*, putting in her time on the West Coast. From there she became a staff writer at Gigaom, a technology research and analysis firm, before becoming a full-time freelancer a little over a year ago.

● **What are some LSC classes that you feel really benefited you?**

In Shiela Reaves's photography class, I really enjoyed the class discussions and critiques from my peers. It was just so beneficial being in a place like LSC surrounded by so many others who shared my interests. I still do a lot of photography and go back to those class concepts.

Ron Seely's science writing class was my first formal training in how to translate technical science

and technology issues for a general audience. Having someone watch over my science writing and give feedback was something no one else could provide. I now write for publications such as *MIT Technology Review*, *Wired*, *Symmetry Magazine*, *New Scientist* and *TechCrunch*, among others.

● **What about theory classes in LSC?**

I really learned a lot about communication theory from Dominique Brossard's risk communication class, as well as from Dietram Scheufele's "Science, Media and Society." Learning about risk and communication theory gives me insight into how others think and talk about science.

● **What makes LSC special to you?**

I knew I wanted to be a science writer since I started writing about stem cell research. Life Sciences Communication educated me in skills and theories that I was able to apply at the *Badger Herald* on campus, my numerous internships and now my freelance career. The Department of Life Sciences Communication is just a unique place that gave me exactly what I was interested in.

—KAINE KORZEKWA MS'16

The Head and the Heart

At the start of a new school year and the near end of 2016, we at CALS wish to thank some people whom we really can't thank enough: the members of our Board of Visitors.

The Board of Visitors (BOV) serves as an advisory group to Dean Kate VandenBosch in determining how best to lead and advance CALS. Each of the BOV's 25 members help the college by providing an external perspective and link to the wide range of CALS stakeholder communities, building an advocacy network and participating in the college's development efforts.

All of these functions are important, but we'd especially like to thank the BOV for its exemplary achievements this past year in the area of development. As you may know, CALS recently has benefited from offering dollar-for-dollar matching gifts, up to \$100,000, on all donations to the CALS Annual Fund. We were able to offer the match in 2014 and 2015 thanks to a gift from anonymous donors. In 2016, the match was made possible by a donation from the Board of Visitors, whose members pooled their resources.

While members emphasize different points about why they support CALS, an abiding love for the college and belief in its mission is a source of motivation for all of them. So is a desire to advance educational excellence at CALS and ensure that the college's importance to business and industry remains strong.

For example, BOV chair Dr. David Ryder, recently retired Vice President

of Brewing and Research for Miller-Coors, has worked tirelessly to boost CALS' leadership in the area of fermentation science education.

"I find it personally rewarding to give to the CALS Annual Fund," he says. "Being from the fermentation industry, my own experience of learning in fermentation science—in a different country at a different time—was far from perfect, but one learns from that to know how to better prepare the student for the current and future needs of industry." CALS, he believes, can play a key role in providing industry the kind of workforce needed for future growth.

BOV members who are alumni feel strongly about ensuring that new generations can meet or exceed their own positive experiences at CALS. "My husband and I graduated from CALS and really value the world-class education and experiences we received to prepare us for graduate school and medical school," says Karen Metzler BS'03. Metzler is a genetic counselor; her husband, Jeremy Metzler BS'02, is a physician. "We feel it's really important to pay that forward to help current and future students have access to the same education and opportunities we have had."

We welcomed incoming freshmen to CALS at a new student orientation, an event supported by gifts to the CALS Annual Fund.

Another thing BOV members agree on: You don't have to be a BOV member to offer significant support to the college.

"Aside from financial contributions, the most important thing that anyone can give to CALS is their time," says Bill Staudenmaier BS'83, a Phoenix-based attorney specializing in water and natural resources law. "There are numerous ways alumni can contribute their time—mentoring students, volunteering at events, serving on boards and committees and contacting elected officials about the importance of adequate funding to keep CALS and the university among the very best institutions of higher education in the United States. Wherever your talents and interests may lie, you can give back by contributing your time."

We thank our Board of Visitors for their leadership and generosity. And we thank all members of the CALS community for their support, however they choose to provide it.

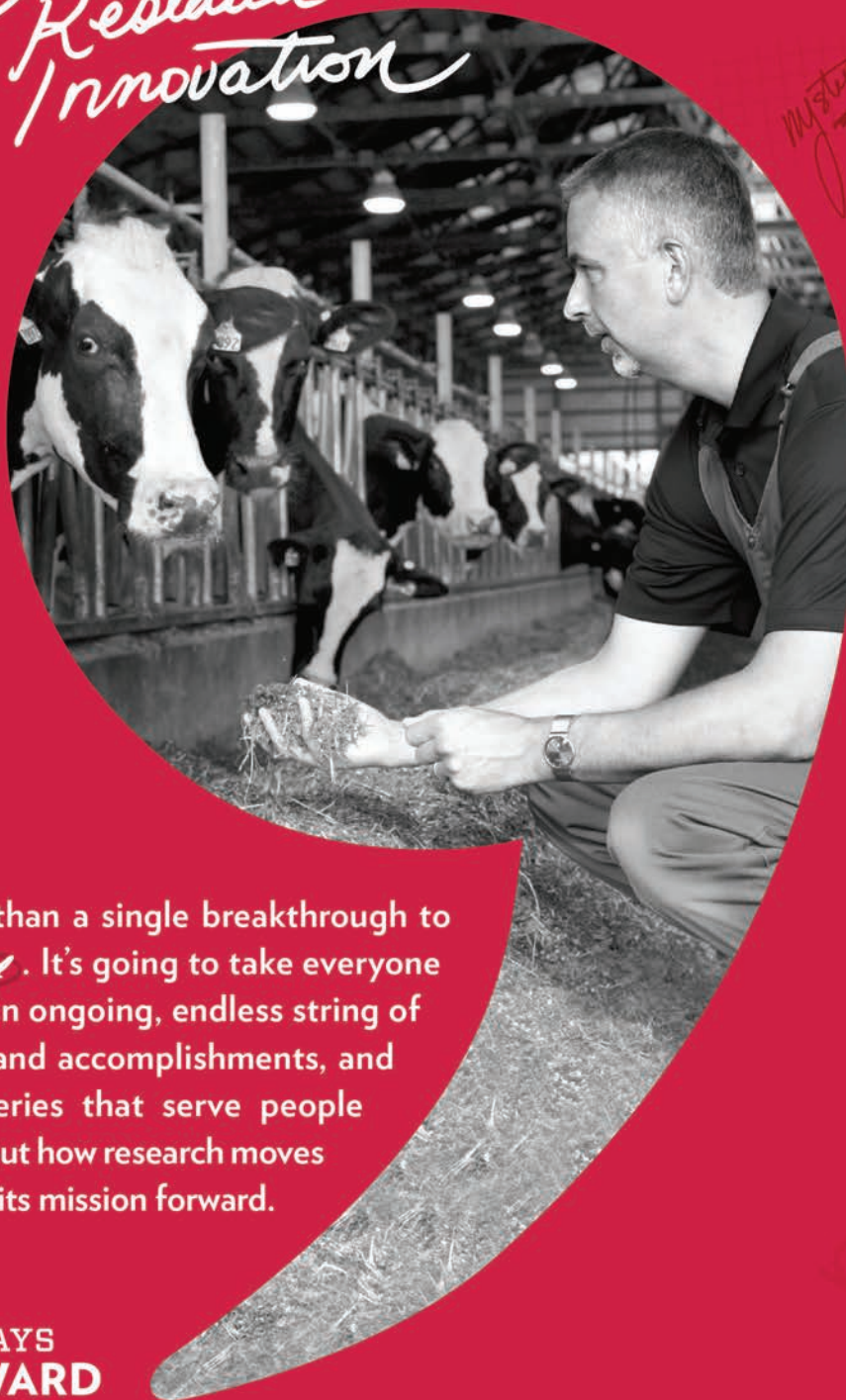
Make a gift online at supportuw.org/giveto/CALS. And learn more about other opportunities for alumni engagement at www.cals.wisc.edu/alumni-friends/



PHOTO BY CAROLINE SCHNEIDER MS'11



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Agronomy

1) Which of the following systems would be primarily used on sloping land to reduce erosion?

- a) Strip cropping
- b) Relay cropping
- c) Mixed row cropping
- d) Sequential cropping

Animal Sciences

2) When did domestication begin?

- a) 1,000 years ago
- b) 10,000 years ago
- c) 100,000 years ago
- d) 1 million years ago

Biochemistry

3) Which of the following is FALSE regarding enzymes?

- a) Enzymes are very specific
- b) Enzymes work by raising the activation barrier for a chemical reaction
- c) Enzymes change the rate of a reaction, not the equilibrium
- d) The three-dimensional structure of the protein is essential for activity of the enzyme
- e) Some enzymes have catalytic rates that are limited by the rate of diffusion

Horticulture

4) The term "germplasm" refers to:

- a) Diseases that affect crop plants
- b) The pool of genetic variation available for a crop
- c) The process of progeny production—selection—recombination
- d) The process of inbreeding

Global Health

5) Why might reducing poverty result in decreased human fertility rates?

- a) Increased probability of child survival to adulthood due to improved nutrition and access to health care
- b) Wealth affords some financial security and decreased dependence on children for support in old age
- c) More women participate in the workforce, have less time for childcare and therefore elect to have fewer children
- d) Desire to be able to afford to give children more opportunities, such as better education
- e) All of the above

Last issue: Answers were 1:C; 2:C; 3:C; 4:B; 5:E. Congratulations to Lee Van Wychen BS'96 MS'98, who was randomly selected from 22 people who correctly answered all questions. He wins a Babcock Hall cheese box.

College of Agricultural and Life Sciences
University of Wisconsin–Madison
136 Agricultural Hall, 1450 Linden Drive
Madison, WI 53706

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