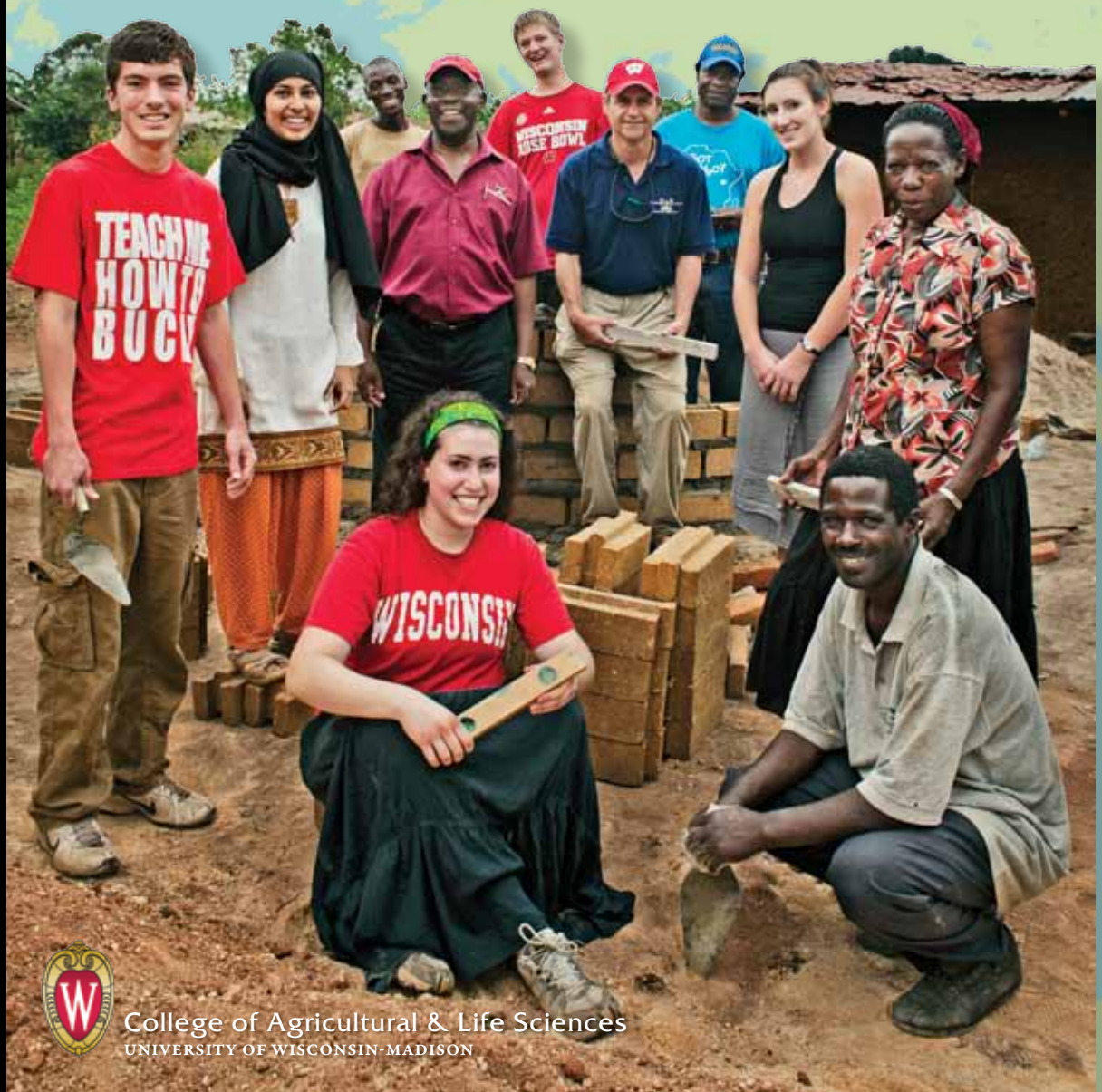
grow

Wisconsin's Magazine for the Life Sciences • Summer 2011

food & agriculture • environment • energy • health

CALS around the World

Changing lives through global engagement



Students work with Ugandan villages on safe drinking water and other crucial health needs

College of Agricultural & Life Sciences
UNIVERSITY OF WISCONSIN-MADISON

DESERT SPUDS • REBUILDING KOSOVO DAIRY • BREWING GURU ON CAMPUS

Getting to know you: CALS nutritional sciences student Rebecca Residorf making friends in rural Uganda. This photo and many others in this issue were taken by CALS biochemistry student Christopher Pearce, a fellow Uganda study abroad participant.

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Wisconsin's Magazine for the Life Sciences

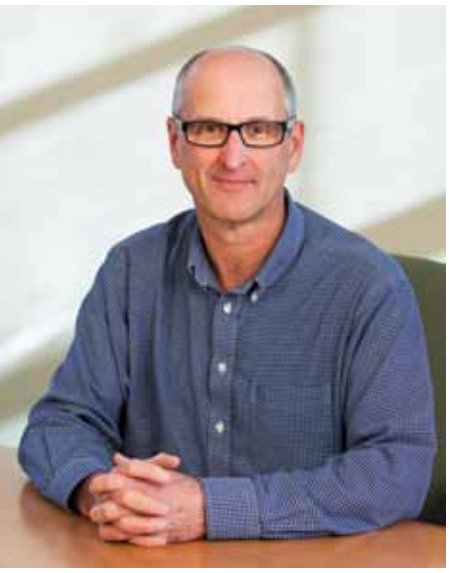
On the cover: A CALS study abroad program brings undergrads to Uganda to learn about public health and partner in community service projects. *Program leaders:* Biochemistry professor James Ntambi (standing in back in blue T-shirt); Assistant Dean John Ferrick (seated in center); and Ugandan partners professor John Kakitahi (next to Ferrick) and Imelda Zimbe of Makerere University (standing far right).

Photo by Charlie Shoemaker

Departments

Interim Dean William F. Tracy

No Substitute for Experience



Outstanding teachers in our college will tell you that there are many ways to reach the eager minds in our classrooms. An illuminating lecture, a probing question or a well-designed experiment all can spark our students' intellect and ambition. But nothing generates a more powerful or lasting response than firsthand experience.

I was reminded of that last summer, when I led 12 CALS students on a two-week travel course to Texcoco, Mexico. Our primary destination was the International Maize and Wheat Improvement Center (CIMMYT), the world's premier research laboratory for the improvement of corn and wheat (you can learn more about it on page 26). While the students learned a great deal about the science of breeding crop plants, they also experienced what life is like for corn and grain farmers in Mexico. They saw for themselves how differences in climate, soil quality, technology and socioeconomic conditions pose serious challenges for farmers in other parts of the world. Because of that experience, those students came back understanding more not only about the work of CIMMYT's scientists, but also about the reality in which they work.

CALS students study and perform research virtually everywhere on the planet.

In CALS, we are in a unique position to provide these transformative experiences for our students. Agriculture is by its nature a global business. Food traverses the world, and so too does the scientific effort to grow it more efficiently and sustainably. Our scientists collaborate with partners around the world to improve plant and animal traits, fight hunger and disease, conserve natural resources and create new knowledge. At the same time, they open doors for our students to learn about and contribute to those efforts.

It's this integration of teaching, research and global experience that makes a CALS education so powerful. Today, CALS students study and perform research virtually everywhere on the planet, from a cornfield in Mexico to a health clinic in Uganda to a forest in China. Many of those students will return inspired to work on global issues. But as we hear from employers frequently, a broad worldview is no longer a luxury for someone aspiring to build a career in the agricultural and life sciences—it's a necessary tool for navigating in an increasingly interconnected global economy.

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Marching to the Music

"Antennal drumming" guides caste development in social wasps

Future queen or tireless toiler? A paper wasp's destiny may be set by the rhythmic vibrations of its colony caretakers.

Like many social insects, paper wasps have distinct castes. Workers build the nest and care for the young, while "gynes," which hatch late in the season, can become queens. Both hatch from eggs laid by the colony's queen and tend to look alike, but the similarities end there. Gynes, unlike workers, develop large stores of body fat and other nutrients to help them survive the winter, start a new nest and produce eggs.

"The puzzle has been how the same egg and the same genome can give rise to two such divergent phenotypes," says Sainath Suryanarayanan, a researcher in the department of community and environmental sociology.

The answer might lie in the music. While feeding a colony's larvae, the paper wasp queen and other dominant females periodically beat their antennae in a rhythmic pattern against the nest chambers. This antennal drumming is in some instances clearly audible even to humans and was thought to be a type of communication, says Robert Jeanne, a CALS professor emeritus of entomology. But its purpose was unknown.

Now Suryanarayanan and Jeanne have shown that antennal drumming may drive developing larvae toward a lifetime of labor.

In the lab, they simulated the vibrations of antennal drumming using piezoelectric devices designed by John Hermanson, an engineer at the USDA Forest Products Laboratory in Madison. Vibrating the late-season nests—which normally would hatch gynes—instead produced wasps resembling workers, with much lower fat stores.

"We think it initiates a biochemical signaling cascade of events," says Suryanarayanan. "Larvae who receive this drumming may express a set of genes that is different from larvae who don't—genes for proteins that relate to caste." These could be hormones, neurotransmitters or other small biologically active molecules.

Photo courtesy Sainath Suryanarayanan

Calling the shots: A queen paper wasp (*Polistes fuscatus*) perches atop her nest. Eggs and water droplets are visible in the nest cells.

The researchers' conclusions mesh well with field observations that antennal drumming is common early in the season when colonies are pumping out workers but drops to nearly zero by late summer, when the reproductive wasps—males and future queens—are being reared.

Studies in other species also have shown that vibrations can have profound effects on animal development and physiology, Jeanne notes. In one study, young mice exposed to low-frequency vibrations developed less fat and more bone mass than other mice.

— Jill Sakai

Safer Snacking?

A CALS plant geneticist has found a way to reduce a possible carcinogen in our favorite snack foods—but his solution is on hold for now

Which would you eat? Researcher Amy Wiberley notes differences in potato chip browning in Jiming Jiang's lab. Below, holes in potato slices show where samples were removed before frying.

What do Americans love more than french fries and potato chips? Not much—but perhaps we love them more than we ought to. Fat and calories aside, both foods contain high levels of a compound called acrylamide, a potential carcinogen.

First discovered in foods in 2002, acrylamide is produced whenever starchy foods are fried, roasted or baked, meaning that it's found in everything from doughnuts to coffee beans. But fries and chips are relatively high in acrylamide compared to most starch-based snacks, and potato processors are eager to change that.

CALS plant geneticist Jiming Jiang, a professor of horticulture, has a solution. His lab has developed a promising new kind of potato with reduced levels of acrylamide, an innovation he created with support from USDA-ARS plant physiologist Paul Bethke, a professor of horticulture. As a bonus, these potatoes also could help producers significantly reduce food waste.

The problem starts with storage. Because fry and chip processors need potatoes year-round, most of the fall harvest goes into storage, where low temperatures can cause simple sugars to accumulate in the tubers, a phenomenon known as "cold-induced sweetening." During cooking, those sugars react with free amino acids to produce acrylamide. The same reaction also causes fries and chips to turn dark brown during processing, making them unsalable.

Jiang's solution is to insert a small segment of a potato's own DNA back into its genome. The extra DNA helps block the gene that converts sucrose into glucose and fructose, the sugar culprits that cause both acrylamide formation and browning. Through this process Jiang has created a number of potato lines that produce very little acrylamide when cooked.

"Regular potato chips can have acrylamide levels up around 1,000 parts per billion," says Jiang. "Ours are down around 150." Jiang's process, potentially of enormous use to the food industry, is now being patented by the Wisconsin Alumni Research Foundation.

But because they are genetically modified (GM), Jiang's potatoes can't be grown for consumption in the United States, where only a handful of GM crops have been approved and widely cultivated.

Jiang hopes that will change, and notes that GM versions of corn and soybeans, which are now added to many processed food items, contain DNA from other species. The extra DNA in his low-acrylamide potatoes, on the other hand, comes from the potato genome itself.

Down the line, especially if scientists confirm acrylamide's link to human cancer, consumers may have to make a choice: accept a new GM crop or cut back on fries and chips.

—Nicole Miller MS'06

"Discovering the World and Myself"

Photo courtesy Christopher Stillion

The Peace Corps celebrates its 50th anniversary this year. And because UW–Madison has long been the nation's second-highest provider of Peace Corps volunteers—with a high percentage coming from CALS—we can consider it our celebration as well. Here we share the story of Peace Corps veteran Christopher Stillion (shown here during his service in Niger) who was drawn to study at CALS.

A CALS Peace Corps veteran draws on his experiences in Niger to help Kickapoo Valley landowners plan a sustainable future

Chris Stillion did lots of different things during his time with the Peace Corps in the West African nation of Niger. He worked with women to establish a group savings fund, which often was the only way poor rural residents could save money. He helped restore a 100-meter-deep drinking water well. He organized a women's cooperative garden, where women learned irrigation techniques and grew onions, mangos, tomatoes, cabbage, peppers and leafy greens for home consumption and sale.

But the thing that drew him most was the land itself. While coordinating a large-scale intervention to restore soils in a heavily eroded agricultural valley, Stillion drew connections between soil quality and human survival.

"I realized how important caring for and understanding soil is to the long-term productivity of the land," says Stillion. "I was working with farmers who were absolutely dependent on what they could grow on limited and nutrient-poor land."

Stillion returned to the United States in 2007 determined to contribute to that field. He's now a graduate student in the CALS cross-disciplinary agroecology program, where he continues to collaborate with local landowners, this time in the Kickapoo Valley. Under the guidance of soil science professor Stephen Ventura, Stillion is working with residents who were involved in the recent drafting of state-mandated land use plans to develop compatible scenarios.

Information Stillion is gathering includes documenting land use priorities of local residents as well as Kickapoo towns and counties; using GIS mapping to assess the future of managed rotational grazing and how a woody biomass energy program might best benefit the area's economy; and working with residents and groups to calibrate the land use model being created at the university for use in local decisionmaking.

Approaching Kickapoo landowners is not so different from what he'd experienced in Africa, Stillion notes.

"I'd say that they're skeptical at first but eventually they become very receptive and supportive," he says. "I think they finish by understanding that I'm not going to tell them what they should be doing, that I really do want to learn something from them, and as a result produce something of potential use to them."

Looking back on his Peace Corps experience with a few years' distance, Stillion has no doubt that it had a profound effect on his life.

"Helping other people and learning in partnership with them is fairly addictive, and that's what we were really doing in Peace Corps—getting to know people and their needs and working with them to meet those needs," Stillion says.

He recommends Peace Corps to anyone considering it.

"It's an excellent way to discover the world and yourself—the complexity and diversity that's out there, outside of America," he says.

—Cathy Day

classAct

Jeffrey Vinokur

Science Onstage

Fancy footwork: Vinokur demonstrates how a non-Newtonian fluid of cornstarch and water is solid when hit fast and liquid when touched slowly.

He loves science, loves to dance. And, as the Dancing Mad Scientist, biochemistry senior Jeffrey Vinokur gets to do both at once.

Vinokur's hip-hop laboratory extravaganza—for which "fiery," "explosive" and "steamy" are literal descriptions—last fall got him to the top 100 out of 70,000 hopefuls for NBC's "America's Got Talent," an opportunity that took his act to Vegas. His dance instruction channel on YouTube has surpassed 10 million views, and this summer he's embarking on a national tour of middle schools, high schools and science centers. Education is at the heart of Vinokur's mission.

"Science is happening all around us. Understanding and appreciating it is something I hope to help people do with my show," Vinokur says. He uses an Airzooka to shoot rings of fog through the audience, demonstrating air movement; adds various catalysts to make hydrogen peroxide burst into foam; and dances on a mixture of cornstarch and water that is liquid when touched slowly but hard when hit fast.

Vinokur has had some UW masters of science performance mentor him along the way: chemistry professor Bassam Shakhashiri and physics professor Clint Sprott, who featured Vinokur in a recent "Wonders of Physics" show.

But his own childhood experiences—which included all manner of home experiments encouraged by his Russian parents—led him to believe in hands-on science. One of his earliest memories is a visit to the Liberty Science Center in his home state, New Jersey. Kids were invited to participate in a frothy experiment with dry ice, soap and water.

"You got to wash your hands in the bubbles. I was blown away," says Vinokur. "Everyone remembers the hands-on stuff. That's a big part of science." The Liberty Science Center will be one of Vinokur's stops this summer.

See Vinokur in action at www.dancingmadscientist.com and (dance instruction only) www.therussiantiger.com.

LAUNCHING, the **Undergraduate Certificate in Global Health**, earned through a 15-credit program of core courses, electives and a field experience. The program, sponsored by the Center for Global Health in partnership with CALS, includes course offerings from schools and departments across campus and is open to students from all majors.

NAMED director of the Wisconsin Center for Dairy Research: **John Lucey**, a CALS professor of food science. Lucey has been a member of the CDR Industry Team since he joined the food science department in 1999, and he also has contributed to CDR short courses and research projects.

ELECTED to the National Academy of Sciences, **Ching Kung**, Vilas Professor of Genetics and Molecular Biology, for his "distinguished and continuing achievements in original research." Elected fellows of the American Association for the Advancement of Science, the following CALS professors: **Michael Cox**, biochemistry; **Jiming Jiang**, horticulture; and **Jorge Escalante-Semerena**, bacteriology.

Photo by Craig Slattery

WON a Wiscontrepreneur Challenge award: CALS BSE students **Kody Habeck**, **Thomas Hoffman** (in photo) and **Craig Slattery**, for the "Clean Seat," a foot pedal device to lift and lower toilet seats. Created with a $15 budget and a 100-hour deadline, the invention has garnered praise ranging from "Pure genius!" to "I want one for my husband!", Habeck says.

APPOINTED to a new international Commission on Sustainable Agriculture and Climate Change: genetics professor **Molly Jahn**, former dean of CALS.

Number Crunching

25 YEARS OF WISCONSIN FAST PLANTS. It all started when Paul Williams, a CALS professor of plant pathology, sought a breed of plant with a high-speed life cycle to study genetic alterations. He began breeding *Brassica rapa*, a crucifer related to broccoli and cabbage, for that purpose—and soon found that the plant, which shoots from seed to flower in two weeks, also was instructive and fun for students of all ages. Williams started the Wisconsin Fast Plants program as a way to share materials and other resources, and the plants are now a staple in classrooms around the United States and 10 other countries.

how to grow a **living soil**

Soil quality may be thought of as a three-legged stool. It's balanced when each leg—soil structure, organic matter and soil life—works with the others to create a healthy system supporting plant growth.

Contributed by Jim Stute, educator, UW Extension Rock County

structure improves soil as a medium for plant growth and provides the habitat for biological activity. The gluing together of sand, silt and clay particles creates a range of pore sizes. Larger pores facilitate gas exchange and drainage and allow easier root growth. Smaller pores store water and protect microbes, the smallest members of the biological community.

organic matter is the fuel driving the system. The biological community decomposes plant residue and animal waste, releasing nutrients in plant available forms. Waste glues primary soil particles together, improving structure.

soil life is the key to the system. Bacteria and fungi cycle nutrients and improve structure. Earthworms and night crawlers redistribute organic matter and concentrate nutrients while creating "biopores" that improve gas exchange, drainage and root growth.

These practical steps can help keep the stool upright:

1 Minimize tillage. Tillage destroys structure and biological habitat. It disrupts biopores and the communities that produce them, resulting in population declines. Tillage also harms mycorrhizal fungi whose intimate association with plants improves water and nutrient uptake and whose waste product, glomalin, is a biological "super glue" that binds soil particles together in a waterproof manner.

2 Keep the surface covered. Raindrop impact has a devastating effect on structure at the soil surface. Clay particles become detached and fill pore spaces, creating a crust. This reduces gas exchange and water infiltration, inhibiting subsurface biological activity—including root growth—and promotes soil erosion and nutrient run-off on slopes. Conservation tillage (which leaves more crop residue), mulching and cover crops all protect the surface in the absence of a crop canopy.

3 Manage traffic. The physical force of traffic, whether large equipment in a field or walking between rows in the garden, can destroy structure by the process of compaction. Compaction reduces total pore space and harms the habitat of soil life.

4 Add organic matter. Returning organic matter to the soil in the form of compost or manure adds nutrients, stimulates biological activity and can improve tight soils by acting as a bulking agent, increasing pore space.

5 Use cover crops. These unharvested crops are grown to protect soil, and often their green tissues are returned to the soil. This addition of fresh, readily decomposable organic material will stimulate a pulse of biological activity and the soil quality benefits that come from it. Many legume species—red or berseem clover, for example—will promote mycorrhizal abundance and glomalin production.

Global Storytelling

Patty Loew talks about the future of community-based journalism and her recent experiences in rural Africa

PATTY LOEW, a CALS professor of life sciences communication, recently traveled to Mozambique to train community-based journalists in a number of rural villages. Loew is a veteran broadcast journalist and a co-host of "In Wisconsin," a weekly news and public affairs program that airs statewide on Wisconsin Public Television. An enrolled member of the Bad River Band of Lake Superior Ojibwe, Loew has authored numerous scholarly and general interest articles and books on Native American topics and produced several award-winning documentaries, including *No Word for Goodbye*, *Throwaway Future*, and *The Way of the Warrior*, which have appeared on commercial and public television stations throughout the country.

What was your project in Mozambique? Why were you interested in pursuing this?
I worked with ORAM, a Mozambican NGO, to train community-based journalists (CBJ) in villages near Quelimane. ORAM has been helping these villages secure official certificates to manage their lands. Village leaders feel that identifying their needs and successes and communicating them to their government and outside world is critical to their success. The Mozambican journalists were nominated by their villages to learn digital storytelling. Both Fawn Youngbear Tibbets, a life sciences communication senior who accompanied me on this trip, and I saw parallels between the Mozambican villages and our own Native American communities. Like us, they're trying to find sustainable development, and, like us, they have a rich storytelling tradition.

How would you define community-based journalism? What kinds of professional and personal backgrounds did your students have?
To me, community-based journalists are professionally trained journalists who focus on local issues. They are journalists who have a relationship with or a stake in the communities on which they report and whose stories reflect broad participation from their communities. The students I worked with had completed six or seven years of primary school, but had no professional background in journalism.

What role does community-based journalism currently play in Mozambique?
For the past few years CBJs, particularly those in radio, have been meeting to talk about the role they might play in development and to undergo skills training, so I think the concept of community-based journalism in Mozambique is still evolving. The community journalists there want to be inclusive; they want to be balanced; and they want to reflect the character of their communities—all solid ideals, I think.

What potential do you see for its future?
It's all about connections. For example, Edwardo Bofete, one of the Mozambican journalists, lives in a village that's without water. The village pump broke more than a year ago, so villagers have to travel some distance to a water source and carry it back by hand. It's particularly difficult for children who go to school all day and have no access to water. He hopes that by telling this story, someone will come to fix their pump. If I were a civil engineering professor looking for a good project for my students and I saw this story on YouTube, you bet I'd be interested. So the opportunity to become part of the world community via the Internet has tremendous potential.

What could help community-based journalism really take flight there, i.e., what resources are needed most?
They could really use some small digital cameras with microphones. Right now they have only one camera for 12 journalists, some of whom live six hours from Quelimane. So for Edwardo to do his water story, he must travel six hours to Quelimane to pick up the camera, travel six hours back to his community to shoot his report, travel six hours back to Quelimane to return the camera and have his story edited and burned to DVD, then hope that someone he knows is headed for Maputo, the capital—a two-day drive—where the story can be uploaded to the Internet. I mean, that's just an impossible situation!

How have you seen community-based journalism play out in ethnic minority groups in the United States? What does it offer these communities?
Native American media are good examples of community-based journalism. We have hundreds of tribal newspapers and radio stations and even a few television stations that provide unique voices. Native media cover local events and issues that mainstream media ignore and offer distinctly Native features. Some radio stations broadcast programs in their Native tongue and tribal newspapers often print vocabulary and puzzles in their own languages. Many of these languages are considered threatened and in danger of going dormant.

Every trip abroad offers indelible experiences and impressions. What did you take with you from this one?
For me, it was meeting a group of local Mozambicans at dinner the first night. We talked about politics, religion and all those things you're not supposed to talk about in conversations that were stimulating and meaningful. We became friends and have continued our friendship via Facebook and Skype. Our

The CBJ team: Far left, Patty Loew—and hanging near her, the killer mangos.

last night in Quelimane, they cooked a nine-course Mozambican meal for us using only local foods. One of our friends brought his acoustic guitar and played Mozambican freedom songs and Brazilian sambas. It was a magical evening and reinforced for me how enriching and precious cultural exchanges can be.

Do you have any concerns about "citizen/community" journalists undercutting the profession?

I *am* concerned about this. We are inundated with information that blurs the lines between objectivity and opinion. We have bloggers, political spin doctors and people who deliberately spread disinformation. For the less discerning news consumer, it might be difficult to know sometimes what is—and is not—journalism. As long as citizen journalists adhere to the ideals of journalism—objectivity, fairness and balance—I have no problem with them. In countries without freedom of speech, citizen journalists are indispensable. But I think there's a difference between "citizen" and "community-based" journalists. The first implies an observer with no formal training; the second implies an observer who has journalistic training and adheres to journalistic ideals.

We also hear you had a run-in with a mango. What was that about?

Oh boy! Could I be the first person who's ever been knocked cold by a mango? Edwardo arrived one morning with a terrible toothache. Luckily, Fawn had studied dentistry and knew he needed help. She had some medicated toothache swabs back at the hotel, so she and one of the ORAM workers went to retrieve them. About a minute after they left, I remembered that I had penicillin and pain medication in my first aid kit, so I ran after them, hoping to catch them before they left the parking lot. There was a mango tree outside the office with a very hard, very unripe mango dangling from a low-hanging branch. I ran full tilt into it and the mango caught me smack dab in my left eye. I saw stars and then I didn't see anything.

> "In countries without freedom of speech, citizen journalists are indispensable."

The next thing I remember I was back in the office with a cold compress on my eye. When the stars and the pain subsided, the ridiculousness of the situation hit me and I started to laugh—one of those snorting, crying, laughing jags where you just can't stop. And the more I laughed, the more horrified the Mozambican journalists became ("She's knocked herself silly!"), and that made me laugh even more. There was no way to communicate with them (our interpreters were dealing with Edwardo's emergency), which just added to the absurdity. At dinner that night our new Mozambican friends got a good chuckle out of the story and began referring to their town, Quelimane (pronounced Kill-a-mahn-nay), as Killermango!

"The boundaries of the university are the boundaries of the state," proclaims the Wisconsin Idea. But that concept has expanded. The boundaries of the university are the boundaries of the world—and no institution demonstrates that more clearly than CALS.

Nearly all CALS faculty engage in international work of some kind, and collectively they cover every continent. There are many reasons why "global" is built into CALS. The College's expertise in areas vital to human needs—food and agriculture, health, environment and energy—make CALS the go-to place for countries seeking development assistance.

While the humanitarian impulse is strong, there are many other incentives for international engagement. Providing help abroad also means developing new markets for Wisconsin products—increasingly important in a global economy. Research needs call CALS scientists out into the world for access to diverse breeds and growing conditions to advance their work. Students from abroad study here to gain job skills needed in their countries, and CALS graduates often find employment abroad or volunteer for Peace Corps. These experiences create international professional and personal connections that deepen and multiply over a lifetime.

In this edition of *Grow* we are pleased to offer a few snapshots of that work. Our cover story highlights an undergraduate course in global health that morphed into a student-run nonprofit serving rural Ugandans. We'll learn about a seed potato project in the Middle East that unifies scientists from hostile nations and a dairy assistance program in war-ravaged Kosovo that was prompted by a concerned Madison businessman. We'll learn how one course forges relations with Mexican dairy farmers and how an exchange program expands our research ties with India.

While these stories show a range of experience, they are only a selection. For a more complete picture, please visit an online map we are developing that allows everyone engaged in international work with CALS to share their stories. Experience the start of a work in permanent progress at www.cals.wisc.edu/global/.

A fair question to ask about international work—and, indeed, about any endeavor conducted by a public institution—is "What's in it for us?" Does international engagement make Wisconsin stronger? These stories, we believe, illuminate how working globally deepens our understanding of human experience and our sense of being both citizens and fellow stewards of the world. We may go abroad to make the world a better place—but it seems that we become a better place because of the world.

Opposite: Students Ryan Cooper (left) and David Campbell leveling the floor of a house they're helping local residents build in Kabale in southwestern Uganda.

Photos in this story by Christopher Pearce

It Takes a Village

Waves of undergrads who visit Uganda with CALS have taken the African proverb as a call to action. Their engagement has included founding a nonprofit and choosing careers in which they serve communities at home and abroad.

By Frank Bures

IT WAS A SHORT WALK FROM the village of Biwolobo, deep in the Ugandan countryside, to the pool where villagers got water for drinking, cooking and bathing. But the trip, a mere daily errand for locals, would have profound consequences for the CALS study abroad students who accompanied them.

After a few minutes they arrived at the narrow pool, which was set in a rock with steep walls on three sides. Slippery dirt stairs led down to the water's edge. The water was brown and murky, with scum and bits of garbage floating on it. In a country where few people know how to swim, the pool invited tragedy. In the past month alone, two children had drowned while fetching water, then-student Jenna Klink BS'07 recalls learning.

Klink was shaken. "In spite of the drownings, kids were still fetching water from that pool. It was the only source of water for their village," she says. "And the water didn't look at all safe to drink. We later found out that it wasn't."

It was but one of many stories that would change the way Klink and 13 other UW students saw the world. Most of them came from small towns in Wisconsin and had never before left the country. They were part of a new CALS study abroad program in Uganda, in its third year when Klink's group went in 2005. There they would spend three weeks over winter break experiencing things seldom seen by tourists.

Two nine-hour flights took them to steaming, bustling Kampala, the nation's capital. There they attended lectures on such topics as AIDS and malnutrition at the Makerere University School of Public Health before heading out to rural villages to see how people dealt with those problems. In one village, Lyantonde, they observed and learned from a Ugandan nonprofit that was planting vegetable gardens, building rainwater collection tanks and getting mothers and infants off to a healthy start with nutritional education.

The entire time they soaked in the sights, the sounds, the smells—sometimes the aroma of foods they'd try for the first time, other times the stench of human waste and illness. They were delighted by people's disarming friendliness—so different from the guarded stance of people at home—and by the children who would wave at their bus from the roadside. There were lush, rolling hills, the beauty of zebras and elephants in the wild.

And there were moments of despair. During a visit to Mulago Hospital—the nation's referral hospital, meaning it offered the best treatment in Uganda—they were jarred by the dilapidated beds and equipment, the reek of urine, the open windows letting in dust and insects, the understaffing, and, above all, the suffering. The AIDS/HIV wards were full to bursting; children with extreme malnutrition and other conditions were waiting long hours to be seen.

Eric Monroe BS'05 was struck most by the malaria patients, many of them small children. They lay dying, a sense of futility engulfing patients and caregivers alike. "It made you sad but also angry because there are effective treatments out there," says Monroe.

The weeks flew by, the students flew home. Small wonder that the world they returned to didn't look quite the same. "We were shown all these things, then we came home to our beautiful Western lives, with our showers and toilets and sinks and washing machines," says Kim Isely.

Around Madison, the students met up often and talked about their times in Kampala, in the villages. They reminisced about sitting around at the end of the day sipping Nile Specials, laughing at their mistakes and trying to make sense of it all.

And they started thinking of ways they could give back to Uganda, a country where people had much to offer but also needed many simple things. There must be something they could do. As they tried to resume their lives, they found that something had changed. They had left Uganda, but Uganda hadn't left them.

A traditional healer explains how he works with patients. The spears represent the spirits of ancestors, and in front of him are samples of plants used for medicinal purposes.

That was exactly the kind of impact CALS had hoped for when starting the program in 2002. Biochemistry professor James Ntambi had been talking about undergrads in the life sciences with Ken Shapiro, then associate dean and director of CALS International Programs, and John Ferrick, then director of CALS Study Abroad. Sure, students were getting a top-notch education. They were learning all about cellular cycles and endocrine function and gene expression.

But the students needed more. They needed to know not just how biochemistry worked, but how the world worked. "It's not just the biology of health," says Ferrick. "There are many, many other factors that influence people's decisions about health. Nutrition. Economics. Politics. Culture. All of those things are what we were trying to get at."

Moreover, they wanted to respond to student demand. Students were eager to learn about conditions in the rest of the world. They wanted to get beyond their classrooms, beyond their borders.

Uganda seemed like a good way to get them there. Ntambi, a Ugandan native, had grown up in a small village and still had many connections at Makerere University, where he'd arrived to study science in 1971—the same year that dictator Idi Amin took power. Ntambi kept his head down and moved through the university system as Amin grew more outlandish in his rule, as people around town began to disappear.

By the time Amin was overthrown in 1979, Ntambi was finishing his master's degree and working as a lecturer at Makerere. The following year, out of the blue, he got a Fulbright scholarship to do his Ph.D. at the Johns Hopkins University School of Medicine, an opportunity that brought him to the United States.

At one point he ran an exchange program with Uganda that he thought could serve as a model for CALS. As it happened, UW–Madison and Makerere University had recently renewed a Memorandum of Understanding for such partnerships. Shapiro, a CALS professor of agricultural and applied economics, had done research in East Africa and Ferrick had extensive experience in Africa as a Peace Corps volunteer in Lesotho.

The trio hammered out the program. A fall semester class about global health would be followed by a trip to Uganda over winter break. During the trip each student would work on a health-related research project. Ntambi and Ferrick would teach the class and accompany the group to Uganda.

Uganda study abroad was an im

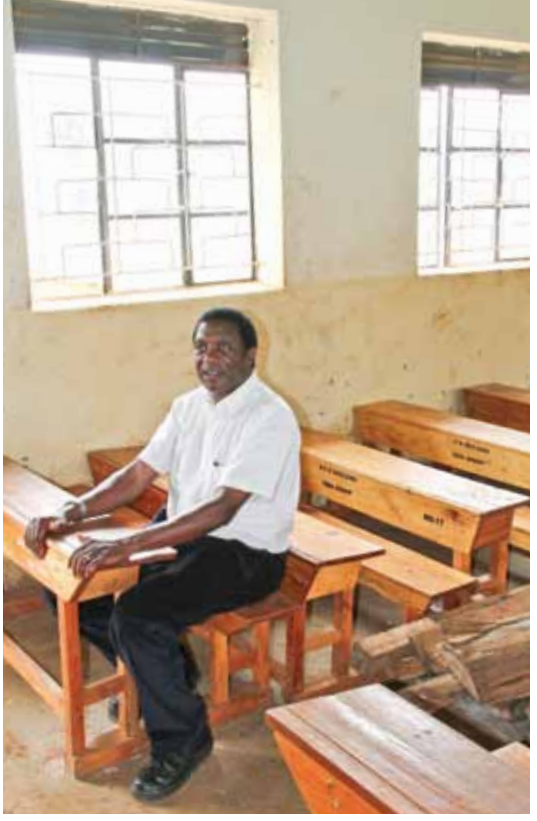
A district hospital outside of Queen Elizabeth National Park in southwestern Uganda. Many healthcare facilities do not include mosquito nets despite the widespread prevalence of malaria.

A mobile outdoor weigh-in: Infant weight monitoring is a crucial aspect of public health in rural Uganda.

mediate success—so much so that Makerere set up similar programs with other universities. In Madison, each year the program was improved upon—and each year it got more popular. By 2005, Ferrick was getting three and four times more inquiries than he could accept. Before long, he stopped publicizing the program. Word of mouth was more than enough.

After returning to Madison, the students from '05 continued thinking of ways they could help the people who had opened their homes and lives to them.

And it was here that the local link provided by James Ntambi proved



crucial. Several of Ntambi's former colleagues at Makerere University were committed to improving health and nutrition in Uganda's rural communities. The students realized they could have the greatest impact by contributing to those efforts.

The most impressive was the work they had learned about in Lyantonde. The Community Based Integrated Nutrition program—CoBIN for short—was led by John Kakitahi, a physician and professor of community health at Makerere. CoBIN had trained 150 volunteer "family care workers" from various villages around Uganda to provide basic health services and education in their communities—an effective, low-cost way to address key public health challenges. Activities included health and nutrition counseling, garden planting and distribution of vegetable seeds, basic infant care and weight monitoring and building rainwater collection tanks.

The water tanks struck the students as especially important. Jenna Klink remembered the children drowning in Biwolobo. Eric Monroe recalled the many stagnant pools that were breeding grounds for mosquitoes carrying deadly malaria. The collection tanks being built by CoBIN often offered rural communities their only reliable source of clean water, especially during the dry season.

Even better, the tanks were conceived of and designed by a Ugandan. Engineer and Makerere University lecturer Moses Kizza Musaazi, through his company Technology for Tomorrow, specialized in simple inventions using local materials, all aimed at improving living conditions in rural Uganda.

In order to raise money, the students began selling necklaces made by Reach Out, a group promoting awareness about AIDS in Uganda. They gave some profits back to Reach Out and the rest to CoBIN to build more water tanks. It was a good start, but more was to come.

CALS biochemistry professor James Ntambi (left) began his education at Lweza Primary School in rural Mukono, central Uganda. (Far left) The group surveys building improvements UW students have made through the Village Health Project and Uganda study abroad.

"We'd never talked about forming an organization," says Klink. "Then we heard about the Wisconsin Idea Undergraduate Fellowship program, and we decided to apply." Soon the group found themselves with $7,000 and a growing list of things they wanted to do. They formed a student organization and incorporated as a 501(c)3 nonprofit.

The fledgling Village Health Project (VHP) took on a life of its own. Fueled by passion, Klink, Monroe, Isely and the other founders applied for more grants and hit up friends and family. Their parents caught the fever and helped the group network in their own professional circles. Soon the students were visiting Rotary clubs and other service organizations and making their pitch.

With CoBIN as their boots on the ground, VHP started sending over funds. The projects they supported grew to include:

- Provision of natural water filters for use by village households. The filters use gravity to move water through layers of organic matter that absorb or kill many water-borne pathogens.
- Provision of "MakaPads," affordable sanitary napkins made from papyrus—a simple innovation (also by Musaazi) that allows girls to attend school while menstruating, a barrier that impedes young women's education throughout much of Africa.
- Building repairs and school supplies for Lweza Primary School in the village of Mukono, where Ntambi began his education.

The Village Health Project had an early opportunity to prove its mettle. In 2006 CoBIN's funding from USAID dried up, and suddenly a group of undergrads in Madison became the organization's sole source of revenue. Not surprisingly, CoBIN's funding went from some $75,000 a year to around $15,000, which is roughly what it gets now, depending on donations. But CoBIN continues to thrive with its fleet of family care workers providing vital services in rural communities.

The Village Health Project, too, continues to grow and works in an easy exchange flow with Uganda study abroad. Study abroad students work on some VHP projects in Uganda, and many get involved with VHP after coming home, replacing students who graduate and move on in their lives. James Ntambi and John Ferrick sit on VHP's board of directors to help make the flow even smoother. A half-dozen years after VHP's founding, one thing seems clear—students returning from Uganda will continue feeling the need to do more.

Students who perform service

abroad hope to make positive changes in that country. Less tangible, but just as real, are the ways in which the experience changes them.

Susan Mawemuko, a program officer with the Centers for Disease Control and Prevention at Makerere University, sees those changes in the waves of UW students who come in and out each year.

"When you meet them again at the end of the program, you think they have been living in Uganda for a very long time," Mawemuko says with a smile. "It's just three weeks, but it changes them forever—and you can see that on their faces."

There is much evidence for the benefits of study abroad. Living in other countries helps students in everything from their general maturity to self-reliance and their ability to tolerate ambiguity, holds one study by the Institute for the International Education of Students. And spending time in another culture increases a person's baseline creativity, found a study published in the *Journal of Personality and Social Psychology* (2009).

Employers increasingly recognize not just the value but the necessity of having a globally experienced workforce.

"A significant portion of our growth will come from international markets, whether through expanding the exporting of our products from the United States or establishing manufacturing bases overseas," says Joel N. Krein, vice president–operations with Leprino Foods Company, Inc., a Colorado-based company that recruits CALS graduates. "The key to our success will be in recruiting and developing our future leaders with the skills and knowledge to excel in this international market."

Certainly students are mindful of the job market when they opt to study abroad. "I recognize that to get the kinds of jobs I want, I need international experience and I need to know how to interact with other cultures. And I think that's true of all students at this point," says Rebecca Gilsdorf, who went to Uganda in 2009.

But what students experience runs much deeper. It's a transformational experience that changes hearts as well as minds, and it's not unusual for students to choke up when they talk about it. "Almost every single day I teared up," says Liz Hill BS'09, recalling her trip to Uganda in 2009. "Just seeing how with so little they can give so much, and still be happy. I feel like they gave more to me than I gave to them."

"It was one of the most pivotal experiences of my life," says fellow '09-er Douglas Stewart, who now works as a medical researcher and plans to go to med school. "You think you have a sense of what it will be like. But once you're actually there, the visceral experience is much more powerful than simply reading about it."

The experience has changed life plans for many students. "Before the trip, I was pre-med," says Jenna Eun BS '07, who now serves as president of the Village Health Project while earning her doctorate in biochemistry. "But afterward I realized I didn't need to go

into medicine, that a lot of what people need is not getting drugs or seeing a doctor. The issues there are usually more fundamental. It's water and electricity. It's public health issues. It's civil engineering."

Eric Monroe, from the 2005 group, had the opposite reaction. "I'd been kicking around the idea of medical school, but I wasn't quite sure. I was thinking about maybe going into research or business," he says. "But Uganda was one of the things that sealed the deal for me." Monroe graduated from medical school in 2009 and is now a resident in radiology at the University of Washington.

Abby Stepaniak, also from 2005, was drawn to Africa for the long haul. After graduating she did the Peace Corps' Master's International program in South Africa and then shipped off to Sudan, where she works as a partnership coordinator with GOAL, an Ireland-based nonprofit. Study abroad continues to inspire volunteering for Peace Corps. Elizabeth Chadwick, who went to Uganda earlier this year, has signed up for a posting in West Africa after graduating this summer.

As for Jenna Klink, the Village Health Project's first president, she took her community service gifts to post-Katrina New Orleans, where she earned a master's degree in public health and serves as a program evaluator with the Louisiana Public Health Institute.

This year, Klink and Kim Isely returned to Uganda to assess impacts of the Village Health Project so far. They evaluated use of nine of the 13 VHP water tanks, and found that they are serving about 340 people, including 43 households and a school. Residents say the tanks save them up to four hours a day they would have spent fetching water, and that they are grateful to have water that tastes clean, gets their clothes clean and is free of water-borne diseases. This is an impressive achievement, especially considering it was the spare-time work of undergraduates.

But many of the group's accomplishments defy quantification, Klink notes. "A lot of our impact can't be measured. For example, the number of malnourished kids brought to the hospital and lives saved because of the family care workers' presence in the villages." Not to mention village children who have not drowned while fetching water.

Another thing that can't fully be measured: the program's impact on the students themselves. Because one thing no class can teach you is that when you set out to help others, the life that you change may be your own.

For more information, please visit www.cals.wisc.edu/ip/ProgramTypes/Uganda and www.villagehealthproject.org. Some material in this story comes from the documentary "Destination Uganda," produced by the Big Ten Network in association with UW–Madison and CALS. The video is posted at www.youtube.com/watch?v=V5SQK29DtFU.

Building a water tank in rural Lyantonde (James Ntambi, right, and student Ryan Cooper, center). Below (left to right), students Tae-Young Nam, Elizabeth Chadwick, Aneela Alamgir and Molly Overby pose in front of a water tank built by the Village Health Project during an earlier visit.

Rebuilding from the Ruins

A small project led by CALS could have a big impact on dairy in Kosovo

By Joan Fischer

around CALS the world

A Kosovar pasture with hay shocks that are characteristic of the region.

Photos in this story by Pamela Ruegg

IT STARTED AS A PHONE call to CALS from one concerned citizen. Now it's a project that, with relatively few dollars, has the potential to improve and strengthen the emerging dairy industry in the war-ravaged nation of Kosovo.

It began when Al Anding, a commercial real estate entrepreneur in Madison, became close friends with one of his tenants, restaurant owner and Kosovo native Gani Ahmetaj, an ethnic Albanian. He familiarized Anding not only with the beauty of his country, which had been part of Yugoslavia for most of his life, but also with the horrors his people endured when centuries-long hostility between Serb and Albanian inhabitants flamed into war in the late 1990s.

Years of violence included the killing and persecution of farming families, the destruction of livestock and agricultural infrastructure and the displacement of 300,000 ethnic Albanians from Kosovo. Ahmetaj's own family fled to the mountains, and Ahmetaj often did not know for weeks if they were dead or alive. A massive NATO bombing campaign (with substantial participation of the U.S. military) was successful in introducing peacekeepers from the UN, which governed Kosovo for nearly 10 years. The Republic of Kosovo declared its independence from Serbia in 2008.

That year, Anding visited Kosovo with Ahmetaj. "I literally fell in love with the people," he says. "They are so bright, so eager to learn, they have an excellent work ethic—and in every home I went in I saw an American flag." Anding saw how much help they needed, particularly in the farming sector. "They're at least 50 years behind where we are in agriculture."

That's what prompted Anding, a UW business graduate, to call CALS, where he reached then-associate dean of external relations Ben Miller. Miller saw a good fit between Anding's concerns, CALS' expertise and UW's role as a land grant university. "It's part of our history and our mission that when people present us with these types of needs and opportunities, we are able to snap into action," says Miller.

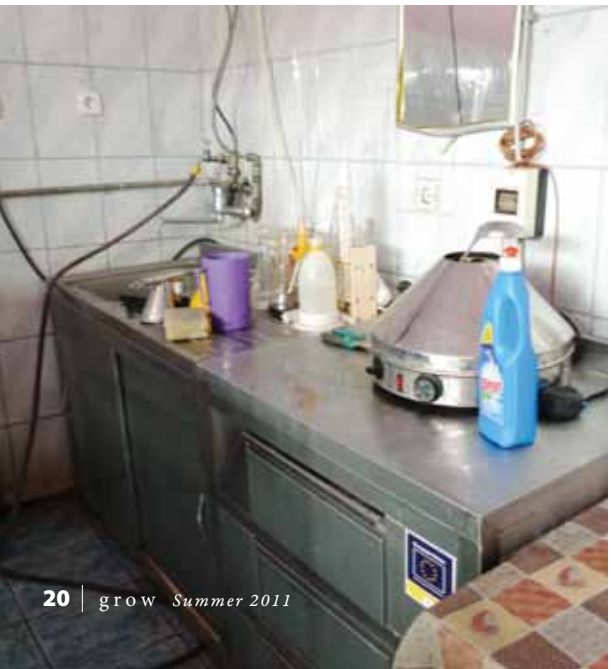
Anding sponsored an exploratory trip to Kosovo that included CALS agronomy professor Dan Undersander, who had worked with farmers there on alfalfa growth, and John Kappelman, a Manitowoc County farmer who had worked in the nearby Republic of Moldova with the USAID Farmer-to-Farmer program. They met with potential partners and stakeholders through the University of Pristina's College of Agriculture to discuss how CALS could best assist the country's demolished dairy sector.

As a result, a team from Kosovo—which included representatives from the University of Pristina, the Ministry of Agriculture, Forestry and Rural Development, the federal legislature and business—traveled to Wisconsin in late 2009 for a 10-day Wisconsin-Kosovo dairy policy workshop to meet their counterparts and other stakeholders and hammer out a course of action.

"Everyone was really moved by what this group had been through and how they'd had to fight for their country," says Karen Nielsen, director of CALS' Babcock Institute for International Dairy Research and Development, which organized the workshop in partnership with the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP). "The

"It's unbelievably sad to see that babies were slaughtered," says Pam Ruegg. This gravestone (above) is for an infant from the Jashari family, whose head, Adem Jashari, was a founding member of the Kosovo Liberation Army and is revered as a national hero. (Left) Photos of people who disappeared during the Kosovo War are posted on a fence in Pristina.

(Left, center) An outdoor weighing station at a milk processor, with the milk fully exposed. "In a modern milk processing plant, you never see milk," notes Ruegg.



(Bottom) Very old milk testing equipment in use at a milk collection center.

progress they've already made in putting their country back together is really impressive."

Babcock was key in helping secure a two-year USDA grant, launched in early 2011, with the goal of improving the safety and quality of milk production. The first year is devoted to gathering baseline data and developing a risk assessment tool—a checklist, in effect—of what practices should be in place wherever milk is produced, transported and processed. In the second year, researchers will run checks at all sites in that chain. The project team consists of government, industry, university and extension experts in both the U.S. and Kosovo, led by veterinarian and CALS professor of dairy science Pamela Ruegg.

All of these participants are donating their time and expertise. The $150,000 in funding covers travel expenses and some testing and equipment costs. The team's motivation, Ruegg says, comes from a genuine desire to help and the belief that project results will be tremendously effective not only in Kosovo but in the United States and other parts of the world.

Dairy in Kosovo is at a very simple level, where even basic safeguards—such as hygienic conditions for milk production, effective testing for bacteria, milk with a refrigerator life of more than three days—aren't yet in place, says Ruegg.

For example, at the small farms her team works with, farmers put their milk in small, non-refrigerated containers and deliver it to a centralized collection center for cooling. Few hygienic controls are in place. Not surprisingly, milk quality and safety are a huge problem.

"Right now the dairy sector can't meet the people's needs for dairy, let alone contribute to economic growth," Ruegg says.

Ruegg's project also will address critical gaps left by USAID and other big international aid projects—such as a state-of-the-art national laboratory without systems in place to have it effectively serve industry needs. Ruegg's team is training personnel in milk microbiology and other relevant specialties. One of the newly minted lab workers happens to be a UW biology alumna—Fillojete Rrustemaj, who as a student had worked at Gani Ahmetaj's restaurant and become friends with Al Anding, who helped pay for her education.

But this is not merely a project to serve Kosovo, says Ruegg; the risk assessment tool will have broad application in other developing countries and even here at home. The growth of farmstead dairy processors in the U.S.—where, for example, artisan dairy farmers may milk their own cows, make their own products on site and live close to a variety of other animals and crops—means that we face some of the same health and safety issues as small farms in Kosovo, Ruegg says.

The project's timing and focus will allow it to have a big impact on Kosovo dairy, Ruegg believes.

"We're working with the highest levels of a new government, so what we learn from this project could become embedded in policies that are now being developed," says Ruegg. "It is very gratifying to be involved at this stage."

around CALS the world

Salty spuds: Hoophouse seed potato production using saline water in Morocco.

Desert Spuds

Photos courtesy Amy Charkowski

The quest to improve potato growth in the arid, salty Middle East led to cost-saving innovations and some extraordinary travel experiences

by Joan Fischer

POTATO FARMING IS A CHALLENGE ANYWHERE. But try it in an arid environment where the little water available usually is salty—and where imported seed often contains pathogens that are deadly to potatoes in your region.

Add religious, ethnic and political tensions to the mix, and you'll see what CALS plant pathology professor Amy Charkowski and an international team of scientists faced as they sought to advance the cultivation of seed potatoes in Israel, Lebanon, Egypt, Morocco and the United States. The five-year, $1 million program, funded by USAID-MERC, or Mid-East Regional Cooperation, began in 2005.

Potato is an important crop in Morocco and Israel, but most of the certified seed potatoes planted there are imported from Europe—and they sometimes contain pathogens that are under quarantine in the Middle East. Establishing a local potato seed industry is considered important both to diminish the introduction of diseases and to enhance local economies.

The fact that potatoes are vegetatively propagated—a new plant is grown from a chunk of tuber rather than from true seed—makes them extremely susceptible to disease.

Scientists at work. At lectures, Charkowski notes, women colleagues always sat in the back of the room.

"Potato is really hard to grow because whatever the main plant gets, all the tubers have. If you don't take great care in seed production, you can get a 75 percent yield reduction pretty quickly just from disease pressure," says Charkowski, who also serves as administrative director of the Wisconsin Seed Potato Certification Program.

To avoid that kind of fallout, pathogen detection at the seed level is crucial. "You want the detection method to be accurate, you want it to be cheap, and you want it to be really efficient," Charkowski says. "But common methods here—based on polymerase chain reaction—are not really applicable to most of the rest of the world, including, actually, here. It's too time-consuming and expensive. You don't want a method that costs $5 a sample. You need methods that are in the pennies per sample."

That's what the team was able to develop, mostly building upon work done by a Lebanese colleague.

"It was technology transfer from Lebanon to the U.S.," says Charkowski. "We've been able to modify a detection assay that is very inexpensive. It's not a novel method, it just hadn't been developed for potato virus detection. It's now being used by about four labs here on campus. The low cost has allowed us to do a lot of experiments we never could have done before because we couldn't have afforded them."

The method, called DBIA—dot blot immunoassay—is considerably less expensive than the currently more widely used ELISA (enzyme-linked immuno-sorbent assay). "In our program now we do several thousand ELISAs per year for the farmers," says Charkowski. "So, the comparison is doing 2,000 tests at $1.50 apiece versus 15 cents apiece."

In addition to disease, another big obstacle is salinity. Previous work in Israel had demonstrated the feasibility of growing potatoes with saline water. This project supported additional work by Israeli and Lebanese scientists on seed potato production with saline water—an effort that was successful. Demonstrations were conducted in Israel, Morocco and Egypt, countries with a range of water availability and soil and water salinity.

"There's definitely a genetic component to it," notes Charkowski. "Some varieties do much better with saline water than others. There's potential to breed improved varieties, and possible parents have been identified for that."

Water challenges in the Middle East got Charkowski thinking about broader applications for work her lab group has been doing in Wisconsin cultivating seed potatoes in a greenhouse hydroponic system. The method requires far less water than conventional growing in soil—which means it could be useful in the Middle East and other arid areas.

"Our rough estimates are that we'd need about a quarter to a fifth the amount of water to produce the same amount of seed. You're using water very efficiently. And you're using greenhouse space very efficiently," says Charkowski. "You also don't have as many pathogen issues because you don't have to worry about soil-borne pathogens. So the system is applicable anywhere, and I think it would be very appropriate for that region."

She shares these findings and others with Middle East colleagues she met through MERC—an example of how international collaboration has benefits well beyond the immediate project. In particular she values being part of a science community in which people from a wide range of Middle Eastern cultures have had a rare chance to interact with relatively little political baggage.

"Every year we meet, and we are able to get scientists from Morocco, Egypt, Israel, Lebanon and sometimes Jordan and Palestine together, because there are multiple MERC projects that work together," Charkowski says. "We are all able to get together in a room and share information. This is actually a lot more complicated than it sounds."

Indeed, working and traveling in the Middle East has been an enormous learning experience, as Charkowski describes it.

She has visited some extraordinary places, such as "the lowest farm in the world" on the edge of the Dead Sea, 1,312 feet below sea level. It is where, as the Bible would have it, Lot's wife turned into a pillar of salt.

"They've got this amazing green-

Photo by Wolfgang Hoffmann

From CALS to the Middle East: Plant pathologist Amy Charkowski believes that the hydroponic system her research group has developed (shown here at the Walnut Street Greenhouse on campus) would be useful in cultivating seed potatoes in the Middle East and other arid parts of the world.

house complex and farms there," says Charkowski. "They grow date palms and a lot of greens and herbs for export to Europe. They obviously can't use Dead Sea water because it's just solid salt. So they have to figure out how to pipe in water or use treated water in different parts of their agriculture. It was phenomenal to me. It looked like a very prosperous farm."

But there are stark reminders, too, of challenges facing the region. In the Sinai Peninsula, Charkowski experienced a landscape without water. It was like visiting another planet, she says: "Nothing grows. There are no insects, there are no birds. It's like being on the moon."

At her conference hotel, guests were issued wristbands indicating what levels of water access they'd paid for. "At one price range you get your room and all your food, and at the higher price you also can have as much water as you want. Being scientists, we went for the cheaper one," she says. "And so you could buy bottled water or at lunch they had a cooler and there'd be a guard posted there. You had to go and give money if you wanted water to drink."

And then there was the place of women in the project, even women scientists—namely, at the back of the room, where women always sat during presentations. Men and women also flowed into separate rooms during breaks, Charkowski noted. "That happened at every meeting," she says.

Political tensions occasionally were on display as well. The owner of a small hotel in rural Morocco felt compelled to post an armed guard outside of the team's meeting room after learning townspeople were upset by "all those Israelis and Americans" gathered there.

Charkowski also has to serve as an e-mail way station between her Israeli colleagues and another colleague in the Middle East. "He will often e-mail me things and ask me to pass it on to Israel because he doesn't want the Israeli e-mail trail," Charkowski says. "And he can't sign anything with the word 'Israel' on it. It would be a career-killer for him."

The five-year project is winding down now. What role could its accomplishments play in helping to feed a hungry population?

"These are countries that, relative to the rest of Africa, are actually doing pretty well," says Charkowski, referring to Morocco and Egypt. "But a typical yield in North Africa for crop potato is about half of what we see here. In sub-Saharan Africa, it's about a quarter of what we see here. If they can develop a decent seed system, they should be able to double the yields that they're seeing. That would be significant."

Her project, she believes, has helped give the region the tools to do that. "I don't think there's a lot of novel research that has to go into helping seed production in other parts of the world," Charkowski says. "It's more taking the parts that are already available and making it a system that works in that country."

Commercial scale irrigation of seed potatoes on a kibbutz farm in Israel using both fresh and saline water. Scientists shown are from Israel, Morocco and Egypt.

Bridging Borders

Photos courtesy Michel Wattiaux except where noted

Partnerships with our nearest neighbors give CALS students firsthand experience with diversity of both crops and cultures

by Masarah Van Eyck

WHAT KATIE BEHNKE BS'08 MS'10 remembers most from a CALS trip to Mexico is the sight of cows grazing under coconut trees. It was on a farm in the Mexican state of Jalisco, she says, that she really understood the importance of diversifying farming practices.

"They grazed in this area near the ocean that provided food for the cows. The farmers harvested the coconuts, and I think they also used the cows for meat as well as milk," Behnke recalls from the two-week field study, which followed up on material learned in a semester-long seminar called "Agriculture in Emerging Economies: Dairying in Mexico." "They don't have the type of specialization we have here in Wisconsin because there is so much uncertainty in their markets. So if the price of milk is down but coconuts are up, they're protected."

Now, as the University of Wisconsin–Extension agriculture agent for Shawano County, Behnke says she puts to use the things she learned in that course every day—and not just what she learned about diversification as a tool for risk management, the subject of her subsequent in-class presentation. She's come to embrace diverse practices more generally.

Working and learning alongside Mexican farmers in their homeland helps students see the world from the farmers' perspective.

"What I learned is that each farm is unique," she says. "So when I go to a farm now, I understand that each one has its particular challenges. I have learned to embrace the differences."

That's what Michel Wattiaux, a CALS professor of dairy science, aims for when he teaches the popular undergraduate course. "My goal is to help Wisconsin dairy students broaden their understanding of the world," says Wattiaux, who recently was honored with a CALS Excellence in International Activities Award. "Learning about Mexico is also a way to learn about the United States, Wisconsin and themselves."

Wattiaux, who grew up on a dairy farm in Belgium, says he saw himself early on in his students, many of whom hail from rural areas of the state. He wanted to make relevant the global effects that influence their lives.

Almost 10 years ago, Wattiaux found a way to do just that. Students were beginning to notice California's growing competitiveness in the dairy industry due in part to inexpensive labor from across the border. Then Hispanic immigrants began to appear in significant numbers on farms here in Wisconsin. Both phenomena prompted Wattiaux to develop the seminar, which is designed to drive home the interdependencies between the United States and Mexico. Two weeks are devoted to debating issues surrounding immigrant labor.

His approach works. The course, says Stephanie Plaster, a student who went on to serve as Wattiaux's teaching assistant, "makes us see the world from the eyes of a Hispanic worker on a Wisconsin farm, or from the perspective of a smallholder who lives below the poverty line in the highlands of Mexico."

Katie Behnke says that kind of content will help in her work with Mexican immigrants. "It makes communication easier because you understand what's behind the thought process and you understand their previous experiences," she says. "Just because they do it differently in Mexico doesn't mean they do it wrong. We're not better farmers, we're just different farmers."

Of course, immigration is only part of the picture. Looking at emerging economies like Mexico's, Wattiaux says, helps students understand how Wisconsin's agricultural industry is tied to not only the national but also the global industry.

Accordingly, the course includes study of policy papers, current affairs and trade agreements to underline the global nature of agriculture. Beginning with a worldwide overview of food production, livestock agriculture and trade, the course then focuses on U.S.–Mexico agricultural relations and the Mexican dairy industry.

"Mexico is the largest dairy export market for the U.S., and I'm trying to be respectful of that," Wattiaux says. "If students want to go into that business, then I want them to be as informed as possible."

Leaving economic competition aside, Wattiaux says, "If you have a bachelor's degree in dairy sciences from the University of Wisconsin, don't you think you should know a little about how milk is produced and consumed in other countries? This class is about diversity. It's about thinking from different perspectives."

By the time students leave for the optional field study, they also have an understanding of the history and cultures of the people of central Mexico. "I touch on some stuff that doesn't have anything to do with science but everything to do with everyday life," Wattiaux says.

For Erik Dolson, an agricultural and applied economics major who took the course last semester, the opportunity to learn about the entire spectrum of the industry is what drew him to the course.

"I was excited for the opportunity to get such a close look at issues like livestock and agricultural production that are so pertinent to another country and its development," he says. "Plus I love learning about other cultures and speaking other languages."

Arguably, it's the two weeks visiting with Mexican universities and smallholder and subsistence farmers in central Mexico that has the biggest impact on the students, some of whom have never been on an airplane, much less applied

Students helped farmers cut and load grass.

Photo by Bryce Richter

The next best thing to travel: In Madison, Michel Wattiaux uses a two-way video feed with students and colleagues in Mexico to foster a closer connection.

for a passport or visited a travel nurse.

Accompanied by colleagues from the University of Guadalajara, students also visit a small-scale cheesemaking factory in Aculco, a family-owned diversified poultry and dairy operation with its own industrial scale feed mill in San Juan de los Lagos, and a cooperative of small and mid-size dairy farmers in Acatic.

But some of the best experiences come from the one-on-one interactions with farmers who welcome them onto their land. As dairy science student Will Springer wrote after last year's field study, the best part of the trip "was when we would visit with the farmers either over lunch or still in the field and they would be beaming with pride ... Their way of life may not be more modern than ours, but it is not less in any way."

As Wattiaux puts it, once they see a farmer plowing land with a horse, students quickly come to appreciate that individual needs breed necessary differences.

"It's one thing to see it on the Discovery Channel. It's another thing to see it for yourself," he says.

Our man in Mexico: Kevin Pixley (second from left) with graduate students.

Photo courtesy Kevin Pixley

Corn Connection

It's no surprise that Mexico is a mecca for corn breeders. Not only is Mexico the center of the plant's origin; the region also boasts the greatest natural diversity of maize grown on the planet, including wild relatives of maize. Moreover, the country is home to a wide range of tropical growing climates, from sea level to mid and high altitude.

"I can find climates that are representative of much of the world all within a half day's drive," says Kevin Pixley, who directs the genetic resources program at Mexico's International Maize and Wheat Improvement Center (CIMMYT) and just completed several semesters as a professor of agronomy at CALS. During that period he retained a half-time appointment at CIMMYT, and he plans to continue cultivating a vibrant corn connection with CALS.

"CIMMYT scientists do not conduct basic research. But basic research, and the cutting-edge knowledge of basic researchers—for example in the areas of genomics, bio-informatics and nutrition—are instrumental to enable the application of recent scientific advances to benefit poor farmers," says Pixley. "For UW scientists, participating in research projects with CIMMYT is an exciting opportunity to see their research reach farmers beyond Wisconsin and the United States, and to expand the impacts of their work and of UW."

It was at CIMMYT that Pixley first met fellow corn breeder Bill Tracy, an agronomy professor and now CALS' interim dean, who brought students to visit the CIMMYT headquarters in Texcoco.

Through Tracy, Pixley and other researchers, CALS' corn work with Mexico continues to grow. And undergraduates get a taste of it. In August, for example, Tracy and Pixley, along with CALS nutritional science professor Sherry Tanumihardjo and agronomy professor Shawn Kaeppler, plan to once again hold a class for undergrads in partnership with CIMMYT. "Linking Agriculture and Nutrition in Mexico" will include a visit to the National Institute of Health in Mexico City and count toward a newly offered undergraduate certificate in global health.

around CALS the world

Top students such as Mufaddal Soni will help foster a vibrant scientific community between Wisconsin and India.

Photo by Wolfgang Hoffmann

Science Ambassadors

An exchange program helps create a "seamless scientific community" between the United States and India

by Masarah Van Eyck

WHEN MUFADDAL SONI spent a summer researching type 2 diabetes in the lab of CALS biochemistry professor Alan Attie, he was surprised by the degree of autonomy that he enjoyed, even as an undergraduate.

"The work culture was really different," remembers Soni, then a visiting student from Chennai, India. "Everyone in the lab was really independent." In fact, he admits, it was a bit disconcerting to have "the liberty to do any experiment and not be questioned at that time."

But for Soni and many of the some 15 research interns from India who come to CALS for 10 weeks each summer as part of the Khorana Program for Scientific Exchange, the benefits of learning to work with such autonomy outweigh the discomfort. "It helps you grow as a person," Soni says.

And the Khorana program helps CALS grow as a presence in India, one of the world's fastest-growing economies. The brainchild of CALS biochemistry professor Aseem Ansari and Ken Shapiro, former associate dean of CALS International Programs and a CALS professor of agricultural and applied economics, the Khorana program was founded four years ago in response to the many requests Ansari was receiving from cream-of-the-crop young Indian scientists seeking research opportunities in his lab.

"I knew some of these students were very, very good," says Ansari, who was raised in Mumbai. And he recognized the long-term benefits of such a program

Photo courtesy Aseem Ansari

President Barack Obama learning about CALS soil testing in India during a recent visit.

to CALS. "These students will be leaders, and their eyes were opened for the first time at UW–Madison," says Ansari. "They are the best ambassadors we could have."

He and Shapiro saw the opportunity for CALS to forge stronger ties with an emerging global power committed to educational and scientific excellence. The Khorana program, including its rural development arm (see sidebar), aims to foster what Shapiro calls a "seamless scientific community" between the United States and India.

Har Gobind Khorana meeting Khorana exchange students on campus.

Its name pays tribute to Har Gobind Khorana, who received the Nobel Prize in 1968 for his work—while a member of CALS' biochemistry faculty—showing how nucleotides in nucleic acids, which carry the genetic code of a cell, control the cell's synthesis of proteins. "There is a real value to having the Khorana name on this program," says Ansari, noting that Khorana never would have had the opportunity to make such research strides in India at that time. "It's a living symbol of how this exchange benefits both cultures."

Such exchanges are more important now than ever. "In this day and age, you need to understand the global aspects of research and be able to communicate across cultures," says Shapiro. "These students will become part of international labs. The sooner they become able to operate in such contexts, the better for them."

The experience leads to lasting connections. Some young scientists, like Soni, even return to CALS as graduate students, recruited by the faculty they met as interns. Now a doctoral candidate in the Integrated Program in Biochemistry (IPIB), Soni continues to study type 2 diabetes in Attie's lab.

But more than simply providing a space for Indian scientists to train, Ansari and Shapiro wanted to create an enriching exchange experience that would emphasize the diversity of cultures both inside and outside the lab.

As part of it, CALS undergraduates travel to India and conduct research—often their first opportunity to do so—in some of the best laboratories in India, including the National Center for Biological Sciences (NCBS) and AstraZeneca in Bangalore. There each intern experiences scientific research—and life—in a remarkably different culture from his or her own.

Erica Barts, a CALS biochemistry major who spent last summer interning at NCBS, was surprised by the amount of time the Indian researchers spent in the lab, working Monday through Saturday and typically staying until after 8 p.m. "I realized that to work with science, you need to have patience because the reactions and time processes take a while to get quality results," Barts says.

Barts gained research experience that will help her no matter where she chooses to work. "I had read about transformation, Western blots and transfections before, but I was never able to actually perform the experiments," she says. "This was a really nice opportunity to get hands-on experience and practice what I have been learning."

The Khorana program is resonating with funding agencies in both countries and will expand to other campuses, Ansari says. By 2013, up to 100 students from each country per year could be involved in Khorana exchanges.

Help on the Ground

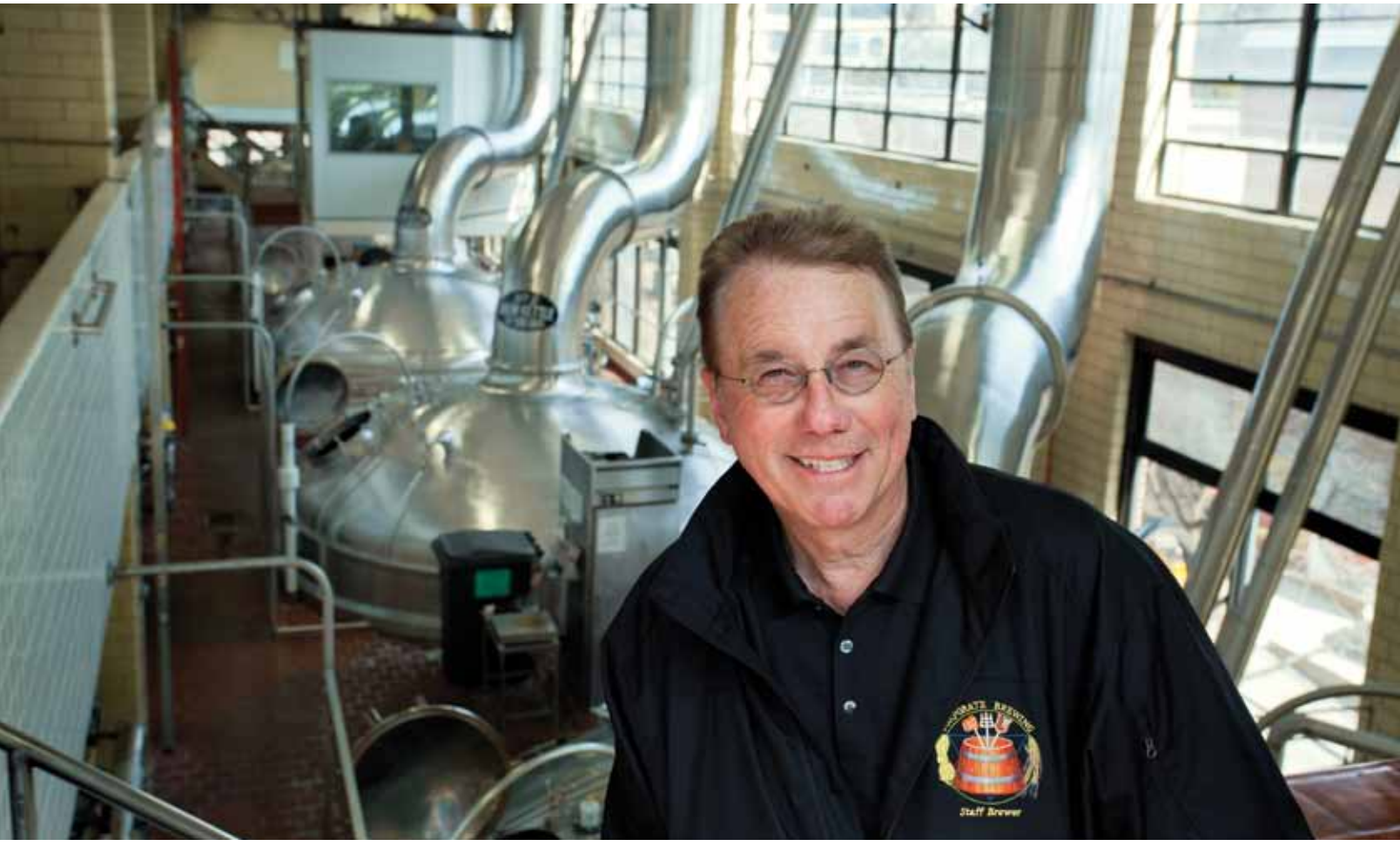
In addition to student exchanges, the Khorana program supports rural development projects between CALS faculty and partners in India. CALS and UW Extension dairy scientists Jerry Guenther, Bob Kaiser and Ken Bolton, for example, are working with women's self-help groups through the Rajiv Gandhi Charitable Trust to improve dairy productivity in the state of Uttar Pradesh, one of the poorest places in the world. Their efforts helped double the dairy and agricultural productivity of many of the some 50,000 families they worked with, notes Aseem Ansari.

And CALS soil scientist John Peters, director of the University of Wisconsin Soil Testing Labs, partnered with Indian industrial conglomerate Mahindra and Mahindra to establish a nationwide network of some 120 soil testing laboratories and full-service agricultural assistance centers, called Samriddhi Centers from the Hindi word for "prosperity."

Peters recently returned from almost two years in India, where he helped establish the centers and train staff. "In general, the farmers traditionally follow the same practices as their predecessors and neighbors," he says. "Now they can actually know the acidity, alkalinity, salt content and nutrient levels of their soils to make sound decisions regarding their farming practices."

Rising to the Top

Photos by Wolfgang Hoffmann



David Ryder standing above six massive brew kettles (each brews nearly 15,000 kegs of beer daily) at MillerCoors in Milwaukee.

Many of our state's signature foods and industries are defined by a fragrant microbial process: fermentation. Why shouldn't UW–Madison become a world leader in fermentation science? It's a question that David Ryder, VP of brewing and research at MillerCoors, dares to ask—and a dream he'll help CALS pursue.

By Nicole Miller MS'06

Imagine, as a young biology student, trying to explain stem cells to Jamie Thomson, the UW scientist who first isolated them in a lab. Or, as a budding computer scientist, pitching an iPhone software upgrade—in person—to Steve Jobs. That will give you some idea of how students in "Microbiology 375: Introduction to Brewing" felt about their final project.

After delving into the science of brewing, the class broke into small groups to concoct their own beers from scratch using state-of-the-art microbrewery equipment—a capstone project that made them the envy of their peers. And as a final exam, the students presented the suds of their labors—a Scotch ale, an Irish red ale, an American lager and a bock—to an expert panel of brewing heavyweights. The panel included experienced homebrewers, brewmasters from Wisconsin's Capital Brewery, Lake Louie Brewing and New Glarus Brewing Company, and perhaps most intimidatingly—here's where the Jamie Thomson/Steve Jobs thing comes in—David Ryder, vice president of brewing and research at MillerCoors and a world authority on fermentation and yeast physiology.

Drawing on all they'd learned about microbiology, biochemistry and engineering, the students described the ingredients they chose, the time and temperatures they used for each step and how they treated the brewing yeast. "Although they were nervous about it, that experience was a highlight for them," says Jon Roll, a CALS faculty associate in bacteriology who led the brewing lab. "Having that audience in that situation was an incredible opportunity."

Of the experts on the panel, no one was more engaged than Ryder. For him, it was a shining moment in the course of a strategic partnership in which the Milwaukee-based brewing giant is helping the college ramp up its offerings in fermentation science. That field underlies the production of not only beer but also other products critical to the state's economy—including cheese, sausage, sauerkraut, soy sauce and bioethanol, to name a few. As an overture to the budding alliance, in 2007 Ryder arranged MillerCoors' donation of more than $100,000 worth of pilot-scale brewing equipment to the college—the guts of Roll's brewing lab. Now, with a lecture-style fermentation course available, CALS is gearing up to offer an undergraduate certificate in fermentation science.

"This will give UW students an opportunity to see what's out there in the fermentation industries," says Ryder. "They don't have to come to MillerCoors, but what helps the industry helps

These fermentation tanks at Promega Corporation are used for growing bacteria and yeast. Fermentation is used at Promega to manufacture both proteins, such as Taq Polymerase, and nucleic acids, such as pGEM plasmid vectors. Promega uses five tanks of various sizes to produce an average of 1,500 pounds of cell paste to support about 1,000 products every year.

us, by implication. The program will help MillerCoors find great people for the future."

The certificate is just the first step. Down the line, Ryder and leaders in the food science department hope to establish a Food and Beverage Fermentations Center to help focus and expand the university's teaching, research and outreach in this field. While the spark came from the brewing business, the center will serve all of Wisconsin's many fermentation-based industries and help prepare students for careers in the state's cheese plants, food processing facilities, breweries and biorefineries alike. It's an ambitious plan, but there's no doubt that Ryder, known affectionately as "Dr. Bubbles" in the brewing world, will see that it happens.

"David is the champion of getting brewing on campus," says food science department chair Scott Rankin. "He's a man of action, and it's his personal mission to see this through."

The nickname "Dr. Bubbles" reflects not just the products that David Ryder creates, but also his manner. With his charming British accent—Ryder was born and raised in London—and easy enthusiasm, Ryder can be effervescent, particularly when he's bantering about his favorite topic: happy yeast. "Our yeast has to be happy. Under no circumstances can it be sad," he explains. "Happy yeast is good yeast because it enables us to create superior beers, so we always look to the yeast."

Ryder got into the brewing industry by chance when he took a job at Associated British Maltsters during college. Throughout graduate school he worked and traveled, troubleshooting and conducting research for South African Breweries in South Africa and Zimbabwe and Artois Breweries in Belgium. By the time he completed his doctorate in biochemistry in 1985, he was already a sought-after commodity. In 1986 he took a position at Chicago's J.E. Siebel Sons' Company Inc., a brewing research, analysis and education outfit, where he served as vice president of technical services and education director of the company's brewing school, the Siebel Institute of Technology.

Ryder joined Miller Brewing Company in 1992, which in 2008 merged with Molson Coors Brewing Company to form MillerCoors, the nation's second largest brewing company. In labs in Milwaukee and Golden, Colorado, he leads a crew of brewers, microbiologists, chemists, biochemists and engineers who spend their days examining the brewing process in excruciating detail. The tiniest thing that affects beer's 3,000 chemical compounds and 97 detectable flavors is fair game for study. Among the endless list of research targets, Ryder's team has figured out why beer turns "skunky" in sunlight, developed a colorless beer, and come to understand a head of beer so well that they can now dial the foam up—or down—with pinpoint precision. In 19 years, Ryder has published more than 32 scientific articles and racked up 19 U.S. patents, all centered on improving or diversifying the company's products.

"Brewing is one of these things that can keep a curious mind very interested and very active," Ryder says.

When Ryder moved to Wisconsin, he was bothered by the lack of ties between one of the state's signature industries and UW–Madison. MillerCoors needs scientists, he says, if not for Milwaukee's research division or brewing plant, then for the company's

Showing some hops, transmitting enthusiasm: A fermentation science program will bring eager young students into related industries, Ryder believes.

seven other breweries around the nation. "I was surprised to learn that brewers in the state hadn't taken more interest in UW–Madison in the past, to have a brewing school in Madison or a school of fermentation science there," he says. "It makes a lot of sense to take advantage of it, because it's just down the road and it's such a great university."

So when Anjali Sridharan, a university-business liaison at the UW–Madison Office for Corporate Relations, reached out to Ryder to explore opportunities, it didn't take the brewing expert long to lay out an ambitious plan. "My big dream is to have UW–Madison be the preeminent brewing university in the world," he says.

Ryder's idea sparked the food science department's plan to create a broader Food and Beverage Fermentations Center, which will house the brewing program. The center will capitalize on the department's strong ties to industry, plus the extensive scientific expertise available across campus—in food science, the Center for Dairy Research, the bacteriology department, the Great Lakes Bioenergy Research Center and the College of Engineering—to help prepare students for jobs throughout the state's vibrant fermentation sector.

About one-third of what the world eats consists of fermented foods. And in Wisconsin, thanks to the state's cultural history, the proportion is much higher, says Jim Steele, professor of food science, who studies the microbes that grow in cheese. "Cheese, beer, sausage, sauerkraut—any of those ring a bell?" Steele asks. "Fermented foods are a significant portion of a typical Wisconsinite's diet."

People have been fermenting food and drink for thousands of years, often to help preserve foods with a short shelf life, such as milk and juice. It wasn't until 1854, however, that French chemist Louis Pasteur discovered that tiny microbes are what drive the process. Yeast cells, he found, control the most important step in beer making: converting the sugars in malted barley into ethanol and carbon dioxide. Cheesemakers, in much the same way, rely on bacteria to turn milk sugars into lactic acid, which helps milk curdle.

Fermentation's primary value today is in creating complex, palette-pleasing flavors. In addition to beer, wine and cheese, fermentation brings us whiskey, vodka and bread (from grains); vinegar, cider and brandy (from fruit); mead (from honey); miso and tempeh (from beans); pepperoni and salami (from meat); and crème fraiche and yogurt (from milk). Thank you, microbial metabolism!

But Wisconsin doesn't just eat and drink fermented products. The Badger State makes them, in a big way. The state's dairy industry, where 90 percent of milk goes into cheese, contributes about $20 billion to the state's economy. The beer industry adds another $6 billion. In the southern Wisconsin village of Walworth, a Kikkoman soy sauce fermentation plant—one of the largest in the world—produces more than 33 million gallons of the salty condiment each year. In Waupaca County, one of the world's largest sauerkraut producers,

At UW's Great Lakes Bioenergy Research Center, senior scientist Yaoping Zhang uses pretreated biomass (such as corn stover) in fermentation experiments with ethanologenic bacteria (bacteria that can directly use the plant sugar and cellulose and convert it to ethanol). Here he is about to collect samples from a fermenter.

the Great Lakes Kraut Company, goes through a lot of cabbage.

"This is a fermented foods-rich state," says Steele. "Incredibly rich."

But fermentation isn't just about food. It turns corn waste into silage, an important feed for Wisconsin's dairy cows. Fermentation also drives Wisconsin's corn ethanol industry, which generates more than $1 billion annually by using yeast to turn corn sugar into fuel. It will be equally important for creating cellulosic ethanol, a next-generation biofuel made from stalks, wood chips and other non-edibles, which is now under development at the UW-based Great Lakes Bioenergy Research Center. And a number of Wisconsin's biotech companies, including Promega Corporation, Cardinal Health and Bio-Technical Resources, use microbial fermentation to produce drugs and other valuable compounds.

If all goes according to plan, a new undergraduate certificate in fermentation science—followed by a master's program—will soon help open up new and better jobs for UW–Madison students in a variety of departments. "In food science, we currently place 100 percent of our undergraduate majors already, but I think that we can place them at higher-level positions and at places that have even stronger career tracks," Steele says. "And for students in microbiology and other fields, going through the certificate program will provide much broader exposure to the basic food chemistry and food engineering principles that people need to work in industry."

The shiny, stainless steel microbrewery equipment donated by MillerCoors currently sits in the bacteriology department's Kikkoman Fermentations Laboratory, where it's clearly visible to diners in the Microbial Sciences Building's atrium cafe. This is where Roll ran his brewing lab in spring 2009 and spring 2010, with about 10 enthusiastic students each time.

"Brewing is such a great hook to get students into deeper science," he says. "When they taste something surprising in a beer they made, they ask, 'What is that? Oh, it's *this* chemical compound. Well, where does it come from? It comes from *this* biochemical pathway in yeast.' It makes what they learned in biochemistry tangible and gives them a genuine interest in why various chemicals appear."

About one-third of what the world eats consists of fermented foods.

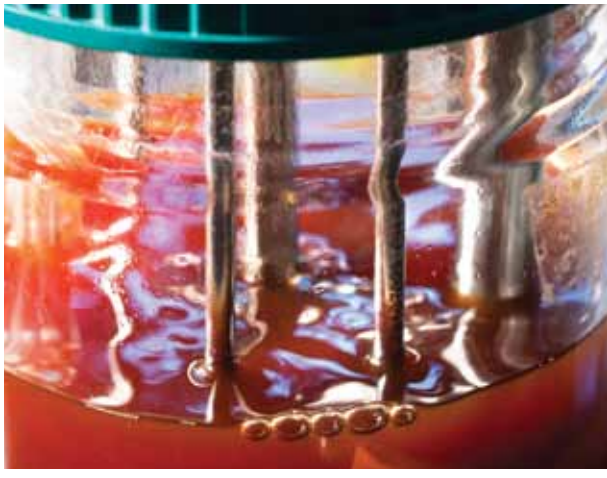
To give more students a taste, this past spring Jim Steele offered a lecture-style course on fermentation science while the brewing lab took a hiatus. "Food Science 375: Beer and Food Fermentations" quickly filled to 95 seats. "The interest has been overwhelming," says Steele, who is leading the college's push into fermentation science.

Starting next spring, the food science department will offer Steele's course alongside an expanded lab course with both brewing and cheese-making units. By then, MillerCoors' microbrew equipment will likely be installed in a larger, food-grade-certified classroom in Babcock Hall and the department should have a new associate faculty member on board, selected with an eye toward building the department's fermentation science program. "This hire will have a big impact on the direction that our department goes," says Steele.

This past fall, the food science department also hired David Ryder as an adjunct professor, enlisting his help right away in Steele's fermentation course. During the brewing section, which spanned five weeks, Ryder drove out to Madison to give a lecture on hops and another on the future of the brewing industry. He clearly enjoyed sharing his knowledge with the students and stayed late both times to answer a long string of questions, even sending home two bags of pungent MillerCoors hops with an inquisitive homebrewer.

The pleasure Ryder gets from teaching mirrors his enthusiasm for the whole effort to bolster fermentation education on campus. He's excited about creating new opportunities for UW–Madison students to follow a path that he's found to be challenging, fun and fulfilling. "If those students want to come to MillerCoors, great," he says. "But if they want to do something else in the fermentation industries, that's fine, too. They will have this really great grounding that will help them along—whatever they choose.

"It's fantastic to think that we'll have graduates from UW–Madison going into the brewing industry worldwide," says Ryder. "That's great. That's what it's all about."



The Grow Dozen


John Bowman


Bonnie Cooper


Herman Chein


Florence Chenoweth


Erick Danzer


Michael Dunbier

John Bowman MS'80 Plant Pathology • Bowman has nearly 30 years' experience designing, implementing and managing agricultural development projects in more than 30 countries. Much of his past and current work has revolved around containing bird flu, most recently in Vietnam. Bowman recently accepted the position of senior international affairs specialist for USAID. His favorite part of the job is fieldwork. Or, as Bowman puts it, "Jumping off a plane, putting on my boots and traveling to a farmer's field to help him find solutions."

Bonnie Cooper BS '73 Agricultural Journalism • As editor of the Canada-based Holstein Journal, Cooper wears a lot of different hats. "I write, edit, proofread and lay out the magazine," she says, along with working with freelance writers, translators and a graphic designer. Cooper says the hardworking, down-to-earth people of the dairy industry inspire her in her work. Her favorite part of the job is covering dairy cattle shows. She's familiar with that environment. "I grew up showing cattle as a youth and still enjoy seeing the best cattle in the world compete in the show ring," she says.

Herman Chein BS'94 Landscape Architecture • In 2005, Chein and family members created an online cosmetics label called UNT Skincare, based in Taiwan. His passion for his work has translated into great success for UNT, which has 50 employees, consumer bases in 90 countries and the potential to go public in three to four years. The company was a 2010 winner of the prestigious Red Herring Asia award, which honors only 100 exceptional businesses across the continent. The nuances of landscape architecture may have little to do with cosmetics, but Chein has found his background in design helpful in developing brand and packaging identity for UNT.

Florence Chenoweth MS'70 Agricultural Economics Ph.D'86 Land Resources • At age 32, Chenoweth became Africa's first female minister of agriculture. Following a violent coup in her native Liberia, she became a political refugee and eventually traveled to Madison to earn her doctorate. Through her research and subsequent employment with the UN's Food and Agriculture Office, Chenoweth has been heavily involved in agricultural reform projects in such countries as Zambia, Gambia and South Africa. More recently, she launched UW–Madison's Human Rights Initiative, which works toward education and reform in areas where fundamental human rights are denied. In the battle against such formidable opponents as political oppression, world hunger and the AIDS pandemic, Chenoweth turns to an enduring sense of optimism to drive her efforts. "Even in the darkest of times, I see hope at the end," she says.

Erick Danzer MA'04 Agricultural and Applied Economics • "Philanthropic capitalism" is the idea behind Danzer's new company, Photocrati Media, which provides high-quality web publishing and gallery tools for photographers. But for Danzer, the company is much more than that. He has pledged 25 percent of profits to donations, mostly to support international NGOs involved in sustainable growth for developing countries. During his graduate studies, Danzer worked internationally as a photojournalist, an experience that left him with a deep sense of concern for the economic and environmental issues faced by developing countries—and a commitment to support solutions through philanthropy.

Michael Dunbier PhD'74 Plant Breeding and Plant Genetics • Dunbier moved on from his role as CEO of the New Zealand Institute of Crop & Food Research to become a freelance consultant specializing in agriculture and agribusiness issues. His work revolves around bringing agricultural research to New Zealand farmer groups in an effort to promote better use of research and development investments. The lasting impact of his time in Madison includes a nuanced understanding of agricultural systems and a persisting allegiance to the Green Bay Packers.

Amitabha Guha BS'87 Agronomy • Guha sees exponential population growth and the accompanying demand for food as a serious issue for the next 30 years. "Helping in a small way to build the agricultural resource base to feed all these people is what drives me," he says. Guha is managing director for the Malaysia-based Agricultural Research & Advisory Bureau, where he spends much of his time working with Southeast Asian plantations to promote productivity and good farming practices. He focuses on teaching better field management and promoting health and quality of the products.

Jon Halpern MA'82 Agricultural and Applied Economics • When a stint as a studio musician proved fruitless, Halp-

12 Alumni who are working globally to improve our world


Amitabha Guha


Jon Halpern


Jessica Jacobsen


Abdul Waheed Khan


Anna Lammerding


Jwee Tan

ern's mother convinced him to go to college. Thirty-five years later, he is the lead infrastructure advisor for energy and water at the World Bank, where he works to assess impacts of energy and infrastructure policies and projects in developing regions worldwide. Halpern leads multidisciplinary teams to help local decision makers improve people's lives. A professorship at Georgetown University, raising several teenagers and fly-fishing in the Appalachians take up much of his remaining time.

Jessica Jacobsen BS'97 MS'99 Food Science • Jacobson was born, raised and educated in Wisconsin—but when the opportunity came to work for Kraft Foods in Germany, she jumped on it. Working at the research and development center in Munich, Jacobsen manages a team of product developers for Philadelphia Cream Cheese. The dynamic nature of her job keeps it exciting, she says: "I could be participating in a flavor innovation brainstorming activity, creating new formulas in the pilot plant and testing production for other formulas in the factory—all in the same week." An avid traveler, Jacobsen has been to all seven continents.

Abdul Waheed Khan MS'71 Agricultural Journalism • Khan's journey began in a remote Indian village and has paused, for now, at Bahrain's Talal Abu-Ghazelah Business University, which he serves as president. Along the way, he worked in radio broadcasting, consulting for international organizations, communications and IT, and established himself in academia as an international leader in technology implementation (he earned a Ph.D in mass communication from UW). For Kahn, the highlight of his career was his role as assistant director general for communication and information at UNESCO, where he promoted the use of communication and IT for sustainable development in 192 member states.

Anna Lammerding Ph.D'91 Food Science • Ensuring the safety of Canada's food supply is no small task, so it's fortunate that Lammerding has a team of food microbiologists, public health veterinarians, risk management experts and epidemiologists to assist her. Lammerding was recently named acting director of the Science to Policy Division within the Public Health Agency of Canada, where she focuses on microorganisms that cause disease in humans. Lammerding credits the international network of colleagues she built at CALS for helping her develop her career and her image of the world as a global village. She is an active board member and fundraiser for Friends of the Orphans, a nonprofit that builds homes in Central and South America.

Jwee Tan BS'93 Bacteriology, MS'95 Bacteriology • Although Jwee Tan describes himself as a "suit," not a scientist, he focuses on creativity as the guiding force of his work. This drive led to the production of award-winning advertising campaigns while at global marketing giant Saatchi & Saatchi. Tan also headed the consolidation of Tiger Beer and Anchor—both lagers produced by Singapore-based Asia Pacific Breweries, where he is assistant general manager. His education at CALS led Jwee to develop a systematic, analytical approach to problem solving. In his free time? "Collect Star Wars toys I do," he says.

Baker's Dozen • Scientist-turned-entrepreneur **Krishna Ella PhD'93 Plant Pathology** will receive a Distinguished Alumni Award and speak about global health at the **International Convocation in Madison July 26–29**. Ella's company, Bharat Biotech International, Ltd., has supplied affordable hepatitis vaccines to millions of people around the world. Fellow CALS alumni presenters include **Abdul Waheed Khan MS'71 Agricultural Journalism** (see bio above) and **Aman Wirakartakusumah MS'77 PhD'81 Food Science**. More info on page 37.

About the Dozen

These 12 alumni represent the depth and breadth of CALS graduates' accomplishments. Selections for the list are made by the 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/

Next issue: Soil Science

Know someone who should be in the Grow Dozen? Email us at grow@cals.wisc.edu

Catch up with …

Percy Mather BS'68 Biochemistry

"WHEN I RETIRE, I SHALL PLANT FRUIT TREES." That's not exactly how Percy Mather, a longtime civil and environmental engineer with the Wisconsin Department of Natural Resources, had planned things. But then she became involved with Madison Fruits and Nuts, a volunteer group that plants fruit-bearing trees, shrubs and canes—so far, mostly cherry and peach trees and raspberry canes—in parks, community gardens and other public spaces around Madison. • They don't grow nuts; the name is a gentle joke on themselves. "We're embracing Madison's kind of kooky reputation," Mather says. And although their mission may suggest guerrilla action, the group works closely with city parks and other public authorities. "Madison Fruits and Nuts does not sanction or encourage illegal acts but works to identify potential sites where edible landscaping can be done," says Mather. • Founded in late 2009, the group scored an early success by winning a national "win free fruit trees" contest—sponsored by Edy's Fruit Bars and administered by the Fruit Tree Planting Foundation—which allowed them to plant trees in Madison's Wingra Park last year.

Why go out and plant fruit trees?

I have always maintained my yard as my own private garden of Eden for eating, where you can go around and snack on raspberries. There is something very primal about that, and I have a real sense of joy when I do it. You look around and have the idea that there ought to be some public space for this. We're in a time of unprecedented interest in locally grown foods, and this is just another step. If you're buying your food from a local farmer, why not grow it in your lot or on the edge of a park or along a bike trail?

Why take this into your own hands?

There have long been plantings, often decorative flowers, for people to enjoy in public spaces. Funding cuts have made it so that there are fewer and fewer of those kinds of amenities. But we still have the land, and all we need are the seeds, the bulbs, the trees and people who will care for them. This is a way to give back to our community and to involve kids in growing healthy food because park budgets are so limited that it's all they can do to mow the grass and pick up the garbage.

Your group is devoted to not only planting but also making better use of existing trees. Can you describe that?

One of our members has created a Google map of these places, and everybody can contribute to it. For example, there's a huge pear tree in public space on Madison's East Side and a lot of apple trees even in city parks. So, part of Madison Fruits and Nuts' mission is to do a better job of caring for those trees and bringing them back into production—doing some pruning and then utilizing the fruit. For example, we sponsored an apple cider-making event where people brought apples that they had picked and pressed cider.

Any heartwarming experiences while planting?

In September when we planted in Wingra Park, it was good to see a number of parents brought their kids. These were preschoolers, and seeing them plant the trees and measure themselves against the heights, thinking they would grow up along with the trees—that was pretty cool.

Learn more at ***madisonfruitsandnuts.org/***

Photo by Michael Forster Rothbart/UW Communications

A PLACE FOR REFLECTION AND CELEBRATION: The International Convocation (info below) features a welcome reception at Olbrich Gardens' Thai Pavilion on Tuesday, July 26, 6–9 p.m. Thai cuisine, entertainment and garden tours included.

JOIN CALS alumni and friends at **Farm Technology Days** near Marshfield (host farm: Seehafer Acres) July 12–14. CALS will host daily receptions at 11 a.m. and 2 p.m. in "tent city"—look for the Wisconsin Alumni Tent—and the Wisconsin Agricultural and Life Sciences Alumni Association (WALSAA) is holding a picnic on Wednesday, July 13, 3–8 p.m. at the nearby Marshfield Agricultural Research Station. Brats and other fare served, no reservations necessary, friends and family welcome—just $10 at the door. More info at **marathonfarmtech.com** and **walsaa.org.**

TAKE PART in UW–Madison's global engagement at an **International Convocation** in Madison July 26–29. You'll hear from international leaders and connect with alumni from around the world (including CALS alumni; see Baker's Dozen, page 35). Venues include the Wisconsin Institutes for Discovery and Union South, both of them new, state-of-the-art facilities. More info and registration at **uwalumni.com/international.**

For links to more information, go to: ***www.cals.wisc.edu/grow/***

CELEBRATE UW–Madison's service to the state at the **Wisconsin State Fair** on Wednesday, August 10. Central Mall activities include science demonstrations, musical performances (including the UW Marching Band) and athletic contests. Visit **statefair.wisc.edu** to learn more.

FIRE UP for the **WALSAA Fire-Up Tailgate Party and Silent Auction** Saturday, September 10 at the University of Wisconsin Foundation in Madison prior to the game against Oregon State. Volunteers needed! More info at **walsaa.org.**

LEARN how genetic engineering and organic farming can work together, according to plant pathologist Pamela Ronald and organic farmer Raoul Adamchak, authors of the book *Tomorrow's Table*. On September 8 they provide the keynote at a **Bioscience Vision Summit** held by Bioforward, an association of Wisconsin's bioscience industry. More info at **bioforward.org.**

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SWEET SECRETS

Candy to swoon for doesn't just happen. There's a science behind it that even seasoned pros need to stay on top of. That's why, for nearly 50 years, the CALS food science department has run a Resident Course in Confectionery Technology, better known as "Candy School."

No golden tickets are required, but each summer only 27 industry professionals from around the country may join professor Rich Hartel for two weeks of hands-on preparation of anything you're likely to find in a Halloween treat bag: chocolate, toffee, fudge, hard candy, gum, jellies, gummies, nougat, caramel and more.

Even people who have been making candy for years find something new. Recent participant Kathryn Kittel, a scientist with Kraft/Cadbury, has a lot of experience with chewing gum—brands she's worked on include Bubblicious and Trident—and currently does product development for Halls Cough Drops. She enjoyed learning more about the process of panning, in which layers of sugar or chocolate are slowly added to a hard core in a tumbler and allowed to dry before the next layer is added.

Other students developed a greater appreciation of candy's complexity. "The most important thing I learned is that 'candy,' no matter what kind, is a very complex food system," says Ilan Weiss, a senior scientist with SunOpta. "Sugars exhibit very different physical and chemical interactions. Throw in cocoa, fats, flavors, colors and other ingredients and you have a very intricate food system."

Participant April Richter, a research scientist at Hershey, welcomed the chance to discuss candy disasters. "You didn't just learn how things go in a perfect world. There were also hands-on examples of how things can go wrong and then discussions around why," she says.

But there's no denying that, serious learning aside, Candy School brings out the kid in everyone. "We got to choose different colors and flavors for all the products we made," says Weiss. "I liked to go with psychological tricks, like having a green jellybean with an orange flavor."

Candy School advances the science behind the sweets—and you can eat class projects.

The UW Foundation maintains more than 6,000 gift funds that provide critical resources for the educational and research activities of the College. To give to the Confectionery Science Program Fund, which helps support Candy School, visit: http://www.supportuw.org/giving?seq=12882

Five things everyone should know about . . .

Acai Berries

By Rebecca Harbut

1 | **They cannot leap tall buildings in a single bound.** Nor will they flatten your tummy, cleanse your colon, boost your immune system or increase your virility. Society seems to like superstars, and acai (ah-sigh-EE), along with the pomegranate, is one of our reigning fruit superstars. The exotic Brazilian berry's meteoric rise to fame would probably be better analyzed by a marketing specialist than a fruit specialist as most of the media attention has been due to aggressive marketing campaigns making unfounded claims about its powers.

That said, this little berry does appear to pack a punch. Studies are showing that acai, similar to other berries, is a good source of antioxidants, fatty acids, essential nutrients and fiber.

2 | **The plant wears many hats in its native land.** The berries come from the multi-stemmed palm *Euterpe oleracea* Mart., which grows in the eastern Amazon estuary and on floodplains. This palm is an important part of the local diet for both the fruit and the palm heart. The fruit not only is eaten for enjoyment, but also is used as a traditional medicine for its anti-diarrheal properties. Palm leaves are made into hats, baskets and thatched roofs, and the wood is used for construction.

3 | **Distant countries are just discovering it.** Until recently, consumption of acai fruit has been restricted to regions where it is grown due to its very short post-harvest lifespan. However, refrigerated transport and freeze-drying technology have made the fruit more readily available. The fruit is a round grape-sized drupe that is green when immature and ripens to a dark purple color. Some types known as "white acai" are still green at the mature stage. The fruit is typically consumed by locals as a drink by macerating the edible pulp and adding water.

4 | **Works like a blueberry, tastes like a beet. Kind of.** The composition of the acai berry is still being studied in order to understand its full capacity as a "functional food." Studies have shown that the berry is high in oleic acid, a monounsaturated fatty acid, and has high levels of antioxidant capacity against some types of cell-damaging free radicals. The proanthocyanidins (one group of antioxidant compounds) found in the acai berry are very similar to those of the blueberry. Acai has a unique flavor that has been described as "metallic," "slightly nutty," "somewhat creamy" or, to put it in more familiar terms, like a beet or carrot but with a slight odor. Many acai products are made with freeze-dried powder.

5 | **Beware of food fads.** The benefits of fruits and vegetables are due to hundreds and sometimes thousands of compounds including essential nutrients, fiber, fatty acids and antioxidants, just to name a few. It's highly unlikely that there is a fruit out there that can out-perform your mother's strategy of eating a variety of fruits and vegetables. If it sounds too good to be true—it probably is.

Rebecca Harbut is a professor in the CALS Department of Horticulture and a fruit crops specialist with UW Extension.

Take the Final Exam!

Fill out your answers online. Ace our quiz and we'll enter you in a drawing for a gift box of Babcock Hall cheese. Go to: www.cals.wisc.edu/grow/ for more details.

Food Science

1. Which "secret" ingredient softens the cream center in a chocolate-covered cherry candy into a gooey sugary syrup?

a. invert sugar
b. invertase
c. corn syrup
d. cherry juice

Global Health

2. What percentage of the U.S. GNP is committed to Official Development Assistance?

a. 20%
b. 15%
c. 1%
d. 1.5%

Plant Pathology

3. What is a seed potato?

a. It is a seed that is produced when potato fruit is pollinated
b. It is a special kind of small tuber produced by potato plants
c. It is botanically the same as the tuber used for food
d. It is a potato that is already beginning to sprout

Biological Systems Engineering

4. Which of the following is *not* a product from a dry milling process for corn ethanol production?

a. ethanol
b. methane
c. DDGS
d. carbon dioxide

Dairy Science

5. How many "letters" make up the genetic code of a dairy cow?

a. 1 million
b. 250,000
c. 3 billion
d. 44 billion

LAST ISSUE: Answers were 1: A; 2: B; 3: A; 4: D; 5: C. Congratulations to forest science major Peter Schneider, who was randomly selected from the four people who aced our Final Exam and wins a gift certificate to Babcock Hall.

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TASTEFUL RESEARCH

You'll find berries and more at the West Madison Agricultural Research Station, which functions as an outdoor laboratory, a classroom and an education center all in one. Along with the 11 other Agricultural Research Stations run by CALS, West Madison offers opportunities for community involvement. More info at www.ars.wisc.edu. For more cool science, visit us online at **www. cals.wisc.edu/grow.**