

# periodi**CALS**

THE MAGAZINE OF CORNELL UNIVERSITY'S COLLEGE OF AGRICULTURE AND LIFE SCIENCES

VOL. 7 • ISSUE 2 • 2017

## FROM VISION TO VINTAGE

*How our bold discoveries are  
transforming the grape and wine  
industries in New York and beyond*



Cornell University





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**ON THE COVER:** A Cornell research vineyard overlooks Cayuga Lake in Lansing, New York. Photo: Chris Kitchen.

**LEFT:** President Martha E. Pollack was installed as Cornell's 14th president on Aug. 25. A Street Fair held in her honor celebrated the momentous day, and we showed our school pride with a showcase of some of what we do best—berries for tasting, explorations into the fascinating worlds of bugs and birds, virtual reality research, plant science and, of course, Cornell Dairy ice cream. Thousands of attendees walked the paths on the Arts Quad to explore over a dozen CALS exhibits and learn what makes our college so life changing. Photos by Dave Burbank and Matt Hayes.

# dean's message

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Dave Burbank

Dean Kathryn J. Boor '80 with President Martha Pollack at the inauguration Street Fair

Change is in the air on campus, including across CALS. In August, Cornell marked a pivotal new chapter with the inauguration of President Martha Pollack. The two-day celebration featured her articulation of her vision for Cornell, informed by and grounded in its founding principles but also inspired by current and future challenges.

In this environment of change, this issue of *periodiCALS* looks at how some of our CALS researchers and educators have been inspired by change, including one who pushed his own boundaries in new ways after seeing the global impact of his research. And another whose path as an instructor and then administrator ultimately motivated his renewed focus on mentoring students and developing innovative teaching methods.

As a researcher, I've seen how changes in the lab—especially through advancing technology—have shifted opportunities among newer generations of researchers. The primary focus of my own dissertation, which was five years in completion, revolved around sequencing and characterizing about 7 kilobase pairs of the *Bacillus subtilis* genome. Today, the undergraduates in my lab can crank out thousands of times that much data in a single day. Technologies that enable such massive data acquisition are changing the very nature of the questions that we can now explore in the biological sciences, requiring insight from multiple disciplines.

As a consequence of these changes, we've seen a shift from an era of the lone investigator, with its focus on individual effort, to an era where the complexity

of the challenges we choose to tackle demands collaboration and teamwork—and where the need for effective teams can form pathways to new funding opportunities.

This environment of change and collaboration is what many of the new faculty joining CALS this fall—whom you can meet and read about on the CALS website—are most excited about at Cornell. Neil Lewis Jr., assistant professor in communication, is eager to collaborate with College of Engineering colleagues to study how team interactions among people with different backgrounds affect long-term retention in the STEM fields. And plant biology professor Chelsea Specht plans to collaborate with our Plant Transformation Facility to develop new gene editing protocols.

Since our founding, CALS has evolved to meet the changing needs of our world—the discovery of knowledge drives us as scientists. That drive has remained a constant over time, even as the methods and technologies have advanced. Through this lens of change, I hope you'll be as inspired as I am by the stories in this issue, which reveal the work we do and its impact on the lives of others.

As always, thank you for your support and interest in Cornell CALS.

Kathryn J. Boor

Ronald P. Lynch Dean of the  
College of Agriculture and Life Sciences



Sam Alcaine, M.S. '07, pours batches of alcohol brewed from acid whey. The various colors are derived from fruit and other natural ingredients added to the beer.

## SOMETHING IS BREWING IN DAIRY

Food scientist taps dairy waste to create new take on beer

By Matt Hayes

**G**ot ID? Dairy that is fermented and brewed like beer could soon be on tap as Sam Alcaine, M.S. '07, assistant professor in the Department of Food Science, turns dairy waste into a flavorful drink with an alcoholic kick.

The research is more than a compelling addition to the craft beer craze: Alcoholic dairy products could be a solution to an increasing problem for New York's powerhouse Greek yogurt industry.

The production of Greek yogurt creates acid whey, a leftover liquid with very little protein and few profitable uses as a secondary product. Alcaine, former product innovation manager at Miller Brewing Company, thinks there may be a place for alcoholic dairy beverages made from whey.

"There's this whole movement around craft beer and spirits, but dairy doesn't play in that space at all," Alcaine said. "If we could convert whey into something that people want to drink, it opens an entirely new economic arena for entrepreneurs and brewers to explore and innovate within."

But turning dairy into a drinkable alcohol is no simple task. Lactose, a sugar in dairy, cannot be broken down and converted into alcohol by traditional brewer's yeast. Alcaine's lab is working on several fronts to form a solution.

One idea is to combine multiple strains of bacteria and various species of yeast to create a co-fermentation that produces alcohol. The first bacterial strain would digest lactose and give off galactose as a byproduct, which could in turn be converted by another yeast strain into alcohol.

Another variation Alcaine is researching uses barley, a traditional source of amylase enzymes that break down starch into simple sugars that are fermented into beer. Barley also contains enzymes capable of breaking down lactose, but they work at different temperatures than those typically used for brewing and have not been utilized in beer making.

Alcaine has found that a precise mix of time and temperature can break down lactose into the glucose and galactose needed by brewer's yeast to produce alcohol. The alternate source of sugars also means unique flavor profiles. Traits like the breed of the cow influence the flavor of the resulting alcohol.

The methods have already shown results: a low-alcohol beer—about 2.7 percent alcohol by volume—with a sour and salty flavor comparable to German-style gose (pronounced GOZ-ah) beer and other concoctions similar to pulque, a traditional central Mexican drink made from agave.

More research is needed to refine the process, but Alcaine thinks dairy alcohol could be on the market within a few years.

"Right now, brewers use farm products like corn, rye and barley to make alcohol. Dairy is a natural addition, especially now, when consumers are demanding novel and interesting flavors," Alcaine said.

## A GROWING INDUSTRY

New York cultivates industrial hemp

By Matt Hayes

It's not what it looks like. Industrial hemp is growing again across New York as the state invests in the once-banished plant as an economic opportunity for farmers and producers.

Food, paper products, clothing, insulation, consumer goods such as soap, and more can be made from the plant's stalks and seeds. While sharing the same genus and species as marijuana, hemp contains drastically reduced levels of tetrahydrocannabinol (THC)—less than 0.3 percent—far below levels that induce psychoactive effects. Yet until two years ago, the plant was banned for decades across the U.S.

With regulations now relaxing, research essential to making hemp a viable crop is under way. This summer, trial plots in Ithaca and the New York State Agricultural Experiment Station in Geneva were used to study 17 hemp varieties and issues such as disease and insect pests that could prove to be barriers for this emerging industry.

Off campus, we partnered with farmers across the state to cultivate more than 1,700 acres. The research tapped into our multidisciplinary expertise in plant pathology, breeding, genetics, seed technology, soil and entomology to determine optimal growing practices in the state's diverse growing conditions.



Left: Gov. Andrew Cuomo came to campus in July to sign a bill that streamlined research and farming opportunities for hemp in New York. Below: Hemp growing at the New York State Agricultural Experiment Station.



## ON TWITTER, FOLLOWERS DON'T LET FOLLOWERS SPREAD FAKE NEWS

Social connection key to thwarting false rumors

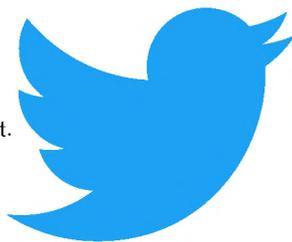
By Susan Kelley

There's hope for those interested in quashing the fake news and false rumors that reverberate around the internet.

When Twitter users tweet a false rumor, they are more than twice as likely to accept correction if it comes from a mutual follower—someone they follow who also follows them—compared with when they are corrected by someone with whom they have no Twitter relationship. That's the finding of Drew Margolin, assistant professor in the Department of Communication and the Geri Gay Faculty Fellow, whose research reveals clues about the relationship between facts and friends online.

"Basically, people don't want to look foolish in front of their friends, but are less concerned with what strangers think," Margolin said.

"We are social beings first," he added. "We care about our friends, family—our social group—and its interests at least as much, and often more, than we care about whether something is true or false."



## LEADERSHIP MINOR TO MAKE MAJOR IMPACT

New minor a 'differentiator' in job hunt

By Jennifer Savran Kelly

Every day across campus, our students are developing the knowledge and technical expertise they need to succeed in their chosen fields. But a new minor available this fall focuses on the skills they need to attract employers across all disciplines.

The leadership minor helps students build key skills to excel professionally and in their personal lives. The goal is to enhance the abilities of students to understand their own strengths, collaborate with others and be positive role models, said Marvin Pritts, professor in the Horticulture Section of the School of Integrative Plant Science (SIPS) and director of the new minor program.

Pritts hopes students will become more aware of the links between community engagement, service learning, leadership and personal growth. The new minor provides opportunities for direct, hands-on experience. It grew out of a desire to formally provide integration and academic credit for the many leadership opportunities that exist at Cornell, both inside and outside the classroom.

"When recruiters come to campus, they already assume that Cornell students are equipped with excellent technical skills, so they are looking for differentiators," Pritts said. "Having leadership experiences and a language to describe these attributes will impress recruiters."

## ANCIENT GRAINS GET NEW LIFE

Project brings back long-forgotten wheat varieties

By Krishna Ramanujan

After a century of markets dominated by a few types of wheat and white flour, ancient and heritage wheat varieties are making a comeback.

"Consumer tastes are changing," said Mark Sorrells, professor in the Plant Breeding and Genetics Section of SIPS. "They are interested in local and flavorful food products, and farmers are looking for value-added crops to sell for higher prices to consumers."

With ancient forms of wheat such as emmer and einkorn now in demand, identifying varieties that are well suited for Northeastern and north-central climates under organic conditions became critical.

Looking to match food lovers' tastes with farmers' ability to supply unique and flavorful grains, Sorrells and his team are determining the most promising grains that can be marketed and processed and which—when turned into bread, pasta and baked goods—satisfy the sophisticated palates of modern consumers.

For three years the researchers evaluated 146 varieties of modern and heritage spring and winter wheat, spring emmer, spring and winter spelt, and spring einkorn. They identified grains that are higher quality, produce larger yields and resist disease.

"Farmers that grow these grains can now look at real data and choose varieties that are most likely to benefit them economically," Sorrells said.



Jane Russell

Left: Emmer grain produced by field trials at Cornell. Below: Bread made from heritage grains.



Jenn Thomas-Murphy



Chris Kitchen

## SMART CHOICE TO LEAD SCHOOL OF INTEGRATIVE PLANT SCIENCE

Plant pathologist appointed to five-year term

By Matt Hayes

Christine Smart, a professor of plant pathology who specializes in developing management strategies for vegetable diseases, was appointed director of SIPS in August.

Smart had been serving as interim director since July 1, 2016, when Alan Collmer, the Andrew J. and Grace B. Nichols Professor in the Plant Pathology and Plant-Microbe Biology (PPPMB) Section of SIPS, finished his two-year appointment as the inaugural director.

SIPS was launched in 2014 to integrate five departments—PPPMB; Horticulture; Plant Biology; Plant Breeding and Genetics; and Soil and Crop Sciences—into a single administrative unit. The school unifies distinct disciplines to tackle urgent challenges relevant to plant scientists, with the mission of creating useful plant improvements that boost human health and advance environmental sustainability.

"It is an honor to have this position, and I continue to be inspired by the outstanding science and global impact of SIPS," Smart said. "At no point has the need for research on plants and soils been greater. The combined expertise of our outstanding faculty and our commitment to science-based solutions positions us to address some of the most serious and fundamental challenges facing humanity."

Cliff Kraft '75, left, and Jason Robinson, B.S. '02, M.S. '08, haul fishing lines to collect samples in the Adirondacks.



Dan Josephson

## A LASTING LEGACY IN THE ADIRONDACKS

From acid rain to climate change, our research has preserved fish habitats in the nation's largest state park

By David Nutt

In the 1950s, fish began disappearing from hundreds of lakes and ponds in the Adirondacks. Local anglers were perplexed. They proposed various creative—and sometimes unusual—methods to bring the fish back: creating spawning boxes, piping in cold water, stocking lakes with different strains of brook trout. Nothing worked.

It wasn't until 1972 that Carl Schofield, senior research associate in the Department of Natural Resources, identified the culprit: acid rain was making cold-water lakes uninhabitable.

Schofield's findings were brought to national attention by Cornell limnologist and ecologist Gene Likens, and this information provided the scientific foundation that underpins the 1990 Clean Air Act Amendments. These government regulations succeeded in reducing sulfur dioxide and nitrogen oxides emitted into the atmosphere by power plants and industrial facilities, and the lakes of the Adirondacks became hospitable once again. In less acidic waters, small groups of brook trout that survived in local tributaries began to flourish and repopulate the region.

Today, however, climate change is posing another environmental threat to fish in the Adirondacks, and our researchers are looking for new ways to help them thrive.

For more than ten years, Cliff Kraft '75, professor of natural resources and director of Cornell's Adirondack Fisheries

Program, along with other Cornell researchers, has been studying the effect of warming lake temperatures on the growth, survival and reproduction of brook trout. Their work examines the genetic capacity of the species to tolerate and adapt to rising summer temperature conditions as well as identifies landscape features that provide cold-water refuge for fish during the peak of summer.

Their findings could ultimately help researchers predict how future changing climate scenarios will impact fish, with implications that extend far beyond the Adirondacks.

"Humans have a tendency to take a sledgehammer to the environment, and we whack it again and again and again and again," Kraft said. "There are limits to what fish like brook trout can tolerate. And we're on a course to find out just where those limits end."

While researchers are still years away from drawing concrete conclusions about climate change's impact on the Adirondacks, Cornell's success with mitigating acid rain shows that it is never too early to conserve natural resources and the ecosystems that sustain them.

"The Adirondacks are a beautiful and interesting place," Kraft said. "When the environment is protected, animals and plants live and survive and they do well. It's a legacy worth protecting."

# ““ CALS in quotes ””

“People think they were born with a sweet tooth or don’t like a certain thing. Maybe taste is much more plastic than that.”

**Robin Dando**, assistant professor in the Department of Food Science, in *Gizmodo* on how perceptions of taste are not as ingrained as some believe.

“You know that your morning cup of coffee helps you lift off for work each day, but did you know that it has the potential to do the same for birds?”

**Amanda Rodewald**, professor in the Department of Natural Resources and director of conservation science at the Cornell Lab of Ornithology, writing in *Scientific American* about a sustainable environment for Colombia’s birds and coffee growers.

“Often the problem now is that if we have a new variety of fruit, it’s very hard to convince retailers to try something new.”

**Susan Brown**, professor in the School of Integrative Plant Science, in the *Washington Post* commenting on the hesitation of retailers to market unfamiliar varieties.

“When you get that puckering sensation in your mouth, it’s the polyphenols binding to proteins in your saliva giving you that dry sort of sensation. Those compounds are really important for the flavor profile of a beverage, giving you a more robust, complex experience when you drink it.”

**Greg Peck**, Ph.D. ’09, assistant professor in the School of Integrative Plant Science, in *Modern Farmer* about how hard cider is growing in popularity for drink connoisseurs.

“For those of us who grew up catching them, rearing them in deli cups and releasing them, perhaps we feel a loss, not only for ourselves, but also for the future generations of backyard biodiversity lovers.”

**Anurag Agrawal**, professor in the Department of Ecology and Evolutionary Biology, writing in *Scientific American* about the decline of monarch butterflies.

“What happens in the Arctic doesn’t stay in the Arctic.”

**Charles H. Greene**, professor in the Department of Earth and Atmospheric Sciences, in *HuffPost* about how climate change contributes to the severity of storms like Hurricane Harvey.

“As nature’s most perfect food, milk is an excellent model for studying the genetics of food.”

**Martin Wiedmann**, Ph.D. ’97, professor in the Department of Food Science, in *Food Safety News* about how a CALS partnership with IBM is using genetic sequencing and bioinformatics analytics to keep the global milk supply safe.

“We see the genome is very dynamic, very elastic.”

**Cedric Feschotte**, professor in the Department of Molecular Biology and Genetics, in *Quanta Magazine* discussing the dynamic forces shaping the evolution of genomes.

“One of the things that is true whether you’re in the ocean or on land or in the air is that the vast majority of animals depend on a naturally quiet world for all of the basic things they do: for finding food, finding mates, navigating, maintaining social networks. Sound is really, really important. When we make a lot of noise, what science is telling us is that animals find it more difficult to survive.”

**Christopher W. Clark**, senior scientist in the Department of Neurobiology and Behavior, in *Popular Science* about how human-created noises have a negative impact on wildlife.





# PERFECT PAIRING

From vine to glass, our science has elevated how grapes are grown—and enjoyed.

*By Erin Peterson*

Such a delicate fruit, the grape. Thin-skinned and weighing only a few grams, this tiny berry has become an elemental part of human civilization. First domesticated some 8,000 years ago in mountainous regions of the Near East, grapes—and the culture surrounding them—have spread across the world: fermented for Egyptian pharaohs, celebrated by Greek poets, tended in French vineyards, raised in Chilean high mountains, and nestled along valley hillsides of the Finger Lakes in New York.

Grapes have held an exalted cultural status for millennia. And throughout that time, the fruits have had to be harvested carefully by hand. It wasn't until 1957 that E. Stanley Shepardson, an agricultural engineering researcher at Cornell, introduced a new method: a harvester that used high-frequency, low-amplitude "bumping" to shake individual grapes off the vines. Grapes used to make wine and juice could be harvested by machine without damaging the fragile fruit.

"Between the late 1960s and mid-1970s, we went from 100

percent hand picking to 100 percent mechanical picking of juice grapes," says Cornell senior research associate Terry Bates. "This was a huge advancement. The discovery revolutionized the industry."

At Cornell CALS, our impact on grapes neither starts nor ends at harvesting. For decades, our researchers have been transforming how grapes are bred and grown as well as how wine is crafted. From nurturing promising new grape hybrids to shaping the aroma of the wine that fills a glass, our scientists have affected nearly every piece of the grape growing and winemaking process.

As a result, the New York grape and wine industries have flourished. The state is the largest producer of grapes in the eastern U.S. and the third-largest in the country—boasting over 400 wineries spread across 59 out of 62 counties. More than 100 are located in the Finger Lakes alone, a region dotted with nearly 10,000 acres of vineyards producing some of the finest Riesling found anywhere in the world.

“Without Cornell CALS, there would not have been the long and sustained expansion of the grape and wine industries in the state,” says Sam Filler, executive director of the New York Wine and Grape Foundation. “Cornell has been at the forefront of innovative research for decades, and continues to tackle the challenges we face today and will encounter in the future.”

Like the harvester developed in the 1950s, our creative solutions to today’s problems are still helping industries thrive. Drones hovering over vineyards are measuring vine growth and health, allowing managers to spot problem areas early. One day, robots may deftly maneuver through vineyards on their own. Justine Vanden Heuvel, associate professor in the Horticulture Section of the School of Integrative Plant Science (SIPS), is collaborating with Cornell engineers on autonomous robots that can touch, sense and handle grapes. These could soon be collecting real-time environmental conditions and cluster data, streamlining decisions about optimal growing conditions, pest control and harvest.

Grapes and wine have earned a prized significance that shows no signs of diminishing. Our scientists are continuing to address the unique challenges and issues of our time—from managing pests and disease in a changing climate to exploring the science of taste in a world of rapid technological advancement.

## IMPROVING EFFICIENCY

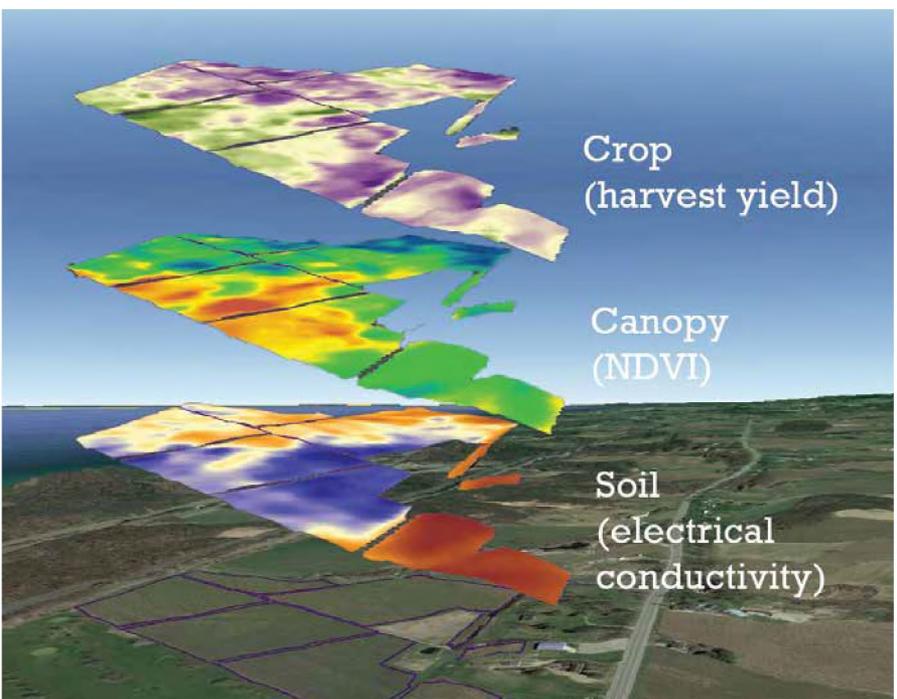
When it comes to grape vines, there really can be too much of a good thing. That was the discovery of professor of viticulture Nelson Shaulis, who in the 1950s found that thick, lush leaf canopies prevented fruit from getting enough sunlight and drastically reduced grape yields. In 1960, he hit on an idea that became known as the Geneva Double Curtain trellis system. Revolutionary for its time, it involves dividing the vine into two separate, thinner canopies with the help of large cross-arms (imagine a single, long row of grapevine trunks with branches outstretched onto two parallel fruiting wires). That configuration exposes more of the fruit to sunlight, which increases grape yields by up to 90 percent. The design proved to be an immediate sensation, especially for the production of juice grapes. It inspired designs for other divided canopy systems as well, and has transformed how grapes of all kinds are grown across the world.

Squeezing every ounce of productivity from the land is essential for vineyard owners. In the 1970s, they could expect to earn about \$220 per ton of Concord grapes, and during the past few decades that number has barely budged. To stay competitive, growers are getting practical help from the Efficient Vineyard Project, a multi-institution effort led by Bates, who also heads the Cornell Lake Erie Research and Extension Laboratory.

Among other initiatives, Bates is putting sensors to work collecting data on soil, canopy and grape yields. While managers dream of growing perfectly uniform grapes, quality varies across a vineyard. Data from the sensors produces spatial maps to facilitate differential harvesting, making it easier for growers to separate the fruit for wines at different price points, optimizing the usage of every grape. The information can also be used to adapt their fertilizing and pruning to grow



Terry Bates



Ground-based sensors like the one mounted to the back of an all-terrain vehicle driven by Anna Long '15, top, can provide high-resolution scans of soils, vines and other attributes, above.



Chris Kitchen

Drones collect detailed measurements of growing operations. Justine Vanden Heuvel, associate professor of viticulture, is providing New York growers with the tools to understand and make use of the rich data.

more uniform grapes, sustainably, across an entire vineyard.

“For growers, the rich data stream allows them to make critical economic decisions that can be the difference between profit and loss,” Bates says.

Producing grapes is a labor-intensive undertaking. Every season, up to seven or eight times before harvest, growers must sample areas of their vineyard—an expensive effort that entails collecting fruit and studying it for everything from sugar levels and acids to color and aroma.

Using images collected by satellites and drones, Vanden Heuvel is developing processes that may upend that labor-intensive practice without sacrificing quality. Aerial imagery and remote sensing pinpoint representative areas for sampling. One study revealed that using these images cut sampling time by 57 percent.

“The views from overhead can help growers see where vines are more or less vigorous, which can be an indicator of vine size and health. Both affect fruit composition and quality, and seeing all of these things in a high-resolution snapshot helps growers understand the variability in the vineyard,” says Vanden Heuvel.

## STOMPING OUT PESTS AND PESTILENCE

One of the most destructive fruit pests in the vineyard, the tiny grape berry moth gobbles up blossoms and small grapes before they ripen. Females lay dozens of eggs on grape stems and berries. As the pupae emerge, they tunnel into the fruit to feast on the pulp and seeds. In 1971, Cornell researcher Wendell Roelofs teamed up with postdoctoral student Jim Tette and Fredonia-based entomology professor E. Frederick Taschenberg to fight this vineyard scourge. In their lab, the trio removed the glands of female moths and isolated Z9-dodecenyl acetate as the chemical that attracts males. They discovered that by synthesizing the compound and releasing it in vineyards it could be used as a potent tool for population control.

“At first, we used the pheromone in traps primarily for monitoring,” Roelofs says. “The capture of males in the traps helped us understand the density of the moths, and when insects were present in the vineyard so that we could time insecticide sprays.”

Over time, they used the pheromone to disrupt mating entirely. “When we released small amounts of the pheromone throughout the vineyard, it confused the males so much that they didn’t mate,” he says. “We could control them without using insecticide.” In 1990, the researchers released a commercial lure that has proven successful in Israel and throughout Europe in hillside vineyards that tractors cannot easily access.

Today Greg Loeb, professor in the Department of Entomology, is continuing the battle against the grape berry moth by working to develop attractants for females. By understanding the chemical compounds—known as host cues—that the insect uses to determine if a vine will make a suitable home, Loeb is developing improved monitoring tools, which could be applied to create more effective attract-and-kill stations. Eventually the right research could help growers sidestep moth-related problems entirely.

“Down the road, we may be able to make changes to cultivated grapes that make them less attractive to female

“Cornell has been at the forefront of innovative research for decades, and continues to tackle the challenges we face today and will encounter in the future.”

- Sam Filler, executive director of the New York Wine and Grape Foundation



Tim Martinson



Chris Kitchen

Our researchers are working to thwart destructive diseases like leafroll, left, and to control the grape berry moth, far left, which causes berries to ripen prematurely, split open, and shrivel.

grape berry moths as egg-laying sites,” he says.

Our researchers are also working to fight destructive vineyard diseases. In 2005 and 2006, Long Island grape growers turned to Marc Fuchs, an associate professor in the Plant Pathology and Plant-Microbe Biology Section of SIPS, for help with a mysterious condition that was devastating their crops. The unknown culprit was creating poor fruit quality and maturity, and substantially reduced yields. Fuchs suspected a variation of a disease known as leafroll, but by probing the genetic makeup of the virus, he and colleagues, including associate professor Keith Perry, discovered that the troublesome affliction was something never seen before: Red Blotch.

The virus attacks rootstocks and leaves, and can drastically reduce the sugar content of berries. It proved to be an urgent issue for growers. Fuchs and Miguel Gómez, an economist at the Charles H. Dyson School of Applied Economics and Management, found that infected Long Island vineyards stood to lose more than \$8,000 per acre. With more than 2,000 acres of vineyards in the region, the economic loss threatened to reach \$16 million or more.

With further study, Fuchs and his colleagues identified the infection during its earliest stages, and they are now collaborating with the New York grape industry and the New York State Department of Agriculture and Markets to reinstate a certification program to ensure that new planting material is virus-free.

“The first New York certified vines will be put on the market in 2018, which is fast, considering how long it takes grapes to grow,” Fuchs says. “When growers are dealing with an issue of this magnitude, we go full throttle.”

## ACCOUNTING FOR TASTE

Wine aromas and flavors are so varied, they’ve earned a vernacular all their own: a wine can be oaky, buttery, briary, grassy or jammy, with hints of chocolate, clove, cranberry and more. It can be brawny or elegant, harmonious, complex, robust.

Simply stated, wine flavor is anything but simple. Many factors contribute to each wine’s specific taste and aroma, including

climate, horticulture, fermentation and the yeast cultures that transform grape sugars into alcohol.

“We’re at the very tip of the iceberg in terms of understanding what makes wine taste good,” says food science professor Terry Acree, an expert in aroma and our sensory perception of food.

What is known, however, is that balancing several major factors can account for a large part of good taste: tannins, acidity and aroma compounds.

Consumers of red wine are often looking for a good mouthfeel. That pleasantly “grippy” feeling of a full-bodied glass of red results from an optimal level of tannins—compounds that bind to proteins, including the lubricating proteins in our mouths, to create the experience that is critical to the sensory quality of red wine. Too much tannin results in a harsh, drying mouthfeel, and too little creates a thin wine with poor body.

The same principle holds true for aroma compounds. In small amounts, for example, the tongue-twisting chemical tetramethylethylenediamine (TDN) gives Riesling wine its characteristic rubbery odor. But nudge those TDN levels up and the wine starts to smell like petrol.

Acree’s findings on aromas are the result of a lifetime of research that started with an unexpected connection with Roelofs. In 1970, Acree learned that Roelofs and chemist Heinrich Arn were using insects’ antennae and a technique known as gas chromatography to understand more about how—and what—insects can smell. That inspiration led Acree to develop a similar device that precisely identified odorants in foods.

“We once believed there might be millions and millions of chemicals that cause aroma,” he says, “but there are far fewer. It’s much more accessible than we believed.”

Yet even a smaller-than-expected constellation of aroma compounds still creates a universe of potential sensory perception. The brain integrates three systems—taste, smell and touch—to create the impression of flavor. As no two brains are identical, so too perception varies from person to person.

“In addition to all the things going on in the mouth, wine

drinkers are also affected by variation in wine color, label design and even the words used to describe the wine," says Anna Katharine Mansfield, associate professor of enology in the Department of Food Science, whose research straddles wine production, flavor chemistry and sensory perception.

Flavor variation has implications for winemakers in surprising ways. Mansfield and Gómez discovered in 2014 that sales dipped when wineries provided written sensory descriptions for consumers. The reason: individuals were led to anticipate flavors they might not ultimately detect, resulting in unmet expectations. The discovery prompted redesigns in tasting room literature in wineries across the country.

"Understanding wine components that produce flavor is only half the story," says Mansfield. "It's just as important to know how different consumers perceive and interact with wine."

Gavin Sacks, associate professor in the Department of Food Science, is helping not only to identify aromas and flavors, but to manipulate their expression in wine. Wild grapes native to the Eastern and Midwestern U.S. evolved in that particular climate, accumulating the beneficial genetics to survive without being sprayed against pests or shielded from harsh winters. The downside, however, is their poor flavor. Their acid concentration, for example, is closer to a cranberry or lemon.

Sacks is working with grape breeders to identify the genes that control traits responsible for undesirable flavor characteristics. As part of a USDA-funded project, he is speeding the process of measuring key aroma compounds in the tissue of grapes

and other plants that are often present at trace concentrations (in parts-per-million or lower), making accurate measurements challenging and time-consuming.

"Current methods for quantifying key odorants take 30 to 60 minutes per sample," Sacks says. "That sounds fast until you realize that a grape breeder might have 20,000 grape crosses they would love to analyze." The Sacks group is developing micro-fabricated films to rapidly extract and then analyze volatiles in plant samples, with a goal of decreasing analysis time to 30 seconds per sample or less.

While Sacks is quick to point out that winemaking isn't an exact science—"there's still a significant degree of artistry," he notes—scientists' increasingly robust understanding of aromas and flavors is helping vintners develop wines that more perfectly fit their desires, and grape breeders identify early the genes for preferred sensory traits.

## BEARING FRUIT

To develop a new grape and introduce it to the world requires a supply of patience: from start to finish, the process takes up to 30 years. It starts with scientists envisioning an ideal new fruit—

a seedless table grape or an aromatic wine grape with specific qualities, for example. Then, researchers develop "crosses"—offspring of two varieties from the same species—that they think might produce such properties. Each year starting in late winter, Cornell grape breeder Bruce Reisch plants up to 6,000 seeds in a greenhouse at the New York State Agricultural Experiment Station in Geneva. While many seedlings don't make it through a season, some begin bearing fruit within three to five years. The most successful vines get propagated to make sure the characteristics persist over time. Finally, grapes are tested at different

**"In addition to all the things going on in the mouth, wine drinkers are also affected by variation in wine color, label design and even the words used to describe the wine."**

- Anna Katharine Mansfield,  
associate professor of enology



Enologists perform detailed measurements of wine to assess composition and quality. Danielle Noce, an MPS student in enology, pipets a wine sample in the teaching winery in Stocking Hall.

Matt Hayes

# A WINEMAKING REGION COMES TO LIFE

## Konstantin Frank changed the course of New York wines

By Krisy Gashler

In 1940s Ukraine, Konstantin Frank was a highly regarded scientist and viticulturist. But as it did for so many, World War II changed everything. He fled with his family, arriving on Ellis Island in 1951.

Frank spoke nine languages, but English was not one of them, so when he called and then showed up at Cornell's New York State Agricultural Experiment Station in Geneva to ask for a job, the only work he could get was janitorial and hoeing blueberries.

Still, the position allowed him to begin meeting players in New York's wine industry. At the time, everyone was growing native grapes or French-American hybrids. Frank considered these inferior, and had a theory of how to grow true European *Vitis Vinifera* in the Finger Lakes. He was met with skepticism—everyone believed New York was too cold for vinifera. But having successfully grown the grapes in frigid Ukraine, the vintner knew that wasn't the issue.

The problem was phylloxera—a pest that feeds on the roots of vinifera, stunting vine growth. Frank had seen it in Europe and knew the solution: American rootstock, with European vines grafted on top.

In 1962, Frank founded his own winery in the Finger Lakes, successfully growing vinifera varieties that shocked, then overtook, the New York wine industry. He is widely credited with raising the quality and profile of New York wines, and his family has continued that legacy of experimentation.

**Meaghan Frank '11, MPS '15, the winery's general manager, and the fourth generation of Franks in the business, credits Cornell with providing research, outreach and teaching that help the winery at almost every level.**

Meaghan Frank '11, MPS '15 is the winery's general manager, and the fourth generation of Franks in the business. She credits Cornell with providing research, outreach and teaching that help the winery at almost every level: cooperative extension newsletters with information about sugar content and fruit maturity; formal degree programs and business conferences that have trained many of the winery's 50 employees; and relationships that help raise the status and the excellence of the wine industry in the entire region.

"There are a lot of people that are doing really neat things in the Finger Lakes region, and Cornell CALS has been an essential part of the growth," she said. "So we're among very good company."



Dr. Konstantin Frank Winery



Dr. Konstantin Frank Winery



Stu Gallagher

From top: Konstantin Frank uses a hydrometer to measure the progress of a fermentation in the 1960s; pruning vines with his grandson Fred Frank '79 in 1971; grapes in the vineyard today.

“The ‘eureka’ moments are rare since it can take up to 20,000 seedlings before a single new variety can be identified and released, but those moments feel wonderful.”

- Bruce Reisch, professor of grapevine breeding and genetics

locations to ensure they will do well under varying conditions.

“The ‘eureka’ moments are rare since it can take up to 20,000 seedlings before a single new variety can be identified and released, but those moments feel wonderful,” says Reisch, professor in the Horticulture Section of SIPS.

New technology has helped scientists hone in on the most promising varieties quickly. Vitis-Gen2, a USDA-funded project co-led by Reisch, is helping Cornell reap the benefits of new tools in genomics.

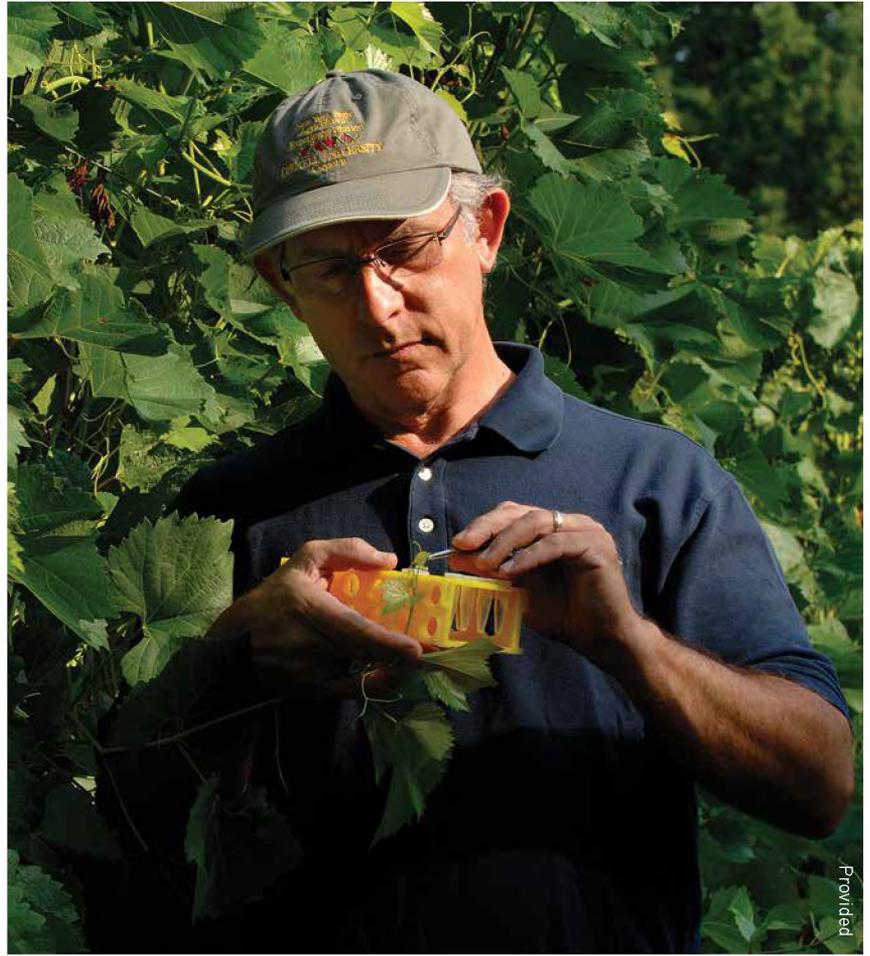
“We can test DNA from a small piece of leaf tissue and make sure certain important genes, like those for powdery mildew resistance, are in those seedlings,” he says. “We toss out more than 80 percent of seedlings before they are planted in a permanent vineyard, and that allows us to be much more efficient with our resources.”

One of the breeding program’s biggest success stories has been Cayuga White, a hybrid wine grape released in 1972. Before that, regional growers often favored Seyval blanc—a hardy white wine grape well adapted for the Finger Lakes. But when Cornell researchers crossed Seyval blanc with another grape called Schuyler, the resulting hybrid proved even more advantageous. It pairs the benefits of the Seyval blanc with high productivity and remarkable adaptability, says Cornell extension associate Hans Walter-Peterson, viticulturist and team leader for the Finger Lakes Grape Program.

“[Cayuga White] can be made into sparkling wine, still wine and blends. That versatility means there’s a lot of demand for it,” Walter-Peterson says. “It has shown how successful a hybrid release can be and how much impact it can have on an industry.” And it’s something wineries have noticed. Bully Hill Vineyards, a winery on Keuka Lake in the Finger Lakes, for example, has pledged to support hybrid grape research for the next five years.

Cayuga White has earned its own modest place in the history of wine, enjoying high popularity in the Northeast and, as of 2017, accounting for more than \$20 million in annual wine production in New York. Cayuga White illustrates the success that has resulted from our dedication to the fragile and humble, but much celebrated, grape.

And the work continues, says Walter-Peterson. “We’re always asking: how can we use the new tools we have today to do it again?” ■



Provided



Chris Kitchan

Top: Bruce Reisch, professor of grapevine breeding and genetics, collects grapevine leaves for DNA extraction in a research vineyard at the New York State Agricultural Experiment Station in Geneva, New York. Above: Doctoral student Anne Kearney examines Chardonnay grapes.

# CHANGING COURSE, CHANGING LIVES

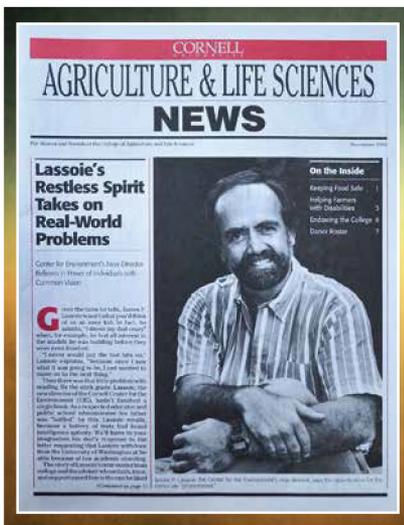
*By Jennifer Savran Kelly*

Sometimes the best way to find answers is to veer off a familiar path. We dug into our archives to rediscover what some of our faculty studied early in their careers—and to see the changes that have defined their research. Our educators and researchers look back at successes and challenges that inspired new directions as they followed their data and their passions to tackle issues of climate change, food security, nutrition, education and human health.



Robyn Wishna

Jim Lassoie in his office in Fernow Hall. He was appointed director of the Center for Environment in 1993.



## JIM LASSOIE

Professor, Department of Natural Resources

“I’m a blue-collar academic. I want to sit down and roll my sleeves up with a group of faculty or students and work on some problem.

My mentor, Dave Scott, found me as a sophomore at the University of Washington and showed me that research is not an end in itself but part of being an educator.

When I arrived at Cornell, I was researching air pollution and tree physiology, and my research/extension split didn’t include teaching. Then I made an early move into administration and no longer had time to run my own lab. Instead, I dedicated more of my attention to advising, and found I loved helping graduate students develop their own ideas.

Ultimately, that work reaffirmed what I wanted out of my career—to be the mentor Dave Scott was to me. So in the last 15 years, I’ve turned my focus to teaching and innovative approaches to education.”



Chris Kitchen

Jocelyn Rose and his work on sustainable biofuels was covered in 2007. His current research has major implications for extending the shelf life of food.

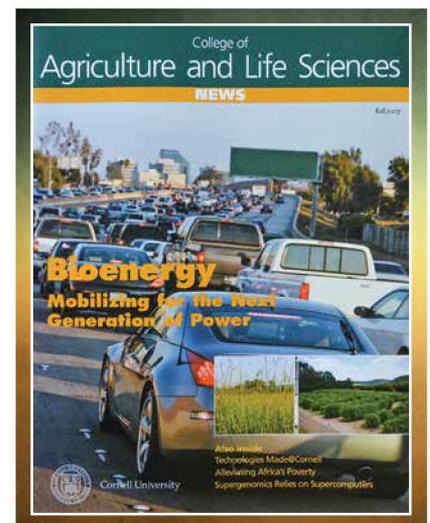
## JOCELYN ROSE

Professor, School of Integrative Plant Science

“When you follow the data, often you go down pathways you never anticipated, which is one of the exciting things about what we do.

When I came to Cornell 17 years ago, I was studying plant cell walls and how they affect processes such as cell expansion. Members of my group then made several exciting discoveries looking at the specialized water-resistant cell walls on plant surfaces. This opened the door to investigating new areas of plant biology in my lab. We are now asking questions such as how plants first colonized land and evolved structures that keep bugs out but water in.

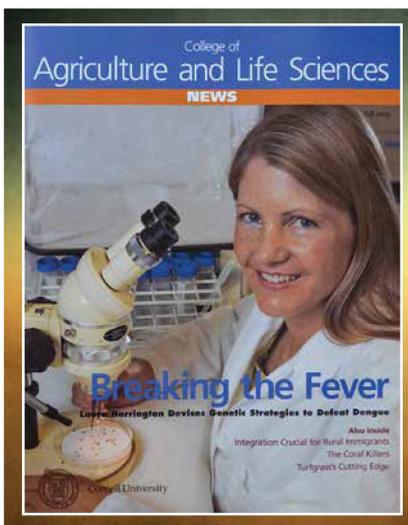
In the U.S. we discard up to 50 percent of our produce due to decay. When we transport fruits and vegetables, shelf life is a major limiting factor. Globally, given population increase and the constraints of factors such as climate change, we need to be doing a much better job of preserving the crops we grow, in addition to producing more.”





Robyn Wishna

Laura Harrington was featured in 2005 for her work on mosquitoes and Dengue fever. She continues her vector-borne disease research in her lab in Comstock Hall.



## LAURA HARRINGTON

Professor, Department of Entomology

“It’s really inspiring to be working with the next generation of people who will be tackling diseases like Zika.

Several years ago I was in Mexico working to develop a mosquito that couldn’t transmit Dengue fever to people. But when we took the mosquitoes from the laboratory to their natural environment, they didn’t mate. The experience taught us that we needed to change our focus to the mosquitoes’ mating system and interactions because that’s going to be essential for success.

Looking back over time, I see mosquito-borne infections have become more common in the United States, so I’ve started building more projects here at Cornell. Recently, we created a CDC Center for Excellence in vector-borne disease research for the Northeast to educate the next generation of vector-control professionals. So when the next Zika comes along, we’ll be well prepared to tackle it.”



Robyn Wishna

Mark Wysocki on the roof of Bradfield Hall. He shared his perspectives on meteorology and weather forecasting in our 1996 magazine.

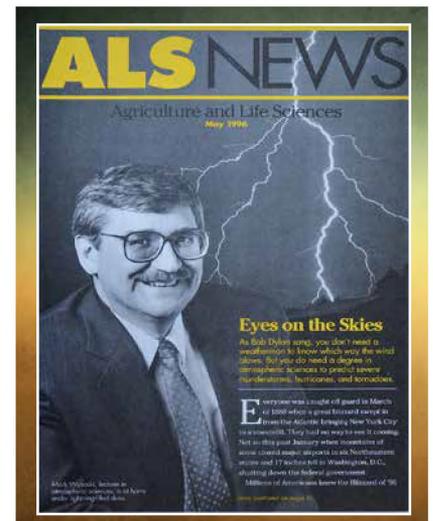
## MARK WYSOCKI, M.S. '89

Senior Lecturer, Department of Earth and Atmospheric Sciences

“**My path has always been teaching, but I never give up on learning.**

When Sputnik was put up by the Russians, my older brother found a telescope at a pawn shop. He gave up when he realized all he could see was a light flying through the sky. So I took the telescope and ended up falling in love with astronomy. But I was also interested in thunderstorms, and when I discovered there's weather on other planets, I decided I could be a meteorologist and do both.

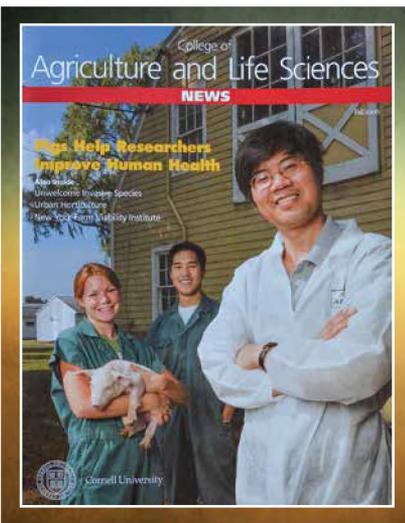
Early on, I began to understand how much weather impacts people's health, so I narrowed my focus to air pollution. But I never give up on learning. I still take courses in astronomy and many other subjects. I'm getting into the design of urban areas, figuring out how to mitigate the impact climate change will have on communities.”





Robyn Wishna

Xingen Lei explained in 2006 how his studies with pigs and mice help improve the human diet. He is now examining how microalgae can be both biofuel and food for farm animals like these chickens at the large animal research and teaching unit near Morrison Hall.



## XINGEN LEI

Professor, Department of Animal Science

“ Seeing the global significance of our projects has made me willing to face new things, take risks and team with people I don’t know.

About 15 years ago, I was using pigs as a human model to study biofortified staples for preventing hidden hunger from micronutrient deficiency. Today, 2 million farming households in Africa are eating those crops, and I brought the program to China in 2004.

The global impact led me to get involved in two major consortia for using microalgae as a dual source of biofuels and food. Microalgae are a naturally grown, plant-based source of protein. Now we can use defatted microalgae rather than soy to feed farm animals and to produce healthier meats and eggs, which helps improve environmental sustainability, food security and human health around the globe. ”

## SUMMER INTERNSHIPS TAKE AN INTERNATIONAL VIEW

### CALS Global Fellows Program enriches undergraduate learning

For students in the CALS Global Fellows Program, summer was anything but a vacation. Twenty-two undergraduates ventured abroad across four continents to participate in internships aimed at developing them into globally-minded leaders.

From Australia to Zambia, students worked directly with local organizations in eight different countries to utilize their skills and enthusiasm to make a tangible contribution in diverse global communities. Now in its second year, the CALS Global Fellows Program supports CALS undergraduates from any major in pursuit of challenging, professionally-focused summer internships of 6-10 weeks that enhance and complement their career goals and academic progress. The program arranges all placements and awards selected fellows up to \$5,000 for logistical and financial support and professional development.

This summer, the students took part in a range of projects, from researching the spread of tuberculosis in Singapore to improving food security in Tanzania to supporting scientific teams working to bolster sheep farming in New Zealand.

"This experience has changed my perspective not only on the agriculture industry, but also on life," said animal sciences major Sam Maloy '18, who traveled to New Zealand to contribute to research on legume-based pastures for sheep. "Traveling internationally has made me realize how much of the world I have yet to see and experience."

Along with the challenging work involved in their internships, students found opportunities to experience the diverse cultural and international immersion provided by the program.





Top: When **Sam Maloy '18** wasn't studying ways to assist farmers in low-rainfall areas in New Zealand, she was out exploring the countryside. Here she's visiting the North Island, where she hiked the volcanic terrain at Tongariro Alpine Crossing.

Above: **Sonya Chyu '19** worked in Bangkok with an organization dedicated to making quality education available at all levels of society in Thailand. Among many interesting projects, she worked with schools to improve the classroom experience.

Opposite page, top: **Aditi Mehrotra '19** interned with a global accountancy firm in Australia, helping with data analytics, social media design, company analytics and event marketing. She also found time in Sydney to meet the wildlife.

Bottom: "No lecture can fully explain the human face of food insecurity," says **Xavier Salvador '19**, who traveled to Tanzania to conduct qualitative surveys among local farmers. The findings were analyzed to improve conservation agriculture projects.

# outstanding alumni & faculty

By Krisy Gashler

## Scott Braunstein '86

### *Outstanding Alumni Award*

Through three major career changes, Scott Braunstein, M.D., has remained focused on one major goal: helping patients.

Braunstein's first, decade-long career as a practicing physician included roles as an assistant clinical professor for Columbia University and the Albert Einstein College of Medicine. From there he pivoted to investment management, working as a healthcare analyst and portfolio



manager at J.P. Morgan Asset Management. In that role, he grew the company's Global Healthcare fund from \$20 million in assets to over \$3 billion in just five years.

Now, Braunstein works as chief strategy officer for Pacira Pharmaceuticals, which focuses on developing

opioid-free products for acute postsurgical pain, and is operating partner at the healthcare private equity firm Aisling Capital. He's also on the board of Esperion Pharmaceuticals, which develops targeted cholesterol-lowering drugs.

In his service to Cornell, Braunstein has worked with the Cornell Alumni Admissions Ambassador Network, as an on-campus advisor to students interested in medicine, financial services and healthcare consulting, and on the board of the CALS Alumni Association. Through that association, Braunstein helped initiate a grant program that provides financial assistance to undergraduates for summer experimental research.

He lives in New Jersey with his wife, Lisa. They have two sons, Jordan '16 and David '21.

## Brad Grainger '79 and Mary Maxon Grainger '79, MPS '87

### *Outstanding Alumni Award*

Mary Maxon Grainger's advice to new students has not changed since she gave her first tour as an undergraduate CALS ambassador: Take advantage of the area's diverse academic, cultural and social opportunities.

Mary and Brad Grainger have been improving those opportunities for others for nearly 40 years.

Their service includes Cornell University Council, Class of 1979, CALS Advisory Council and Cornell Alumni Association.

Long-time Ithacans, the Graingers volunteer for a host of Ithaca organizations. Brad has served on the Ithaca City School District Board of Education, the Seed Capital Fund of Central NY and the Boy Scouts of America. Mary serves with the Ithaca Public Education Initiative and helped found the Friends of Ithaca Youth Bureau. Both serve the Tompkins County Public Library and Family and Children's Service of Ithaca, to name a few.

In 2016, the pair earned the Frank H.T. Rhodes Exemplary Alumni Service Award, Cornell's highest award for service.

Brad worked in the mortgage banking industry securing FHA-insured loans for healthcare companies.

He served as president at Continental Securities and retired as a managing director at Cain Brothers. Mary worked in CALS admissions, before becoming a full-time parent and an independent publicist and fundraiser. She has been particularly active with groups dedicated to female empowerment.

The couple have three daughters, Aileen, Maura and Erin '13.



## Brian Lazzaro

### *CALS Rising Star Faculty Award*

Why do some individuals in a population succumb to bacterial infection while others resist it? Brian Lazzaro, a Liberty Hyde Bailey Professor appointed in the departments of Entomology and Ecology and Evolutionary Biology, was one of the first scientists to use insects to study immunity from the combined perspectives of evolutionary and functional genetics.

Lazzaro's research team employs innovative, cutting-edge approaches to study how the immune system operates within the overall physiology of the host and how pathogens react to the host they live within. He considers host and pathogen as interacting components of a single system, shaped by the external environment, and queries how natural selection operates on host-pathogen interactions through time.

Lazzaro joined Cornell's faculty in 2003 and has taught courses such as Ecological Genetics, Population Genetics, and Ecology and Evolution of Infectious Disease, as well as field courses in Kenya and the Galapagos Islands. He is director of the Cornell Institute of Host-Microbe Interactions and Disease (CIHMID) and he co-chairs the committee that develops the annual college-equivalency Advanced Placement Biology exam for high school students.



## Catherine 'Kitty' Mackey '77, Ph.D. '83

### *Outstanding Alumni Award*

Throughout her extraordinary career, Catherine "Kitty" Mackey has translated leading-edge science into solutions for real-world problems.

Mackey's career began in agricultural biotechnology with Pfizer and then DEKALB Genetics, where she invented and applied new genetic technologies to create plant varieties with increased yields while lowering use of harmful herbicides and pesticides.

Next, her passion for a healthier world led Mackey to make a career transition that few have navigated—from agriculture to human health. Mackey served as senior vice president of Pfizer's Global Research and Development, overseeing Pfizer's La Jolla Laboratories, its staff of 1,000, one-million-square-foot campus and \$300 million budget. Her team delivered four cutting-edge cancer-fighting drugs.

Since retiring from Pfizer, Mackey has served on the boards of directors of numerous biotech companies and started one of her own—CYPrus Therapeutics, Inc., focusing on improving the safety and efficacy of medicines.

In addition, Mackey has served on the boards of numerous non-profit organizations, in particular Rady Children's Hospital—San Diego, where she has been instrumental in forming the Rady Children's Institute of Genomic Medicine.



## Olga I. Padilla-Zakour M.S. '88, Ph.D. '91

### *CALS Outstanding Faculty Award*

Olga Padilla-Zakour, professor and chair of the Department of Food Science, is described by her colleagues and students as understanding yet fair, well-liked and highly respected, and compassionate but insistent on high standards.

Padilla-Zakour has proven excellence in research, education and outreach, with a focus on enhancing the safety and quality of plant-based food products.

Padilla-Zakour was appointed in 1997 to lead what is now known as the Cornell Food Venture Center (FVC), which helps food entrepreneurs and farmers develop and introduce new products. Under her leadership, the FVC has flourished: since 2000 it has served more than 13,000 individual entrepreneurs, and a satellite office opened this summer in Brooklyn.

A Fellow of the Institute of Food Technologists since 2014, Padilla-Zakour has received numerous awards for her teaching (2016 Cornell Food Science Advisory Council Teaching Excellence Award), her research (2006 Shepard Award for best scientific paper published that year in the *Journal of the American Pomological Society*), and her extension work



(2013 Elizabeth Fleming Stier Award, Institute of Food Technologists; 2013 William V. Hickey Memorial Award, New York State Association for Food Protection; among many others).

She and her husband John Michael Zakour have a son, John Sebastian Zakour '15, M.P.S. '16.

## Harriet Pimm Wegmeyer '99

### *Young Alumni Achievement Award*

Harriet Pimm Wegmeyer has dedicated herself to helping good things grow—through the foundation she directs, the family farm she co-manages and the service she's given to Cornell.

Wegmeyer is executive director of the Nutrients for Life Foundation, a not-for-profit focused on educating the agriculture industry, the media and the public on the importance of fertilizers in plant growth. The foundation creates science-based curricula for elementary, middle and high school classrooms, all of which have been reviewed by the Smithsonian Institution.

During her tenure, the foundation has grown its annual operating budget from under \$500,000 to over \$2 million, while expanding its network of teachers from less than 100 to more than 45,000 across the country.

In addition, Wegmeyer and her husband, Tyler, operate Wegmeyer Farms, a strawberry and pumpkin farm in Loudoun County, Virginia. The farm was named 2016 Virginia Farm of the Year by the Virginia Cooperative Extension.

Wegmeyer's extensive service to Cornell includes volunteering with the Cornell Alumni Admissions Ambassador Network and serving as a Class of 1999 Alumni Class Officer.

She lives in Hamilton, Virginia, with her husband and three children: Torsten, Tucker and Colden.



The Outstanding Alumni Awards honor CALS alumni who have achieved success in their professional fields, demonstrated commitment to the college, and contributed to the betterment of society through humanitarian and charitable endeavors. Outstanding faculty and staff are also recognized for significant contributions in research, education, outreach or administration. Visit the CALS Alumni Association site [cals.cornell.edu/get-involved](http://cals.cornell.edu/get-involved) for more information or to make a nomination.

# alumni stories

## THE SWEET GIFT OF KNOWLEDGE

Program ensures research has impact back home

By David Nutt

Kalenga Banda and professor emeritus Chris Wien, M.S. '67, Ph.D. '71 in the Kenneth Post Laboratory Greenhouse complex.



Matt Hayes

**K**alenga Banda studies horticulture not just because of a love of plants, but a love of people. In her home country of Zambia, sweet potatoes are a staple crop critical to the diet of millions and grown primarily by small-scale female farmers. Yet while grains have been well studied in the landlocked country in southern Africa, very little work has been done on root crops.

As a young student, she dreamed of pursuing research in post-harvest horticulture that could be applied directly to farmers she saw struggling to make a living growing the nutrient-dense vegetable. She realized that by studying this critical food she could help address issues like gender disparity and female empowerment in a country where much of the labor-intensive agricultural work is done by women.

With the Cornell Assistantship for Horticulture in Africa (CAHA), she found the opportunity to do just that.

Created in 2006 by a gift from Chris Wien, M.S. '67, Ph.D. '71, professor emeritus of horticulture in the School of Integrative Plant Science, CAHA provides a doctoral assistantship to one student from sub-Saharan Africa who completes coursework at Cornell but conducts dissertation research in the region. The position is contingent upon the student returning to his or her home country after their doctoral degree is complete.

"Too often you see students get really involved in some fascinating project at Cornell and lose sight of the fact that they came from a country that could really use their help," says Wien, who in the 1970s spent time working in Africa at the International Institute for Tropical Agriculture. That experience

awakened him to the continent's need for greater support in horticulture education.

The social commitment embedded in the program is precisely what appealed to Banda. "When I saw it, I thought, 'This is for me'," says Banda. "Studying at Cornell allows me to pursue research that will improve the lives of farmers—especially female farmers—in my home country."

Her research specifically targets the damage caused to sweet potatoes when they are mechanically harvested from the ground, a process that can make them susceptible to pathogens, rot, moisture loss and shriveling. She is examining how the tubers heal, especially under the moisture-stress conditions prevalent in Zambia. Because some cultivars heal better than others, Banda is identifying cultivars that

can be stored longer, which in turn increases the economic output of farmers.

Banda is also examining the critical points where losses occur along the crop's value chain, from farm to market. In that effort she is collaborating with agricultural economist Jan Low, M.S. '85, Ph.D. '94, whose efforts with orange-fleshed sweet potato varieties in sub-Saharan Africa earned her the World Food Prize in 2016. In the process, not only will Banda expand a crucial knowledge base for a significant staple food in her own country, she'll also sharpen the skills that will enable her to have a horticulture career that has social and scientific impact.

"I want there to be a purpose to what I do in my chosen field," she said. "What I do afterwards will be an extension of what I am doing right now."

"I want there to be a purpose to what I do in my chosen field."

-Kalenga Banda

## LEADING THE WAY IN BUSINESS AND GIVING

Philanthropic pledge reflects role CALS played in business success

By Krisy Gashler

**M**arco Barbier and Hector Echaniz met as freshmen at Cornell in 1978. Almost 40 years later, the pair are business partners, leaders in the packaging industry and innovators in philanthropic giving.

Barbier B.S. '82, B.A. '83 and Echaniz '82, M.S. '84 are managing partners of Easypak LLC, a privately held company based in Leominster, Mass.

Since founding their company in 2004, Barbier and Echaniz have collaborated on several projects with the Cornell Food Venture Center (FVC), which has been helping entrepreneurs bring their products to market since 1988.

In addition to providing technological help to Easypak, the FVC has enabled beneficial business connections. Notably, they introduced the company to executives at Wegmans, the Northeastern supermarket juggernaut.

To show their gratitude to Cornell, and to help future scientists and entrepreneurs, Echaniz and Barbier have pledged a recurring gift to CALS: 20 percent of their gross profits from sales to Wegmans will be donated to the dean's discretionary fund. The unique gift mechanism was designed to reflect the value of Cornell's role in Easypak's success.

"I hope this model—of a collaboration between academia and industry, with a percentage of the profit funneled back

**"I hope this model...can be a model for other companies or even other institutions. It's a win-win-win for everybody."**

**-Marco Barbier**

to the academic institution—can be a model for other companies or even other institutions," Barbier said. "It's a win-win-win for everybody."



Kevin Harkins

Marco Barbier B.S. '82, B.A. '83, left, and Hector Echaniz '82, M.S. '84 at their manufacturing facility in Leominster, Mass.

Olga Padilla-Zakour, chair of the Department of Food Science and director of the FVC praised Barbier and Echaniz's ability to find innovative solutions—in their business and in this distinctive gift model.

"Easypak's commitment and generosity to support CALS programs through this new giving model is groundbreaking; they are leading the path for new opportunities and meaningful engagements between companies and the college," Padilla-Zakour said. "This funding allows CALS to support impactful research and extension projects to improve food systems, and to provide training to students in novel technologies."

At Easypak, Barbier and Echaniz have focused on technological innovation; their company was among the first to develop packaging that can be made of up to 100 percent post-consumer recycled materials.

"Initially we were using only virgin petrochemical materials. Then we introduced EcoPak, which is 50 percent recycled material, and we continued to evolve from there," Barbier said. "We invested a lot of money and technology to be able to achieve a very high-quality product with 100 percent recycled materials."

This fall, the company expects to launch another major project they are developing in collaboration with the FVC. This project aims to increase the shelf life of packaged foods, without changing the food's quality and properties and without using preservatives.

"Cornell has an incredible food science department," Barbier said. "Between Cornell's know-how in food and our know-how in packaging, we have enjoyed a profitable collaboration."

Easypak's Cornell connections also include Kathryn Kiplinger '79, M.P.S. '86, founding shareholder and board director, and Barbier's wife, Anita '83, and two children: Stefano '17, M. Eng. '18, and Olivia '19.



Russ Skelton Jr. '54 and Bonnie Renzi in Brisbane, Australia.

Provided

## A LIFE OF SERVICE

### Estate gift highlights alumnus' commitment to others

By David Nutt

Russ M. Skelton Jr. '54 lived a life of travel, adventure and generosity. And he credited Cornell CALS with getting him started on his way.

"He was always proud to be a graduate of Cornell," said Bonnie Renzi, Skelton's partner for his last 16 years. "His education gave him the advantages and the knowledge he needed to move forward in his life. For that he was very grateful."

Even as a child, Skelton knew how to stay busy. He collected stamps, had a paper route, worked at a soda fountain and spent his summers at his grandparents' 64-acre farm in Michigan. It was there, while hoeing and weeding and cleaning the chicken coops, that Skelton's interest in agriculture first bloomed.

When he visited Cornell's campus as a prospective student, the first person he met was the chair of the agriculture department. By then Skelton had already decided he wanted to learn more about the business of farming. At the time the agriculture department was just beginning to develop an agricultural business program, and Skelton was among the first handful of students enrolled in the new curriculum.

That business education inspired him to pursue banking, a career that spanned more than 40 years before he retired in 1996 as senior vice president of Wells Fargo. But immediately following his graduation from Cornell, he embarked upon a parallel career with the U.S. Army. Skelton served seven years on active duty and an additional 31 years in the reserves. He often taught military tactics at the U.S. Army Command and General Staff College in Leavenworth, Kansas, advancing to the rank of full colonel.

In July he was buried in Arlington Cemetery with full military honors.

Military life instilled a great love of adventure and travel in Skelton and that took him to all seven continents and every port a cruise ship could reach. He saw the Taj Mahal, the Sydney Opera House and Milford Sound in New Zealand. In 2001 he met his partner, Bonnie, on a cruise ship bound for the Panama Canal, and together they spent their time roaming the world, cruising the Yangtze River and

climbing the Great Wall of China.

Ever a stickler for details, Skelton kept track of every trip. By his tally he took 140 vacation cruises over a total of 2,146 days.

During all that time, however, he never let his love of travel get in the way of his military service. One of Skelton's cruises was interrupted when the army tracked him down on the ship because they needed his help for an assignment. His dedication to service was a crucial part of Skelton's character. Whether it meant helping a homeless veteran find housing and employment, or covering the cost of putting a neighbor with dementia into a nursing home, Skelton was always ready to assist people in need.

So it's not surprising that he left behind a generous \$1.1 million estate gift for

the college to endow both a fund that supports the advancement of digital agriculture and a dean's discretionary fund.

"He wanted his money to go to a worthy cause that might make a difference in future generations' lives," Bonnie said. "And he knew donating to CALS, with all its research, might make a difference whether future generations eat well or not."

**"He knew donating to CALS, with all its research, might make a difference whether future generations eat well or not."**

-Bonnie Renzi

# In Memoriam

The CALS community remembers with gratitude faculty members who recently passed away.

## **Marvin Israel Adleman**

(b. 1933)

**Professor emeritus of landscape architecture**

*Adleman is renowned for numerous designs, including the original Ithaca Commons in 1974. He built the landscape architecture program and headed the department for most of his 36 years with CALS. In addition to the Commons and other notable projects, Adleman designed the Cornell Botanic Gardens arboretum, recently named the top university arboretum in the country. He was also a fellow at the American Society of Landscape Architects, which awarded Adleman their prestigious teaching medal in 2004.*

## **Martin Alexander**

(b. 1930)

**Professor emeritus of soil microbiology**

*Known for his contributions to environmental science, soil microbiology and toxicology, Alexander was a world leader in his field. His standard textbook is internationally used and has been cited more than 5,000 times. Alexander joined CALS in 1955 with a commitment to undergraduate training and mentorship, and he was awarded the Liberty Hyde Bailey distinguished professorship in 1977. His work led him to an appointment with the EPA as well as with the science advisory board for the U.S. Army.*

## **Bruce Lawrence Anderson '68**

(b. 1946)

**Professor emeritus of applied economics and management**

*Anderson was a passionate educator whose research interests delved into the study of management, strategies and corporate governance of cooperatives and agribusinesses. He taught executive development programs around the world including in Australia, Bosnia, Denmark, Hungary, India, Ireland, the Philippines, Slovakia, Sudan and Sweden.*

## **Chester "Chick" Gene Forshey**

(b. 1925)

**Professor emeritus of pomology**

*Literally writing the book on training and pruning apple and pear trees, Forshey's work as superintendent of the Hudson Valley Research Laboratory helped maintain the vitality of the New York fruit industry. Forshey was noted for his sharp wit and was a popular speaker at Horticultural Society gatherings. Forshey's work took him to South America with the Rockefeller Foundation's Chilean Agricultural Program, and he was named honorary professor at the Schools of Agronomy at the University of Chile and the Catholic University.*

## **André Tridon Jagendorf '48**

(b. 1926)

**Liberty Hyde Bailey Professor Emeritus**

*Jagendorf was a pioneer in plant sciences who advanced the field's understanding of fundamental life processes. He was elected to the National Academy of Sciences in 1980 and served as president of the American Society of Plant Physiologists. He was one of the first fellows of the American Society of Plant Biology, and in 2012 he received a lifetime achievement award from the Rebeiz Foundation. He was noted for collaborating often with other researchers and students, and he continued daily laboratory work until a few weeks before his death.*

## **Russell Earl MacDonald**

(b. 1928)

**Professor emeritus of molecular biology and genetics**

*MacDonald's work in bacteriology started in earnest with his master's degree at Acadia University, where he researched the presence of antibiotic substances in higher plants with special reference to local species. His doctoral dissertation, which he completed at the University of Michigan, expanded to include *E. coli*, with a look into its physiological basis. Known for "fighting the good fight," MacDonald was also an avid debater of politics.*

## **Edwin Burnell Oyer**

(b. 1927)

**International professor emeritus in vegetable crops**

*Oyer first joined CALS in 1955, in what was then the Department of Vegetable Crops. His passion for international agricultural development led him to help found the Asian Vegetable Research and Development Center in Taiwan as well as establish the Agency for Agricultural Research and Development in the Republic of Indonesia. He served as chair of the Department of Vegetable Crops at CALS and then as director of the International Agriculture Program until his retirement in 1992.*

## **Gregory L. Poe**

(b. 1960)

**Professor of resource economics**

*Poe joined CALS in 1993 to teach environmental and resource economics. Over the course of his career, he developed improved measures of hypothetical and actual demand for public environmental goods. His field research frequently addressed issues related to water quality policy and incentive programs for reducing emissions. Known for his sense of humor and dedication to teaching, Poe served as editor of the journal *Resource and Energy Economics* and was part of the executive management team at Dyson School.*

## **Natalie Uhl, M.S. '43, Ph.D. '47**

(b. 1919)

**Liberty Hyde Bailey Hortorium Professor Emerita**

*Uhl was a leading expert in the anatomy of palms and served as co-editor of the journal *Principes* (now *Palms*) for more than 20 years. In 1987, Uhl collaborated with scientists at the Royal Botanic Gardens to publish a comprehensive review of the taxonomy, morphology and anatomy of all genera of palms. She received the Asa Gray Award in 2002 from the American Society of Plant Taxonomists. Even after her formal retirement, Uhl continued her research and maintained many teaching duties.*

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“I strive to add economic value to agricultural commodities by developing new food products and processes that improve the safety and quality of foods. My work makes a real difference in helping food entrepreneurs succeed.”

**Olga I. Padilla-Zakour**  
2017 Outstanding Faculty Award Winner,  
CALS Alumni Association  
Professor and Chair  
Department of Food Science  
Director of Cornell Food Venture Center



“The response to pathogens goes way beyond the immune system. Developing a better understanding of how hosts and pathogens interact is crucial for managing the outcome of infection, and ultimately why individuals vary in susceptibility to disease.”

**Brian Lazzaro**  
2017 Outstanding Faculty Rising Star Award,  
CALS Alumni Association  
Liberty Hyde Bailey Professor  
Departments of Entomology and Ecology and  
Evolutionary Biology  
Director, Cornell Institute of Host-Microbe  
Interactions and Disease (CIHMID)



**Cornell CALS**  
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# FACTS *in* FIVE

## What's in your wine?

**S**wirling around in your wine glass is a flavorful—and fascinating—flurry of chemistry. From taste to aroma to color, the chemicals found in grapes and wine influence how your senses respond to every sip, sniff and pleasing hue.

**1** Tartaric acid is a compound found at high concentrations in only a couple of fruits: grapes and tamarind. This chemical contributes to the sour flavor of wine and—because most microbes can't metabolize it—helps keep the drink stable over time.

**2** Tannins earned their name because they “tan” things—literally. Not only found in wines, the chemicals bind to proteins, which is critical for turning rawhide into leather. They also bind to lubricating proteins in our mouths, resulting in the grippy, tannic feeling of full-bodied reds.

**3** Do some wines make your mouth hot? Ethanol triggers the same thermal receptors as hot jalapeño peppers.

**4** Wines, especially reds, get their color from anthocyanins. These chemicals are derived from a thin layer of cells just under the skin of the grape. While anthocyanins don't stimulate taste buds, their presence does affect flavor—white wines dyed red are described as “fuller-bodied.”

**5** Wild grapes don't make very good wines. Their acid concentration is typically four times higher than cultivated grapes, much closer to levels found in cranberries or even lemons. Plus, many wild grapes have strong vegetal aromas, like green peppers—great for salads, perhaps, but not ideal for wine.



## MY CORNELL STORY Pete Saltonstall '75

**M**y wife Tacie and I started our vineyard and Treleven Wines with some friends in 1984. As I sit down to write, so many memories come rushing forward. I remember driving a tractor in 1988 while Tacie sat behind on a tree planter setting bare-rooted grapevines in the ground. She had to bend over to plant the vines and, being eight months pregnant with our son Lev, this was no easy task. She finally called it quits when she felt like passing out.

In particular, I remember back in the early 1980s seeking information from other growers on how to grow Chardonnay in the Finger Lakes. We received plenty of feedback that included a lot of conflicting advice. Many times we were told not to listen to so-and-so because they didn't know what they were talking about. We learned to rely on Mary Plane, a strong vineyardist from across Cayuga Lake, and soon we were off and running.

In those early days, we also looked to Cornell for help with our questions on

growing European vinifera grapevines in the Finger Lakes. During that time, a crash in prices of native varieties of grapevines such as Concord and Catawba led more and more vineyards to become interested in growing vinifera. Fortunately, CALS invested a great deal of time and money in helping us grow it in the Finger Lakes.

At the same time, we were scrambling to learn as much as we could about winemaking. I had a background in farming but no experience in winemaking

other than a failed attempt at making hard cider. While I relied on my mentor Eric Fry, who now makes wine at Lenz Winery on Long Island, I had much to learn.

We attended many seminars on winemaking held by Cornell Cooperative Extension, which were often conducted at the New York State Agricultural Experiment Station



Pete and Tacie Saltonstall at Treleven Wines.

in Geneva. It was there that we met Thomas Henick-Kling, who at the time was conducting research in winemaking under the Department of Food Science.

Again, we realized just how much we had to learn. Grow the grapes, make the wine, then sell the wine. Whoa! Sell the wine? We were clueless. Marketing? What's that? We always planned to have a tasting room where we could showcase our wines in the best possible light. After almost 30 years, the tasting

room is still an important place where we cultivate relationships with our customers. Selling to restaurants and liquor stores was foreign territory to us, but we learned to put on comfortable shoes and hit the pavement with our wines in coolers to taste with store and restaurant managers.

About ten years ago, in a move that illustrated both how far CALS had come in terms of grape expertise and how much they had come to value the industry, the college established a world-class undergraduate program for viticulture and enology. Former dean Susan Henry was instrumental in making this happen, and I make sure to give her a big hug and say thank you whenever I see her. CALS also conducts important research in both grape growing and winemaking, as exemplified by the work of former associate dean Tom Burr. Tom works on identifying certain bacteria that may play a role in making grape vines more susceptible to cold injury, a topic near and dear to many

of us growers that have had to tear out expensive vines from marginal growing sites.

Looking back at those early days when Tacie and I were planting our first vines, I can see it was clearly trial by fire and we've come a long way. This wild ride would never have been possible without help, and we're grateful to the researchers at CALS and our friends in the industry for their part in making Treleven Wines a success.

**Pete Saltonstall '75** is co-owner of Treleven Wines, a winery in the Finger Lakes located on the east side of Cayuga Lake. In 1984, Peter and his wife Tacie planted the winery's first three grape varieties on 7.5 acres of land. Today, the winery produces about a dozen wine varieties each year harvested from fruit grown on 32 acres. Treleven has tasting rooms at the winery in King Ferry and in Victor, New York. Peter and Tacie reside in King Ferry. They have three children: Courtney, Ph.D. '14; Hattie; and Leverett.

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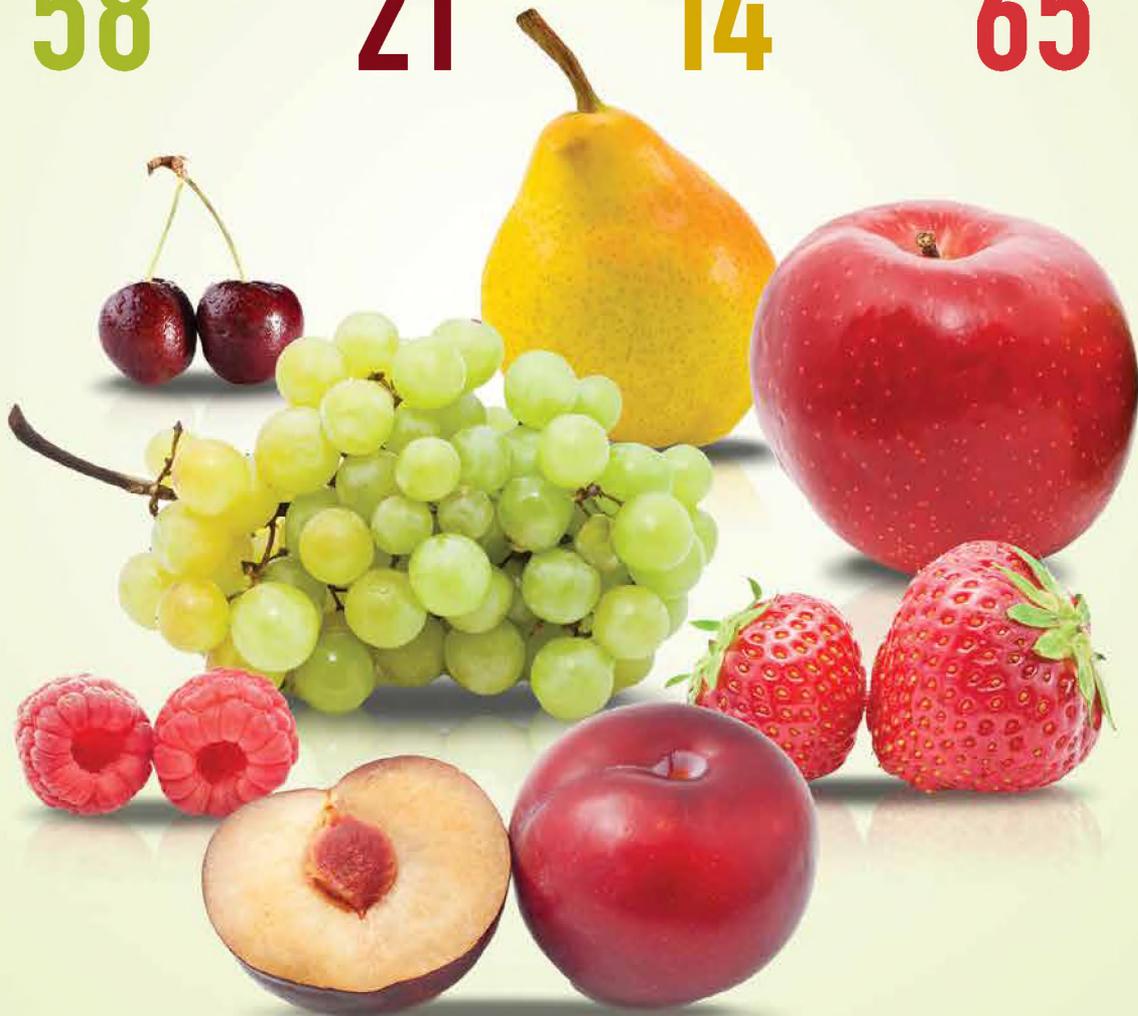
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