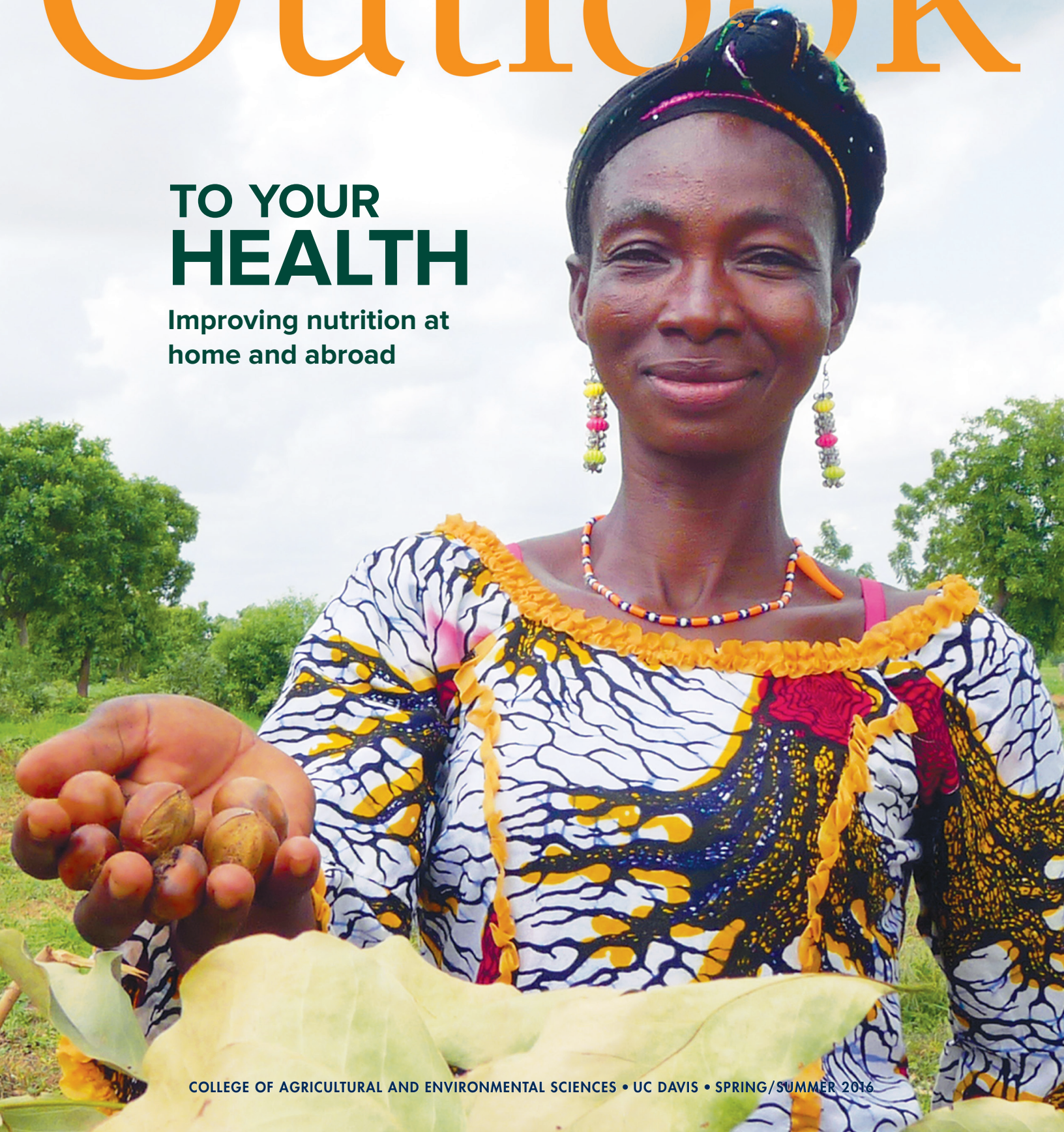


CA&ES Outlook

TO YOUR HEALTH

Improving nutrition at
home and abroad



CA&ES Outlook

is a publication of the College of Agricultural and Environmental Sciences, University of California, Davis

DEAN
Helene R. Dillard

DIRECTOR OF COMMUNICATIONS
Caren Weintraub

MANAGING EDITOR
John Stumbos

ASSOCIATE EDITOR
Robin DeRieux

GRAPHIC DESIGNER
Lisa Wells

CONTRIBUTORS
Charleen Floyd
Diane Nelson

ONLINE MEDIA
Cal Doval

PRODUCTION ASSISTANCE
Charleen Floyd

CA&ES OUTLOOK ONLINE
outlook.ucdavis.edu



DEAN'S OFFICE
University of California, Davis
One Shields Avenue
Davis, CA 95616-8571
Phone: 530-752-0108
outlook@agdean.ucdavis.edu

caes.ucdavis.edu

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COVER PHOTO: UC Davis is partnering in a global plant-breeding consortium fighting malnutrition and poverty in Africa by improving the continent's traditional crops, including foods like shea nuts, which this Burkina Faso farmer is about to roast.

Cover photo by Catharine Watson/World Agroforestry Centre



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Revitalizing research, education, and outreach

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SAVE THE DATE

College Celebration

FRIDAY, OCTOBER 14, 2016

5:30–8:00 p.m.
UC DAVIS ARC PAVILION

At this celebration, we will bestow the Awards of Distinction, the highest recognition presented by the college. The evening culminates with a food-and-beverage reception and Farmers Market displaying California produce you can take home with you. We invite you and your guests to attend and to reunite with old friends.

collegecelebration.ucdavis.edu



Each Wednesday at the campus Farmers Market, students offer cooking demos, recipes, and free samples on the Quad. Dean Helene Dillard (center) joins nutrition students (from left): Joely Zeng, Larissa Saschin, Lesli Castaneda, Janelly Navarrete.

JASON SPRYES/UC DAVIS

FOOD FOR THOUGHT

Malnourishment is a complex challenge with widespread impact

FOOD SECURITY MEANS RELIABLE ACCESS to having enough to eat. But calories alone are insufficient if they don't provide proper nutrients. Nutritional security requires adequate access to foods that provide the right balance of protein, fat, carbohydrates, vitamins, and minerals.

Malnourishment can manifest itself in various forms, depending on social and economic pressures. In the developing world, chronic undernutrition has devastating effects on the health and well-being of millions, particularly children. In some countries in Africa, about 40 percent of children under 5 are stunted and never reach their full potential—physically, mentally, or economically. In the United States, more than 9 percent of households with children are food insecure.

Malnourishment in the form of overnutrition, or obesity, causes a suite of health problems. It can be due to lack of nutrition education, to overconsumption of food, and to eating too many foods that are cheap, nutrient poor, calorie dense, and often highly processed. Underserved communities without access to nutritious, fresh foods—known as “food deserts”—contribute to overnutrition and other forms of malnourishment. Inadequate access to healthcare, stress, and sedentary lifestyles can also affect overnutrition. Malnourishment is a complex challenge, and periodic hunger and uncertain food security can co-exist with obesity.

Historically, malnourishment in low-income countries has manifested itself in undernutrition, while

malnourishment in high-income countries has been reflected primarily in obesity. In developed countries, overnutrition disproportionately impacts the poor. According to the Centers for Disease Control and Prevention, childhood obesity in the U.S. has more than doubled in children and quadrupled in adolescents in the past 30 years. Global trends indicate a decrease in chronic undernutrition and an increase in overnutrition. Paradoxically, many emerging nations face a double burden of malnutrition that includes undernutrition and obesity. To complicate this, vitamin and mineral deficiencies can exist with both types of malnutrition.

In addressing nutritional insecurity, our CA&ES scientists are learning that proper nutrition is more complex than just consuming nutritious foods. Whether people are able to absorb and utilize the nutrients from food depends on their general state of health, the ecology of bacteria in their intestinal tract (their gut microbiota), and on environmental factors such as water quality and sanitation.

Addressing hunger and obesity around the globe is a key challenge for human health in the 21st century. I applaud our college's role in helping fight malnutrition in all its forms to provide the nourishment that people need to thrive.

HELENE R. DILLARD, DEAN
COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

BEYOND NUTRITION

How UC Davis research is expanding the boundaries of human health

BY DIANE NELSON

Around the globe, UC Davis researchers are working to provide the nutrition that people need to thrive. Nutritional security requires access to healthy foods, of course, but CA&ES scientists are showing that proper nutrition goes beyond diet. To improve human health, they are examining the effectiveness of comprehensive nutritional interventions both at home and abroad.

A FOCUS ON FORGOTTEN CROPS

UC Davis is partnering in a global plant-breeding consortium fighting malnutrition and poverty in Africa by improving the continent's traditional crops.

The African Orphan Crop Consortium—conceived by Howard Shapiro, a senior fellow at UC Davis and the chief agricultural officer at Mars Inc.—is making great strides in its ambitious attempt to map and make public the genomes of 101 African food crops. These “orphan” crops are crucial to African livelihood and nutrition, but have been mostly ignored by science and agricultural companies because they are not traded internationally, like rice, corn, and wheat.

The genomic data gathered on African orphan crops will help plant breeders select more quickly for traits that improve the nutritional content, productivity, and resilience of Africa's most important food crops.

The consortium's ultimate goal is to eradicate stunting, a condition caused by chronic malnutrition that affects 195 million children worldwide. In some countries in Africa, about 40 percent of children under 5 are stunted and never reach their full potential—physically, mentally, or economically. “I believe this project will succeed where others have failed because it focuses on crops that have evolved to grow here,” said Busiso Mavankeni, plant breeder with Zimbabwe's Department of Research and Specialists Services and a recent graduate of the UC Davis Plant Breeding Academy in Africa, the educational arm of the consortium. “By improving these neglected crops, we help the children who eat them and the farmers

Tiny gut microbes play a big role in human health.

DAVID MILLS/UC DAVIS

UC researchers are working with people around the world, including families in Malawi, to improve their nutritional health.

ANNA PULANKYI/UNUS PROJECT

CATHARINE WATSON/WORLD AGROFORESTRY CENTRE

At a state-of-the-art laboratory built by the World Agroforestry Centre in Nairobi, Kenya, UC Davis is teaching Africa's top breeders how to incorporate the latest breeding strategies into their programs. The effort will improve crops crucial to nutrition in Africa and the livelihood of farmers like this woman in Burkina Faso.

"I BELIEVE THIS PROJECT WILL SUCCEED WHERE OTHERS HAVE FAILED BECAUSE IT FOCUSES ON CROPS THAT HAVE EVOLVED TO GROW HERE."

—plant breeder **Busiso Mavankeni**

who depend on them to support their families."

At the UC Davis Plant Breeding Academy held in Nairobi, Kenya, Africa's top breeders learn how to incorporate genomic information, statistics, and the latest breeding strategies into their programs.

Initially, the consortium planned to sequence the genome of about 16 African crops. "We were told in order to have any impact on nutrition we would need to improve at least 100 crops," Shapiro said. "In the end, we went with 101 crops, including the Baobab tree, which can survive even the worst drought. You can eat its leaves, which are actually quite tasty."

The group collaborates with researchers all over the world, and all of its sequence information will be posted to the Web and offered free to anyone on condition it not be patented.

"Because we share our information, we can build on each other's research," said Allen Van Deynze, professional researcher with the Department of Plant Sciences. "We hope to have five genomes out for public review within the next six months."

GUT ECOLOGY MATTERS

Eating nutritious food is important for good health, but it's not the only ingredient. People benefit from good genes, for example, and access to health care, clean water, proper sanitation, and a healthy balance of bacteria in their gut.

Gut bacteria are the trillions of microbes that live in our intestines. They have co-evolved with mammals and greatly influence our health. We provide our community of intestinal bacteria—or gut microbiome—nutrients and a warm place to grow. In return, the microbiome helps us digest food, produces vitamins we can't make,

improves our immune system, and helps us harvest energy from our food.

In short, healthy bodies support hardy communities of microbes. But what comes first, the healthy body or the robust gut microbiome? New research is uncovering clues to cause and effect in nutrition, and the influence that our microbial comrades have on human health.

MICROBES AND MALNUTRITION

Professor Kathryn Dewey with the UC Davis Department of Nutrition was one of several co-authors of a study recently published in *Science* that shows microbes can influence an infant's growth, rather than merely respond to that growth. Dewey worked with a team led by Jeffrey Gordon from the Washington University School of Medicine in St. Louis.

Malnourished children have underdeveloped gut microbiomes—their microbiological age lags behind their biological age. The team transplanted stool samples from underweight and normal weight Malawian infants

The goal of nutritional security research is to make sure all children reach their full potential—physically, mentally, and economically.



Busiso Mavankeni

Baobab Tree

ANNA PUKKA-JIINS PROJECT



UC Davis faculty are studying comprehensive nutritional interventions to improve the health of mothers and infants in Malawi and in other countries.

MARY ABIMOND/UNIVERSITY OF CALIFORNIA DAVIS

“THE COMMUNITY OF MICROBES INSIDE OUR BODY IS LIKE THE ECOLOGY OF MICROBES IN THE OCEAN AND SOIL AND EVERYWHERE ELSE ON EARTH.” —Professor Carolyn Slupsky

place. Complex sugars in breast milk and in cow’s milk provide an important clue, according to a separate study involving Jeffrey Gordon from Washington University School of Medicine and David Mills, professor of food science and technology at UC Davis.

Previously, Mills and other UC Davis researchers have shown that breast milk is especially beneficial to human development because some of its complex sugars, or oligosaccharides, feed gut bacteria that boost a baby’s immunity. In a recent study reported in the journal *Cell*, Mills and others found that a specific type of these oligosaccharides called sialylated milk sugars are present at lower levels in the breast milk of mothers of malnourished children than in the breast milk of mothers of healthy children.

To explore that correlation, researchers transferred gut microbes from malnourished infants into germ-free mice and piglets. They fed the mice and piglets a diet supplemented with oligosaccharides derived from cow’s milk, and their microbiomes improved. The bacteria in their guts became metabolically flexible, more able to switch to burning fat for energy when sugar isn’t available, something the microbiomes in undernourished mammals can’t do.

Breast milk contains many more of these important sugars than cow’s milk, but cow’s milk has the advantage of sheer volume. When the dairy industry makes cheese, the watery liquid that remains contains oligosaccharides. It is typically discarded as waste.

“There’s great value in that waste stream,” Mills said.

Industry partner Hilmar Cheese Company provided the oligosaccharides derived from cow’s milk for this study. Hilmar’s cheese-processing facility in Merced has the technical capacity and expertise to separate oligosaccharides from cheese-making waste streams.

“This is a wonderful example of the dairy industry serving as a hands-on partner with UC Davis to make these high-end milk byproducts available for research,” Mills said.

into germ-free baby mice. The mice that received the microbes from the underweight infants gained less weight and developed weaker bones than those that received a healthy baby’s microbiome, even though they ate the exact same diet.

“It was stunning,” Dewey said. “The findings clearly indicate that the proper development of gut microbiota is important for normal growth.”

To further test microbial influence, researchers housed mice with healthy and immature microbiomes together in one cage. Their gut microbiomes mingle easily, because mice practice coprophagia (the eating of feces). Researchers discovered that the healthy communities of bacteria dominated the immature ones—invading and displacing them—so both sets of mice ended up with a healthy balance of bacteria.

The research team identified five species of bacteria that colonized especially well and had a strong influence on the growth of their host, favoring the conversion of amino acids in their diet into flesh and muscle.

TESTING MILK COMPOUNDS

There’s still much to learn, such as why the microbiome in malnourished infants stalls in the first

IT’S ALL CONNECTED

What role does good nutrition play in the health and development of children? That’s the question Christine Stewart, a professor in the UC Davis Department of Nutrition, is helping address. She works with an international team on a project called “WASH Benefits,” measuring the combined impact of water quality, sanitation, hand-washing, and nutritional interventions during a child’s first years of life.

“We’re working with 5,500 families in Bangladesh and 8,000 families in Kenya,” Stewart said. “I’m looking at the nutritional aspects, providing education and nutrient-rich supplements to mothers to feed their infants.”

Poor nutrition and intestinal infection are closely connected. Malnourished children are more prone to infection.

“When children are fighting an infection, they aren’t hungry, their gut microbe balance is off, and they are not as able to absorb nutrients,” she added. “WASH Benefits is looking at all the interconnected pieces to determine what combination of interventions has the most impact and the best chance to succeed in improving child growth.”

“Nutritional security goes beyond providing access to nutritious food,” said Dewey, who has coordinated international research efforts to formulate and evaluate cost-effective supplements to pregnant and nursing women and their infants in impoverished nations. “Nutritional interventions must be coupled with comprehensive strategies for providing access to health care, adequate sanitation, clean water, and other factors that influence the ability to utilize nutrients for growth and development.”

CARE FOR YOUR BACTERIA

The jury is still out on what recent gut-bacteria research means for healthy adults, besides to keep eating your vegetables.

“And fruits and proteins and grains—as many different varieties as you can find, which isn’t easy in this day and age,” said Professor Carolyn Slupsky with the departments of nutrition, and food science and technology. “One of the many good things about the African Orphan Crop Consortium is it supports growing a wide variety of nutritious, traditional crops, which is good for humans and for the planet.”

“The community of microbes inside our body is like the ecology of microbes in the ocean and soil and everywhere else on earth,” Slupsky continued. “Take care of your microbiome, and it will take care of you.”



BY JOHN STUMBOS

A HEALTHY START

Obesity threatens the health and well-being of millions of Americans. It frequently starts at a young age, putting children at risk for health problems such as diabetes and cardiovascular diseases. UC Davis scientists are discovering how to give children a healthier start with a comprehensive strategy that includes nutrition education, physical activity, and the involvement of schools and communities.

LIZETTE RODRIGUEZ/UC DAVIS

A focus on families

Niños Sanos, Familia Sana (Healthy Children, Healthy Family) is a five-year project begun in 2011 that aims to reduce childhood obesity in Firebaugh and San Joaquin, communities comprised of predominantly Mexican-origin families. A USDA grant funded the multifaceted project led by a team of social scientists from UC Davis and UC Cooperative Extension who partnered with each community and the parents of about 400 children ages 2 to 8.

“Many families told us children accept traditional healthy Mexican foods when they’re younger but begin to reject the family

diet when they start school,” said UC Davis Cooperative Extension specialist Lucia Kaiser, who coordinated the nutrition education components of the study. “Gradually, more processed foods begin to replace those foods, so starting children early with the right practices will, hopefully, help them maintain a healthier diet.”

Firebaugh was randomly selected as the intervention community. While San Joaquin received educational programs geared toward academic success, Firebaugh received:

- \$25 monthly vouchers to buy fruits and vegetables at local markets
- Classroom instruction for children on nutrition and physical activity

- Parent education about children’s nutrition needs and physical activity
- Twice yearly health screenings to monitor weight, blood pressure, body mass index, skinfold thickness, and waist circumference

Food demonstrations always included fruits and vegetables in different recipes. Interactive activities helped parents and children learn skills promoting healthy food habits such as meal planning and understanding food labels. Spanish-speaking lay workers helped develop some of the cooking lessons and model healthy behaviors.

Preliminary results have shown a significant decrease in the consumption of processed, high-fat foods. Families used the vouchers to buy more fruits than vegetables. Weight gain slowed down in children who were the heaviest at the beginning of the study.

Ivan Garcia is a Firebaugh resident and planning commissioner who also works on the project. He has noticed how local children are more interested in playing soccer, riding bikes, and joining a new girls’ softball league or stepping out in a new dance academy. “This program has been received really well here in the community,” he said.

“Part of this is about what sort of foods you bring home,” Kaiser said. “It’s also about how you establish a regular schedule and try to help children have a healthy routine—with enough sleep, with physical activity, with regular family meals. I think all these elements work together to make good health happen.”

School-based program expanding

The Shaping Healthy Choices Program is a successful school-based strategy that combines nutrition education, family and community partnerships, regional agriculture, school cafeterias, and school wellness policies to address childhood obesity. UC Davis nutrition specialist Sheri Zidenberg-Cherr developed the program with graduate students, postdoctoral scholars, faculty researchers, UC Cooperative Extension specialists, and county Cooperative Extension advisors and educators.

“Obesity is the main issue that’s being looked at in nutrition and public health across the country,” she said. “We talk about food as a good thing, a healthy thing. Enjoying healthy food has to be a big part of behavior change.”

Shaping Healthy Choices builds on a pioneering curriculum that links school gardens with nutrition education and food preferences. Through tastings, children learned to enjoy foods such as peas, broccoli, and jicama. “We saw very significant results, but we realized that we needed to hit the whole school

environment,” Zidenberg-Cherr said.

The team received a grant from UC Agriculture and Natural Resources in 2011 to create a multicomponent, school-based intervention that included new classroom curricula and community involvement. Initially, Shaping Healthy Choices was tested in schools with high rates of overweight and obese children in Sacramento and Stanislaus counties. A nutrition educator conducted garden-enhanced lessons, led cooking demonstrations, and taught children about the nutrients in foods.

The program also helped bring salad bars to the Elk Grove School District, according to its director of food and nutrition services Michelle Drake. “We now provide students access to fresh, quality fruits and veggies,” she said. “We also purchase from local growers, and we continue to provide nutrition education to our students.”

In just the first year, researchers documented a “stunning” drop in overweight or obese children from 56 percent to 38 percent at one of the intervention schools. “We expected over time to see changes, but we never expected to see the type of findings we saw,” Zidenberg-Cherr said. The Shaping Healthy Choices program is expanding in California through the UC Davis-managed CalFresh nutrition education program.

During a school visit, Zidenberg-Cherr heard from children now of normal weight about how much they loved their vegetables. “It was gratifying going to the school and seeing these kids,” she said. “That was amazing. I’d love to see where they are now.”

To learn more about Shaping Healthy Choices, visit the UC Davis Center for Nutrition and Schools website at cns.ucdavis.edu.



LOBI NGUYEN/UC DAVIS



Mitchell Feldmann
graduate student

Steve Knapp
strawberry breeding
program director

Bryan Pellissier
field manager

Tom Gordon
plant pathology
professor

Dominique Pincot
graduate student

Tom Poorten
postdoctoral researcher

Eduardo Garcia
senior technician

Julia Harshman
postdoctoral researcher

Glenn Cole
staff researcher

Charlotte Acharya
lab manager

Bruce Campopiano
staff researcher

GREGORY URQUIAGA/UC DAVIS

SETTING A BENCHMARK

Industry upbeat about revitalized strawberry breeding program

STRAWBERRY FARMERS AND INDUSTRY LEADERS say new science, education, and collaborations underway at the UC Davis Public Strawberry Breeding Program bode well for the quality and sustainability of strawberries in California. The breeding program has launched a large-scale, genetic disease-resistance experiment, added students and staff researchers to its team, and planted strawberry-yield trials on five farms from Ventura to Watsonville.

“It’s a privilege to participate in the novel research they’re doing at UC Davis,” said Tom AmRhein, a longtime member of the California Strawberry Commission and a strawberry producer with Naturipe Berry Growers Inc. near Castroville, site of one yield trial. “Growers are happy about the new focus and positive energy the team is bringing to the program. And because everything they develop is available to all strawberry growers, it protects the viability and sustainability of the whole industry.”

Improving genetic resistance to disease

Strawberries are especially vulnerable to soilborne pathogens, which can destroy an entire crop. Since the 1960s, strawberry growers have depended on fumigants

such as methyl bromide—a colorless, odorless gas—to control disease. But methyl bromide has been linked to lung disease and ozone-layer depletion, and will no longer be available after 2016.

UC Davis breeders recently took an important first step in developing a berry with improved genetic resistance to soilborne disease. In collaboration with the Department of Plant Pathology, they planted strawberries representing 914 genotypes to begin identifying genes that influence resistance to the fungi fusarium and macrophomina, two common culprits in California, where 80 percent of U.S. strawberry production takes place.

“This will help us identify genes of interest, which we can analyze further in the lab,” said Glenn Cole, a staff research associate with the breeding program.

Integrating genetic tools

The program is incorporating advanced genetic tools into its breeding and will conduct DNA fingerprinting on the entire UC collection of germplasm, the living tissue from which new plants can be grown. Integrating genomic information, statistics, and the latest breeding strategies will accelerate the crop-improvement process.

“Because all the data and material they develop is public, it will be available to any grower, which is so crucial in today’s competitive marketplace.”

—Dan Legard of the California Strawberry Commission

To improve a crop, breeders traditionally cross plants with desired traits and select the best offspring over multiple generations. Some traits, such as flavor and size, are often determined by many genes acting together, while other traits, such as disease resistance, may be regulated by a single gene. Advanced tools help breeders hone in on genes that affect specific traits and select for those genes at an earlier stage.

“Genetic tools are an integral part of a successful breeding program,” said Professor Steve Knapp, director of the Strawberry Breeding Program. “We look forward to helping develop 21st century strawberry breeding.”

Gathering germplasm

Breeders need genetic diversity of germplasm to develop quality crops that can resist constantly evolving pests, diseases, and environmental stresses. The team is building diversity by collecting strawberry species from the wild and germplasm from the USDA.

The new material will be securely stored with the program’s already impressive collection, including some 1,700 cultivars. Of those 1,700 cultivars, 180 are considered “elite” and will most likely develop into a winning variety. Breeders planted those 180 cultivars on five farms in California, each with its own particular climate and crop-management strategies.

“Each farmer has his own recipe, as I call it, for growing the berries, which is good,” Cole said. “It helps us see how the crop performs in different environments.”

Nurturing tomorrow’s breeders

Teaching is now central to the public breeding program, which offers graduate education and will include undergraduates soon.

Knapp teaches quantitative genetics, and mentors postdoctoral and graduate students like Dominique Pincot, whose family farms in Santa Maria.

“I heard such wonderful things about Dr. Knapp, and I knew this was where I wanted to study,” said Pincot, who is working on her master’s degree in horticulture and agronomy.

A good berry should be sustainable, disease-resistant, and tasty, too. Postdoctoral scholar Julia Harshman is focusing on flavor.

“We’ll be conducting consumer surveys and working with sensory panels from the Robert Mondavi Institute to make sure all our varieties are full of flavor,” said Harshman, who worked with apples at Washington State University. “Flavor reigns in apple breeding. I want to bring that same attention to strawberries.”

Dan Legard, vice president of research and education for the California Strawberry Commission, applauds the science underway.



Eduardo Garcia and Charlotte Acharya prepare to plant strawberries for a large-scale, genetic disease-resistance experiment.

GREGORY URQUIAGA/UC DAVIS

“Because all the data and material they develop is public, it will be available to any grower, which is so crucial in today’s competitive marketplace,” Legard said.

And it’s vital to strawberry lovers worldwide, according to Greg France, a family farmer and longtime California Strawberry Commissioner: “The UC Davis Strawberry Breeding Program is setting the benchmark in breeding to improve strawberry quality, yield, and sustainability.”

—Diane Nelson

MAKING CONNECTIONS

UC Davis students finding opportunities on and off campus



SALINAS BOUND

In April, the CA&ES dean's office took more than 40 students to Salinas to learn about potential internships and job opportunities in the Salinas Valley agriculture industry.

Students were able to see how their classroom learning would apply in real life settings as they toured Andrew & Williamson's strawberry farm, and Mann Packing and Taylor Farms processing facilities. The Western Plant Health Association and Grower-Shipper Association, along with a cadre of UC Davis alumni, helped ensure the program's success.

This summer another group is headed to Salinas for a program with Western Growers to attract science and technology students to opportunities in agriculture.

FOOD INDUSTRY SPEED NETWORKING

In March, the Department of Food Science and Technology and the Northern California Institute of Food Technologists hosted the second annual Food Industry Speed Networking event. Designed to connect talented future employees with the food industry, the event attracted more than 100 students and 30 companies.

Students selected five companies that best fit their career path and participated in "speed-networking" sessions with the company's owners, presidents, chief technical officers, and human resource representatives, many of whom are UC Davis alumni. The day culminated with a student recognition and industry banquet. Alumnus Dan Voit, president of Blentech Corporation, presented the keynote address.

MANAGERIAL ECONOMICS CAREER DAY

Once a year, UC Davis managerial economics students hear about opportunities in the working world from a highly reputable source—UC Davis alumni—at the Student-Alumni Career Day. Graduates working in finance, banking, marketing, accounting, and other areas of business share information on where they work, what they do, and how they got the job.

This year, students heard advice from Naeem Ishaq, a 2001 managerial economics graduate who specializes in finance for a high-tech firm. "Hopefully, you can see that your career is not a linear path," Ishaq told students. "It goes up, down, and sideways. Early in your career, it's good to take risks and explore."

AGGIE AMBASSADORS REACHING OUT

The College of Agricultural and Environmental Sciences was among more than 1,500 exhibitors at the 49th annual World Ag Expo held in Tulare in February.

It's the largest annual agricultural exposition in the world, drawing more than 100,000 people to the sprawling show grounds in the heart of the San Joaquin Valley.

CA&ES had a booth in the educational pavilion, along with Cal Poly San Luis Obispo, Cal Poly Pomona, Fresno State, and some private business colleges. Among the many visitors who stopped by to talk with Dean Helene Dillard and the Aggie Ambassadors were hundreds of high school students considering UC Davis as their destination for a college degree.



ROBIN DERIEUX/UC DAVIS

CHARLEEN FLOYD/UC DAVIS



Graduate student Leslie Holland points out where canker disease typically invades an almond tree.

GREGORY URQUIAGA/UC DAVIS

THAT'S NUTS!

Plant pathology research helps ailing almonds

JUST ABOUT EVERYONE SAYS ALMONDS are good for human health, but what's good for the health of almonds? UC Davis graduate student Leslie Holland wants to know. In pursuit of her Ph.D. in plant pathology, Holland studies canker diseases in almond. Canker diseases invade the woody tissue of the almond tree, typically the result of a fungus entering through a pruning wound.

"We're like the cavalry arriving to collect samples, which we bring back to the lab for analysis."

"California is crop central, and almonds are one of the biggest and most economically important crops in the state," said Holland, who came to UC Davis in 2015. "California grows more than 80 percent of the global supply of almonds."

Holland studied general biology as an undergraduate at New Mexico State University and became interested in plant pathology during a summer agricultural internship. After helping plant a vineyard, she learned

the vines had to be pulled out when it was discovered the new plants were diseased. She wondered, "How can I help prevent that kind of problem?"

Holland completed a master's degree in plant pathology at Washington State University and then came to UC Davis to do doctoral research on almond diseases. She studies with Cooperative Extension specialist Florent Trouillas, a stone fruit and nut expert stationed at the Kearney Agricultural Research and Extension Center in the heart of almond country—California's Central Valley. Over the summer, Holland will help Trouillas answer calls from growers and UC farm advisors who seek advice on sick trees.

In the field, the plant pathologist toolkit includes an array of shears, pruning saws, hatchets, and machetes. "We're like the cavalry arriving to collect samples, which we bring back to the lab for analysis," said Holland. "I like working with growers and trying to provide answers."

Holland has learned that it takes a holistic approach to keep almonds healthy. "We stress the integrated approach to orchard management, looking at planting, pruning, water, fertilizer, and pest management," she said. "There is no silver bullet."

—Robin DeRieux

BIG CHEESE

Nutrition student has important issues on her plate

COLLEGE STUDENTS ARE HUNGRY. At dinnertime in the dormitory dining commons, clinical nutrition major Aria Wexler seizes the teachable moment.

As a food and cooking coordinator, Wexler heads a team of interns who host cooking demonstrations. Tonight's fare: gingered kale and carrot ribbons. The samples are well received by students, who stop by the demo table on their way to dinner.

"We try to reach out to first-year students who will be moving to apartments next year and learning to cook for themselves," said Wexler, a fourth-year student from the Seattle area.

Wexler's interest in food grew from her food allergies. "I've always been interested in nutrition—hyperaware about food—because I have a lot of dietary restrictions."

Although she entered UC Davis without declaring a major, Wexler honed in on her field by participating in the CA&ES Career Discovery Groups, a seminar program that helps freshmen explore potential careers. Ultimately Wexler would like to become a dietitian, and majoring in clinical nutrition prepares students for that pathway.

"Aria is one of those students who

"Nearly 40 percent of the food in our country goes to waste."



Aria Wexler

knows how to think on her feet," said Linda Adams, a dietitian with campus food services who has worked with Wexler since she began as a freshman intern. "Aria interacts well with students and understands that making a personal connection is such a huge piece of health and getting people to make healthy changes."

In addition to her involvement with nutrition education and outreach, Wexler serves as the Global Food Initiative ambassador for the UC Davis campus. In this role she collaborates with student representatives from all 10 UC campuses to address the challenge of feeding 9 billion people by the year 2050.

Closer to home, Wexler also works to improve food security for UC Davis students. As a manager of Fruit and Veggie Up, she helps distribute an average of 195 pounds a week of donated, slightly imperfect produce—free to students in need—through the Student Health and Wellness Center and the campus food pantry.

"Nearly 40 percent of the food in our country goes to waste," said Wexler. "If others duplicate this kind of program, think about how much food we could divert from waste and how many people we can prevent from going hungry."

—Robin DeRieux



Tom and Ginny Cahill at Putah Creek and the land they donated to the university in the background.

JOHN STUMBOS/UC DAVIS

A LASTING LEGACY

Cahill gift of land will benefit the UC Davis Natural Reserve System

FOR THE LAST 25 YEARS, TOM AND GINNY CAHILL have owned and enjoyed a beautiful slice of blue oak woodlands and unspoiled riparian forest nestled along the south side of Putah Creek near Lake Berryessa. Now they're giving it away.

The 196-acre parcel will become the Cahill Riparian Preserve, part of the UC Davis Natural Reserve System. It will be managed by the university in coordination with the new Berryessa Snow Mountain National Monument.

The Cahills first learned about the property in 1988. "Ginny and I were looking for a couple of acres—not to develop, not to farm, just to enjoy," Tom said. "Then this large parcel unexpectedly became available."

Shortly before the Cahills purchased the property, a wildfire raced through it. "We were still sold on it," he said. "I know ecology and that this land was designed to burn. The next spring there were wildflowers all over it like you wouldn't believe."

The Cahills have been good stewards of the land, and over the years have granted access to UC Davis scientists for research. While most of the area along the creek is undisturbed, some grassland had been grazed. To bring the land back to its original condition, the Cahills removed the cattle and let nature take its course. Nonnative yellow star thistle disappeared and native bunch grasses made a recovery. Native blue oaks, gray pine, redbud, and California buckeye are present, as are

uncommon plants such as "yellow fairy lantern lily" and "farewell to spring."

The property stretches about a mile along Putah Creek, a section managed as a premier catch-and-release trout stream. Wildlife observed in the preserve includes bear, coyote, bobcat, deer, mountain lion, river otter, and an abundance of insects and birds. Earlier this spring, rain brought out a large migration of newts.

Tom, a UC Davis emeritus professor of physics and atmospheric sciences, is renowned for his work on air pollution. He currently runs the Greenland aerosol program for the National Science Foundation to learn more about global climate change. Ginny is a highly respected water lawyer who teaches an undergraduate course in water law at UC Davis. The Cahills want the preserve to give a new generation of students and scientists the opportunity to study how the local ecology responds to a changing world.

"Our hope is that this becomes a research and teaching resource and a protected area for plants and animals," Ginny said.

"This land donation is a natural follow-up to our love of nature," Tom added. "We feel very strongly about it. It's a will to nature, a will to the future, a will to the students."

—John Stumbos

CHAMPIONS FOR FOOD SCIENCE

Beckley, Herzog help build outstanding program into the future

WORLD-CLASS FOOD SCIENCE REQUIRES a few essential elements: premier professors, stellar students, top-notch technology, and stakeholder partnerships. UC Davis enjoys those critical components, along with one secret ingredient that pulls it all together: support from industry leaders like UC Davis alumna Jacqueline Herbert Beckley (B.S., '72) and her husband, Leslie Herzog.

Beckley and Herzog have long donated both time and money to the College of Agricultural and Environmental Sciences and the Department of Food Science and Technology by serving on leadership boards and creating an endowed student scholarship fund. They recently extended that support into the future

polarizing," Beckley said. "Food issues generate a lot of emotions, and we need to hear and acknowledge people's reasons behind those feelings. Only then can we find ways to engage in lasting, meaningful conversations on topics like food security, which are so important to our future."

Beckley and Herzog share a passion for food science and a commitment to helping others.

"We've been fortunate in our lives," Herzog said. "It's important to give back. We encourage others to get in the game, as well."

Beckley added, "Whether you give \$100 or \$200,000, the important thing is helping any way you can."

—Diane Nelson

"It's important to give back.

We encourage others to get

in the game, as well."

by designating a portion of their estate to create an endowed chair in the Department of Food Science and Technology.

"The food science conducted at UC Davis addresses so many vital issues facing our world, such as assuring food security and coping with climate change," said Beckley. "It feels very good to help build that excellent program into the future."

Food science weaves throughout both Beckley's and Herzog's lives and has been central to their success. Herzog studied food science at Cornell University and worked as a product-development scientist and manager with a global consumer-goods company for more than 35 years. Beckley is founder and CEO of an innovative business development and strategy firm that helps both large and emerging companies understand consumer needs and find solutions that benefit food, health, safety, and sustainable-growth initiatives.

Beckley and Herzog are strategic in their giving by supporting programs and priorities they value most. Beckley, for example, wants to help improve the dialogue around food and food science.

"I would love to see a course that helps students develop the skills to really listen, understand, and discuss food issues like GMOs, which can be so



Leslie Herzog and Jacqueline Herbert Beckley

TUSHING/UC DAVIS



Linda Rosenberg Ach helped create the Peter B. Moyle and California Trout Endowed Chair in Cold Water Fishes at UC Davis.

HOOKED ON NATURE

Environmental design alumna committed to healthy ecosystems

EARLY IN LIFE, LINDA ROSENBERG ACH (B.S., '76, environmental design) developed a deep appreciation for the outdoors that eventually led her to leadership of one of the most important conservation organizations in the state, California Trout (CalTrout).

Linda learned to fish on pack trips to the Trinity Alps with her brother, Douglas, and her father, Claude Rosenberg. Over the years, they tested their skills on trout streams throughout Northern California.

"That's where it all started for me at 13 years old, and in college I just carried it on," she said. She fished Putah Creek west of Davis and also the back country of the Sierra Nevada. "That was the beginning of my understanding the relationships of conservation, water, and fish."

As a student, Linda studied environmental design, focusing on interior design and interior architecture. "Davis was a heavenly place to go to college," she said. "It was close to the city and close to the mountains. It was rural, comfortable, casual, and full of great, smart people who were really interested in learning."

In her career she brought to life the interior architecture of banks, law firms, and companies such as Apple and Federal Express. "We would come in and design everything—the walls, doors, ceiling lights, stairs," she said. "It was fun thinking outside the box to

design for these companies."

Just like her father before her, Linda became involved with CalTrout. The organization works to ensure that fish can thrive in healthy waters—home to California's wild salmon, steelhead, and trout. CalTrout has a long history of partnering with UC Davis to achieve its goals. The Nigiri Project at Knaggs Ranch in the Yolo Bypass, for instance, has demonstrated how harvested rice fields can be used as nurseries to boost populations of Chinook salmon.

"I strongly believe in the work we're doing," Linda said. "It is very science based, and working with UC Davis helps us develop the metrics to see what works and what doesn't. After all, fish are the indicators of a healthy ecosystem."

Linda served on the board of CalTrout for several years, as chair, and in other important roles. She also helped create the Peter B. Moyle and California Trout Endowed Chair in Cold Water Fishes at UC Davis. Professor emeritus Moyle, an authority on California's native freshwater fish, has worked with CalTrout since the 1970s.

"We're not just a fishing group," Linda said. "We have a clear focus on healthy water for fish, which means for people, which means for all of California."

—John Stumbos

MEET PENNY HERBERT

The new CA&ES Executive Assistant Dean

PENNY HERBERT became the new CA&ES Executive Assistant Dean in January. She replaces Tom Kaiser, who retired after more than 23 years at the helm of the college's financial and administrative affairs.

"I am honored to join the College of Agricultural and Environmental Sciences," Herbert said. "As a veteran of the UC system, I'm delighted to bring my experience in working with talented students, faculty, staff, and leadership to my new role in support of the college finances."

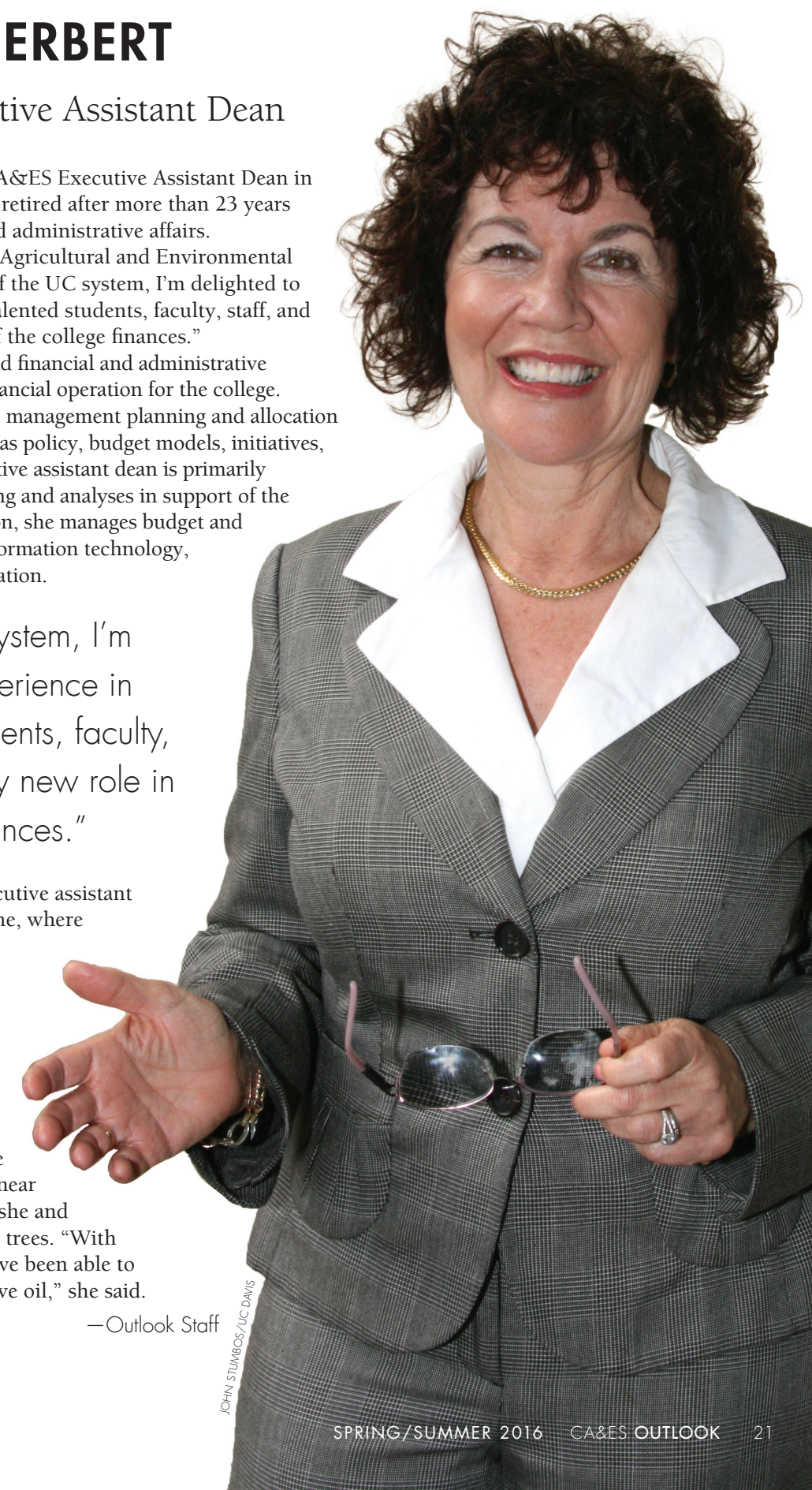
The executive assistant dean is the lead financial and administrative officer and oversees the business and financial operation for the college. Herbert provides leadership for resource management planning and allocation and handles a wide range of issues such as policy, budget models, initiatives, and organizational structure. The executive assistant dean is primarily responsible for CA&ES financial planning and analyses in support of the operating and capital budgets. In addition, she manages budget and financial services, facilities planning, information technology, business services, and general administration.

"As a veteran of the UC system, I'm delighted to bring my experience in working with talented students, faculty, staff, and leadership to my new role in support of the college finances."

Herbert previously served as the executive assistant dean in the UC Davis School of Medicine, where she performed comparable financial and administrative functions. While her previous duties also included the complications of clinical revenues, it did not include the challenges and excitement of "soil, sturgeon, stallions, and strawberries."

Herbert is a native of Auckland, New Zealand. She follows Formula One racing but drives a Prius. Herbert lives near Winters on a five-acre property, where she and her husband tend 50 vines and 30 olive trees. "With the assistance of CA&ES faculty, we have been able to make potable wines and half-decent olive oil," she said.

—Outlook Staff



JOHN STUMBOS/UC DAVIS

NEW FACULTY BRING WEALTH OF KNOWLEDGE

CA&ES welcomes
16 new faculty
members in 2015

For additional information, visit
caes.ucdavis.edu and click on
New Faculty Profiles.



**RICHARD
BLATCHFORD**
Assistant Cooperative
Extension Specialist,
Animal Science

Focuses on the husbandry, behavior, and welfare of small- to large-scale poultry production



**JULIANA
DE MOURA BELL**
Assistant Professor,
Food Science and
Technology

Focuses on developing environmentally friendly technologies for extracting major food components such as oil, protein, and carbohydrates



ELISE GORNISH
Assistant
Cooperative
Extension
Specialist, Plant
Sciences

Develops and deploys effective restoration and land management strategies for grasslands in California



CLARE GUPTA
Assistant Cooperative
Extension Specialist,
Human Ecology

Examines how environmental and agricultural policies affect community food systems, and how citizens and community groups can shape these policies



KRISTIN KIESEL
Lecturer, PSOE,
Agricultural and
Resource Economics

Looks at the health, environmental, and social aspects of food systems, supporting a shift toward healthier and more sustainable food choices through policy interventions



KARL KJER
Professor and
Schlinger Chair in
Insect Systematics,
Entomology and
Nematology

Specializes in the biodiversity of Trichoptera, or caddisflies, which are moth-like insects whose aquatic larvae can be used as indicators of water quality



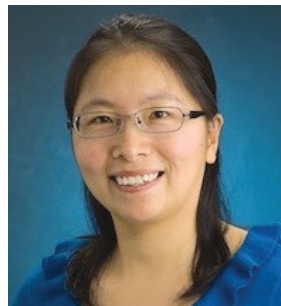
STEVE KNAPP
Professor and Director
of the Strawberry
Breeding Program

Works to develop and deliver outstanding cultivars by collaborating with growers and colleagues, preserving and multiplying germplasm, conducting cutting-edge genetics and genomics research, and planting yield trials in collaboration with growers



KAAN KURTURAL
Associate Cooperative
Extension Specialist,
Viticulture and Enology

Works to understand whole grapevine physiology that leads to improving precision agricultural practices, enhancing berry flavonoid composition, and adapting to ecological stresses



YANHONG LIU
Assistant Professor,
Animal Science

Focuses on improving disease resistance in pigs and increasing the sustainability of swine production



MARK LUNDY
Assistant Cooperative
Extension Specialist,
Plant Sciences

Conducts applied research and produces extension information relating to California cropping systems for small grains, such as wheat and barley, and corn



MAJA MAKAGON
Assistant Professor,
Animal Science

Focuses on the behavior, welfare, and management of poultry, including ducks, turkeys, laying hens, and broilers



TRAN NGUYEN
Assistant Professor,
Environmental
Toxicology

Studies atmospheric chemistry and instrumentation relevant to air pollution, climate change, and environmental health



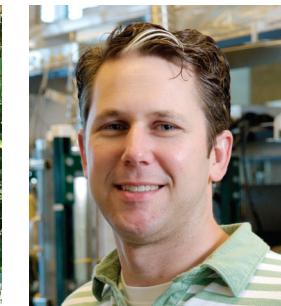
LESLIE ROCHE
Assistant Cooperative
Extension Specialist,
Plant Sciences

Works with a variety of stakeholders to integrate management expertise and applied research to address key challenges on grazing lands



DANIEL RUNCIE
Assistant Professor,
Plant Sciences

Works on predicting crop performance and the effects of climate change by building computational models of plant adaptations to variable environments



RON RUNNEBAUM
Assistant Professor,
Viticulture and Enology
(also in Chemical
Engineering and
Material Science)

Conducts research to make wine processing more sustainable with nanotechnology for chemical adsorption and reaction



RACHEL VANNETTE
Assistant Professor,
Entomology and
Nematology

Studies how microbial communities influence plant traits and interactions between plants and insects, including plant-herbivore and plant-pollinator interactions

CA&ES Outlook

College of Agricultural and
Environmental Sciences
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One Shields Avenue
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Lyla, College of Agricultural
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