WINTER 2019

momentumd

UNIVERSITY OF MARYLAND
COLLEGE OF AGRICULTURE
AND NATURAL RESOURCES

AGNR ON THE CUTTING EDGE:

CRISPR

LEADERS IN GENE-EDITING RESEARCH

ASSOCIATE PROFESSOR **BHANU TELUGU**
AND ASSISTANT PROFESSOR **YIPING QI**

AGNR Open House at the Central Maryland Research and Education Center in Clarksville on October 4, 2018. See more on page 25.

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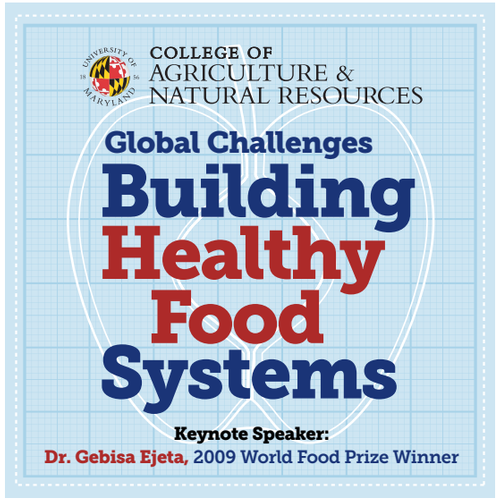

DEAN BEYROUTY'S MESSAGE

Welcome to 2019! I hope you had a wonderful holiday season and enjoyed time spent with family and friends. Winter has arrived, and with it the start of a fresh new semester here on campus.

We are pleased to report that our college is in the midst of a very successful and pivotal academic year. Our current freshman class is one of the largest in the college's history, with 182 registered in the fall compared to 86 in 2017. Extension is back to full strength, with new leadership and a cadre of specialists ready to serve a diverse set of needs. We hosted the college's inaugural Cornerstone Event in October, featuring a full day of engagement around grand challenges and solutions related to food and nutritional safety and security. The term "cornerstone" is a nod to AGNR's history as the University's founding college in 1856. It is a distinct point of pride for faculty and staff. And of course, our strategic initiatives continue to gain momentum with new action plans, events, and grant dollars rolling in. We have driven and seen accelerated progress, because that is our charge and our duty to the community.

With that in mind, I'm thrilled to share this next issue of *Momentum* with each of you, and am particularly excited for you to grab a front row seat to efforts around our initiative, **Establish a Healthy Food System and Ensure Global Food and Nutritional Security**. You'll meet Patrick Keenan, a senior dietetics student who is challenging his fellow students and community members to eat smarter and healthier through a new YouTube series. You'll take pride in our 4-Hers as they work to combat food and nutritional insecurity at home and in their neighborhoods. And of course, an issue of *Momentum* would not be complete without some impactful applied science, reporting on the college's groundbreaking efforts in gene editing and CRISPR technology.

I wish you all the best in 2019, and we look forward to seeing you at our next alumni event!

Craig Beyrouty
Dean and Director

Momentum is published by the College of Agriculture and Natural Resources at the University of Maryland, College Park, for alumni, friends, faculty, and staff. Comments and alumni notes are welcome and should be addressed to Graham Binder at binderg@umd.edu.

For information on how to engage with the AGNR alumni chapter, please contact Amanda Brown Clougherty at akbrown@umd.edu.

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Ask Adel

ADEL SHIRMOHAMMADI DISCUSSES GENE EDITING TECHNOLOGY

Professor Shirmohammadi sheds some light on a hot new research field, and explains how CRISPR is changing the game for agriculture and food security.

What is gene editing, and how does it enhance traditional breeding techniques?
The concept of gene editing has been accomplished with cross-breeding since people first cultivated plants and animals for food. In the old days, they would append a branch from one fruit tree to another to produce a new tree displaying characteristics of both, or pick the best animals to breed and hope the best traits get passed on. That is traditional breeding. But with gene-editing, we can identify a specific characteristic and insert or eliminate it. This cuts years and years out of the process and helps feed more people and account for new issues like diseases, pests, or heat.

What is CRISPR, and how does it work?
CRISPR can be described as "molecular scissors" used to cut DNA. This means that a piece of genetic code related to a specific trait can be changed, turned on or off, removed, or replaced with something that will make a more nutritionally-sound, disease-resistant, or higher-producing plant or animal. With precision breeding, you can produce something in a few years that might normally take decades using traditional approaches.

What is the goal of genetically modified organisms or GMOs?
We need to feed a projected population of 9.6 billion by 2050 with little to no new agricultural land. We don't always have the luxury to wait years and years for traditional breeding. If I am a hungry person in a poor country, I want to eat. So we as scientists have to look at new ways to fight against stressors and keep up with changing climate-induced conditions. GMOs can be used to enhance yield, disease or pest resistance, or even micronutrients like antioxidants or other factors to increase nutritional security and fight human disease. That is the goal, but it is the responsibility of scientists to continue to investigate for society to develop trust in this process because we are responsible professionally and humanistically.

What does this mean for agriculture?
Genetic modification has already made substantial impacts in agriculture. Bt corn makes up over 90% of corn in the U.S., and it has been suppressing pests since the 90s, leading to millions in economic benefit and less pesticide use. AGNR has active research in plants and animals and is leading innovation in CRISPR, which you will learn more about later in this issue. This technology is fast and adaptable, so we can keep modifying as new situations arise, because there will inevitably be new challenges we are yet to face. If a new disease wipes out a crop here, the agricultural industry and economy suffer. In the developing world if this happens, people don't eat. The stakes are high, and AGNR is working to address these global issues.

4-H Youth Feeds Social Change

THIS PAST JUNE, Maryland 4-Hers bit off as much as they could chew at a first-of-its-kind Issue Forum. In conjunction with Hunger Awareness Month in June 2018, Maryland 4-H, with support from the Maryland 4-H Foundation, held a forum focused on food access and security. Youth from all over the state learned about this pressing social problem through civil dialogue and hands-on educational experience to develop an action plan to combat the issues within their own communities.

“Maryland 4-H took an intentional focus on addressing areas of social injustice within communities, our country, and the world,” said Jeff Howard, State 4-H Leader and Assistant Director of 4-H Youth Development for UMD Extension. “We chose food insecurity for this first forum because it closely aligned with several of the strategic initiatives for the college—charting a path toward food and nutritional security and safety, ensuring sustainable agricultural production systems, and promoting improved health and well-being of our communities and environment.”

To kick off the three-day event, 4-H alum and Food Network star Lazarus Lynch gave the keynote speech on the importance of nutrition and how youth can be empowered to be changemakers.

“I’m here to help you to harness the purpose, the power, the authentic voice that is you,” said Lynch, World Food Prize winner and creator of the first ever Snapchat cooking show. “Each of us has something really unique, really special that lives inside of all of us, and when you apply that to issues, when you apply that purpose to a subject, when you apply your personality to things you want to change, amazing things will happen.”

Throughout the three days, students participated in various classroom and hands-on experiences, learning about the research that scientists are conducting to understand and increase Maryland agriculture and food production. A panel discussion with Maryland professionals gave teens the opportunity to hear what initiatives are taking place and what issues communities face when working towards ending hunger locally. This civic dialogue allowed students to explore these topics in a safe environment, said Howard, engaging them with community members, educators, and professionals to deliberate important issues with the help of facilitators to provide factual background information and guidance.

UNIVERSITY OF MARYLAND EXTENSION

Food Network Star Lazarus Lynch speaks to 4-Hers at the forum.

“What is food security in your community?” asked Karen Fedor of the Maryland Department of Agriculture during the panel discussion. “What does it mean? What does it look like?”

“It’s not just an issue abroad,” said Lynch during his keynote address. “It exists in this community that we call high school.”

According to Fedor, normalizing food access in schools is one of the simplest ways students can begin fighting food insecurity. “School lunches were made to feed kids who don’t have access to food, but there are kids who are afraid because there’s a stigma associated with that,” she said. “How can you be a part of the solution? Think about what you can do to alleviate the stigma so those kids will have access to food.”

“Participants now know that these issues aren’t as far off as they may have thought,” said Howard. “Each of their counties and cities had pockets and schools with families that did not have enough healthy food options to maintain physical and mental well-being, leading to increased empathy and feelings of responsibility in the participants to contribute to local solutions.”

Students also toured a forest garden ecosystem and experienced food desert mapping technology, helping visualize where food insecurity exists and how those communities have limited access to resources. They were then tasked with developing and presenting actions plans to address food security issues within their own neighborhoods, and those plans were presented to local educators and stakeholders to determine viability and implementation, explained Dr. Nia Fields, 4-H Youth Development Specialist.

“The youth received mini-grants to carry out their action plans,” said Fields. “The plans ranged from education workshops to collecting cooking utensils for those who don’t have the tools needed to prepare food received from food pantries. Other groups are also working on local community gardens,” she said.

The youth were surveyed after the forum to determine the effectiveness of the communication and to gauge student empowerment. A resounding 100 percent expressed that they learned more about food insecurity, and 95 percent felt that they had a responsibility to help their communities.

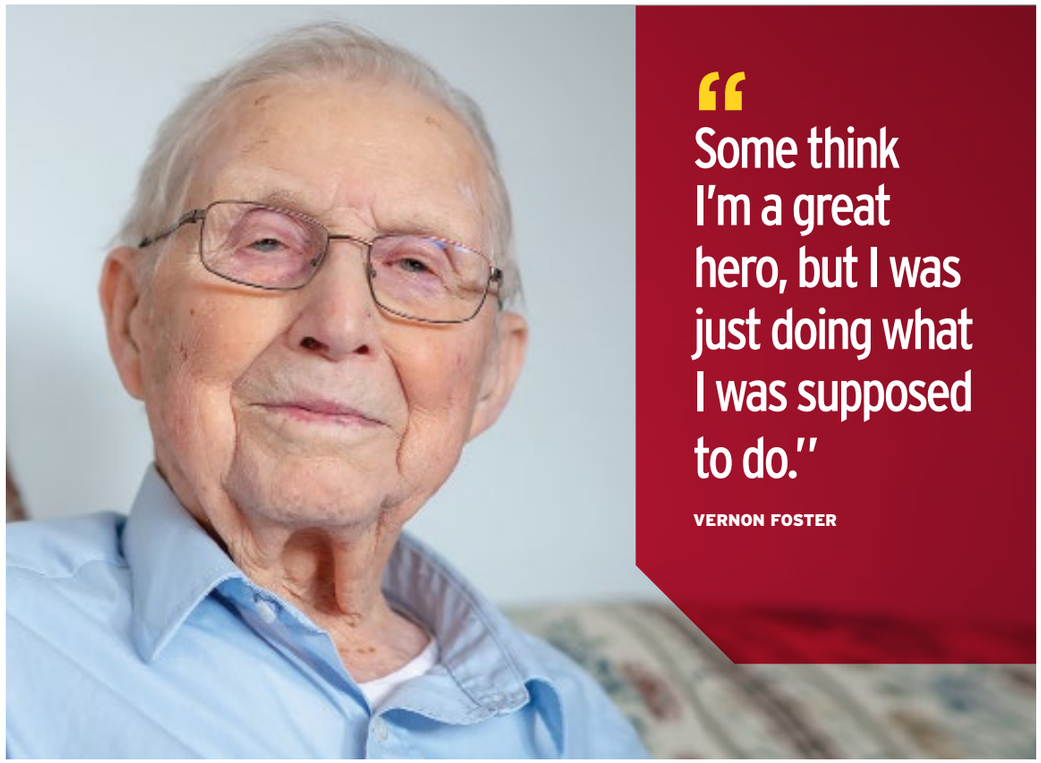
“Our pledge includes using our head, hands, heart, and health to contribute to our communities and world, and 4-H aims to develop leadership and life skills in young people so that they may thrive through adulthood,” said Howard. “We have begun to develop a cohort of young enthusiasts committed to their communities and civically engaged in carrying out the action plans they developed during the forum.”

“Compassion can change everything,” said Lynch. “Until we—as a culture, as a people, as a world—until we identify our neighbor as ourselves, we will never get to solving the really big issues.” — **L.W.**

WATCH **TO LEARN MORE ABOUT THIS 4-H ISSUE FORUM, WATCH THE VIDEO AT go.umd.edu/laz**

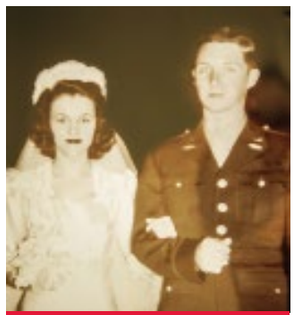
4-H students explore Forested, a “forest garden” in Bowie, Maryland as part of the Issue Forum experience.

A Century of Service



Centurian Vernon Foster is a University of Maryland alumni, World War II veteran, and passionate advocate for Maryland agriculture.

"WHATEVER YOU'RE DOING, take it seriously—do it or don't." Alumni Vernon Foster recently turned 100 years young on November 20, 2018 and has an extraordinarily rich history as a pillar of agriculture in Maryland. Still with a stunningly sharp memory and wit, and living in Parkton, Md, right across the street from where he grew up in the early 20th century, Foster fondly recounts a storied life as a UMD alum, World War II veteran, and a passionate advocate for Maryland agriculture.



Dottie and Vernon on their wedding day in 1943.

As early as high school, Foster gained valuable experience in agricultural education, as his primary career aspiration before life would take him in a variety of directions. He would sometimes act as the unofficial substitute ag teacher, giving tests and grading them with permission from the school's principal. Even though he was president of his class and a top student, he didn't want to go to college. "Going to college just sort of happened," Foster says. While enrolled, Foster joined Army ROTC and was commissioned as a second lieutenant before graduating from UMD and starting as an agriculture teacher in Bel Air, Md, in 1940.

Following the untimely death of his father, Foster made a pivotal decision to leave teaching and return to help run the family farm. But his life was once again turned upside down following the invasion of Pearl Harbor on December 7, 1941. He would join the "greatest generation" as coined by Tom Brokaw to describe the brave Americans who grew up in the Depression era and fought in World War II. He had learned so much about Hitler while in college and was passionately motivated to volunteer. "It was my duty," he said.

Foster would deploy to serve as commander and platoon leader with the 2nd Platoon, Company A, 714th Tank Battalion. He was part of the fabled 12th Division, which for a brief time was under the command of Gen. George S. Patton, Jr. He led a five-member crew comprised of himself, a gunner, loader, driver, and assistant driver. His tank, an M-4 Sherman, featured the words "Dottie" in white-block lettering on the side, an homage to his wife to whom he wrote countless letters during the war.

Foster didn't return home completely unscathed. In 1944, an artillery shell exploded near his head and several pieces of shrapnel lodged in his face. He was instructed to take a few days off, but instead opted to take only a few hours, returning to his duty as quickly as possible. This earned him the Purple Heart. When he recalls his war experiences, Foster said, "Some think I'm a great hero, but I was just doing what I was supposed to do."

When he arrived home, he joined the Army Reserves where he would serve until 1953. Once out of the Reserves, he was able to purchase a 75-acre homestead including the house and barn across the road from where he grew up with 100% financing from the bank. He used the little amount of money he and Dottie had to buy equipment. It was "just a shell house" as he called it. There was a room downstairs where they had their living room, kitchen, and bedroom, and they cut a section out from above to use as their bathroom. They moved into the house on New Year's Day 1954, and slowly made it a home with electricity in March, water later that spring, a bathroom in the summer, and a phone by fall. They slowly fixed one room at a time until the renovations were completed over the course of two years. There are about a dozen buildings Foster has added to the property since then.

Foster has received more than 100 commendations for his work with dairy, crop growing, and the army. He has also served proudly as chairman of the Maryland Soil Conservation Board, as Farm Bureau President, and as a member of the Milk Cooperative Board. In 1959, he became a member of one of three national Farmer's Clubs, a historically difficult organization to break into. He can't remember everything he's been recognized for, but says, "I never have given up on anything and have always stayed interested in what's going on in agriculture."

Even though his son now runs the family farming operation, he doesn't do anything without asking his father first. Even at 100, Foster still attends Farmers Club meetings regularly and is a member of Farm Bureau. He believes in being active, a lesson he learned from his days at UMD. "If you had never done anything except be a student, no one knows who you are or what you did. Be a joiner."

When asked to reflect on his 100 years, particularly his decision to pivot away from ag education after just one year, he offered this simple, yet powerful response. "I have no regrets. I'm proud of my life, proud that I did what I was supposed to do. It's been a pleasure being out on the farm." — **G.C.**

A few of Vernon's many commendations, including the Purple Heart and the Bronze Star.

Trusted Advice from a Trusted Advisor

"GET UP EVERY DAY EXCITED for what you're going to learn and what you might be able to do to help others." If you are an avid viewer of CNBC, you may have already heard some words of wisdom like this from Mark Fleming, Agriculture and Resource Economics (AREC) PhD and alum.

Fleming is a frequent guest on CNBC discussing topics like recent housing trends or rising mortgage rates. Serving as the Chief Economist at First American Financial Corporation, he studies the housing market, writes blog posts, and serves as the main spokesperson to the media for the corporation.

This may seem like an unusual path for an AREC alum, but AREC has graduated a diverse group of economists serving locally, nationally, and internationally on issues ranging from law to politics to public health to productivity. After graduating with a Bachelor of Arts in Economics from Swarthmore College, Fleming admitted he didn't want to attend graduate school until he encountered the diversity and strength of the AREC program at UMD.

He applied with the idea to study developmental economics and apply it to Africa to help establish stronger markets. Fleming was born in England, coming to the U.S. at age 7, but has strong family ties with Africa. Fleming's grandfather was a British civil servant in the 50s and 60s and ran school systems in colonial Africa for the British. His mother visited Africa during her summers off from boarding school, and Fleming himself spent time in Africa while in college.

But this passion soon evolved into a different path for Fleming. Most of his work as an undergraduate was focused on econometrics, the branch of economics that uses statistics in describing economic systems. While in graduate school at UMD, he did a lot of empirical work with property data in Maryland as part of a research assistantship, and gained extensive knowledge of real estate data through the research and dissertation process. His goals shifted, and he became known for his specialty in empirical work, leading him to serve as chief economist for two other companies prior to starting with First American.

From an agricultural perspective, the U.S. is ranked third in the world for food production, with technological advances transforming the world of agriculture and economics at a very fast pace. "Speaking as an economist, there has been a significant change in how we produce our agriculture products," says Fleming. This makes it a particularly exciting time for students to study agriculture, Fleming explains. But there are so many paths to choose within AREC and AGNR. His advice to current AREC students: "If you can find something to study that you enjoy, and you are lucky enough to do that, it's a real blessing." — **S.W.**

AGNR Senior Lands in Puget Sound for Prestigious NOAA Scholarship

CARA SCHIKSNIS has always cared deeply about the world around her. When it came to choosing where and what she wanted to study, the Department of Environmental Science and Technology was an easy pick. Schiksnis' passion for the environment drove her, a senior originally from Montgomery, NJ, to apply and be chosen as a 2017 National Oceanic and Atmospheric Administration (NOAA) Hollings Scholar, one of only 110 students from across the country selected for the prestigious scholarship.

NOAA Hollings Scholars are selected based on outstanding achievement in NOAA-mission related fields and their contributions towards bolstering STEM competitiveness. Scholars receive two years of tuition support, a paid internship at a NOAA facility anywhere in the country, and the opportunity to participate in continuing professional development programming.

Schiksnis chose to intern at the Northwest Fisheries Science Center Research Station this past summer in Mukilteo, Washington. For ten weeks, she worked under the mentorship of Dr. Shallin Busch and designed a research project to study the effect of elevated carbon dioxide on the feeding rate of Dungeness crab larvae. "The response of vulnerable larvae to changing ocean conditions could have implications for the success of the overall populations and other members of the food web," Schiksnis says. "Each day I came into the lab with an invigorated sense of curiosity, impatient to see how my results would come together and eager to continue learning about the complexities of the Puget Sound ecosystem."

This was not Schiksnis' first experience in research. As a member of UMD's Honor College, Schiksnis is in the Gemstone program, where undergraduate teams design, direct, and conduct a research project over four years. Schiksnis is one of six members of Team Oyster who are researching alternative methods of reef restoration in the Chesapeake Bay.

The NOAA Hollings Scholarship provided Schiksnis not only an invaluable opportunity, but clarity for the future. Schiksnis says, "My internship definitely left a huge impact on me, by enhancing my passion for research and opening my eyes to the plethora of exciting information that the oceans offer us, so much so that this is the topic I hope to study in graduate school and as a career." After graduation, Schiksnis plans on pursuing a PhD in biological oceanography and a career in research. — **A.B.**

> “[This new research center] embraces every part of the land-grant mission—community engagement, research, and teaching.”
>
> **JOSE-LUIS IZURSA**

Rooting for Aquaponics

MICHAEL WIJESINGHE REMEMBERS turning 14 years old in the South Brunswick suburbs of New Jersey and telling his father he was ready to work. Wijesinghe always loved working with his hands, so he hopped on his bike and rode down the street to a local landscaping nursery and got his first job in horticulture.

From there, his love of the agricultural sciences grew with him. When first coming to the University of Maryland, he thought he would pursue his interest in coding and computer science. But it wasn't the right fit. "I was sitting inside and hating it. I wanted something more hands-on and interactive, to create a different kind of learning experience," says Wijesinghe.

That is when he discovered UMD Hydroponics through Facebook. When he reached out to what he thought was a student club, he realized it was just one person, Jimmy Shue, an Environmental Science and Policy major in AGNR. Wijesinghe and Shue got together to work in hydroponics, growing plants without soil and instead suspending the roots in water with the appropriate combination of nutrients. This satisfied a need for an out-of-classroom learning environment as well as a love of horticulture, and by sophomore year Wijesinghe had switched his major to Agricultural Science & Technology and hoped to spread that love to as many people as possible.

Dr. Jose-Luis Izursa and Michael Wijesinghe at work in the aquaponics lab.

> “With new systems like aquaponics that can grow speciality crops with not much space, we can give farmers another option to help keep their businesses competitive.”
>
> **MICHAEL WIJESINGHE**

Visitors to Maryland Day 2018 were able to see aquaponics demonstrated by Green Roots.

Wijesinghe is now the President of Green Roots, a hydroponics club co-founded by Shue in the spring of 2016. He is also the President of Alpha Gamma Rho (AGR), a social and professional fraternity for those dedicated to the pursuit of careers in agricultural and life sciences, as well as the President of the AGNR Student Council. He spent summers working at the Terp Farm in Upper Marlboro getting hands-on agricultural experience, where Green Roots was housed briefly before they acquired space in the Research Greenhouse Complex.

Green Roots now has upwards of 40 members and is dedicated to using innovative technology like hydroponics to advance sustainable and urban agriculture. With hydroponics, you can grow food anywhere, even in your apartment. But there is also potential for large-scale food production using these methods, and Wijesinghe teamed up with Jose-Luis Izursa in Environmental Science & Technology to explore a new innovative combination of aquaculture and hydroponics known as aquaponics.

In an aquaponics system, you grow fish (aquaculture) that actually produce the nutrients needed for the plants to thrive in a soiless media (hydroponics), creating a closed and sustainable ecosystem with no pesticides or fertilizers. Systems are scalable for your own food production or for large farms, making this an exciting new venture that can provide multiple sources of profit with both plant and fish production.

With funds from a UMD Sustainability Grant, Wijesinghe and Izursa will be founding the first ever Aquaponics Research Center at UMD. The new 1200-square-foot facility will be on campus next to the current Research Greenhouse Complex and will break ground in 2019. The facility will help the university pave the way in this innovative new research, while also giving students from all majors even more of a chance to interact with agriculture through the Green Roots club. "The center in my mind is so much more than research. It shows that you can have agriculture local to you in a community environment," says Wijesinghe. "It feels like we are making a difference."

"Founding the Aquaponics Research Center, we are going to put the university on the map for aquaponics," says Izursa. "This embraces every part of the land-grant mission—community engagement, research, and teaching."

Through Green Roots and all his academic experiences, Wijesinghe continues to fight for sustainable agriculture and get that hands-on education he so greatly craved. "Where I grew up, there was historically a lot of agricultural land, but everything is being sold off. The 500 acres of forest I used to play in as a kid just got sold to a developer. With new systems like aquaponics that can grow specialty crops like herbs with not much space, we can give farmers another option to help keep their businesses competitive." — **S.W.**

From Farm to Microwave: Dorm Room Delicacies

AGNR's Patrick Keenan filming his YouTube series "Terps vs. Pros".

HISTORY WILL PROBABLY SHOW that when most of us reference our culinary experiences in college, there will be uninspired tales of instant ramen, mac and cheese, and cheap takeout pizza. For the most part, we're all guilty of having taken the easy route with ignorance of our nutritional requirements in favor of convenience and an affordable price. For some, things may not have changed very much since graduation. We're all busy. Extensive meal planning can often take a back seat to things like jobs and children. There are a bevy of excuses, right?

Well, Patrick Keenan '19 is not buying it. With graduation just around the corner in the spring, Keenan is on a quest to entrench some simple, cost-efficient cooking strategies in the minds of his fellow students, with the goal of improving their nutritional security and producing a balanced, sustainable diet.

"I'm trying to get our students to think beyond the culinary possibilities of PB&J and the dollar menu at McDonald's. There's a lot they can do with short money and time to produce a healthy, tasty meal," says Keenan.

At such a young age, Keenan's culinary background speaks volumes. He worked as a professional baker and cake decorator at The Yummery in White Marsh, Md, and is a respected culinary instructor with Williams-Sonoma in Baltimore. What he has learned and understands that most don't is that there are a variety of workarounds and shortcuts that can produce a solid meal. A key component of his vision for healthy eating is to imagine a world where you don't have access to commercial-grade cookware and appliances. You'd effectively be left with basic items like microwaves and toaster ovens. This is precisely the reality of most undergraduate students at universities like UMD.

This idea is the main driver behind episode one of "Terps vs. Pros", a new YouTube series created by Keenan and sponsored by the college and UMD Dining Services.

"I've found that not just students, but people of all ages want to learn how to cook inexpensive and healthy meals, but it's difficult to find the right information," said Keenan. "Throughout our series, I hope we can share some of our ideas with the UMD community and inspire them to incorporate healthy cooking into their daily lives."

In the inaugural episode, Keenan begs the question – how do you think a college student would fare in a head-to-head cooking competition against a professional chef? "It would be no contest, right? But not if the playing field is leveled through basic ingredients and simple cookware."

The episode then launches into a riveting reality-style cooking show competition in which a student who typically only eats pasta and ramen is able to execute on the same level as a pro. Using only a microwave, each must produce a three-course meal using a limited set of tools and basic ingredients. In just 30 minutes, each contestant produces a healthy, delicious looking feast. Who wins? Find out for yourself by visiting **go.umd.edu/ptk**! — **G.B.**

WATCH go.umd.edu/ptk

Creamy Ramen with Poached Egg

Whole Grain Carrot Mug Cake with Yogurt Glaze

Southwest Loaded Baked Sweet Potato

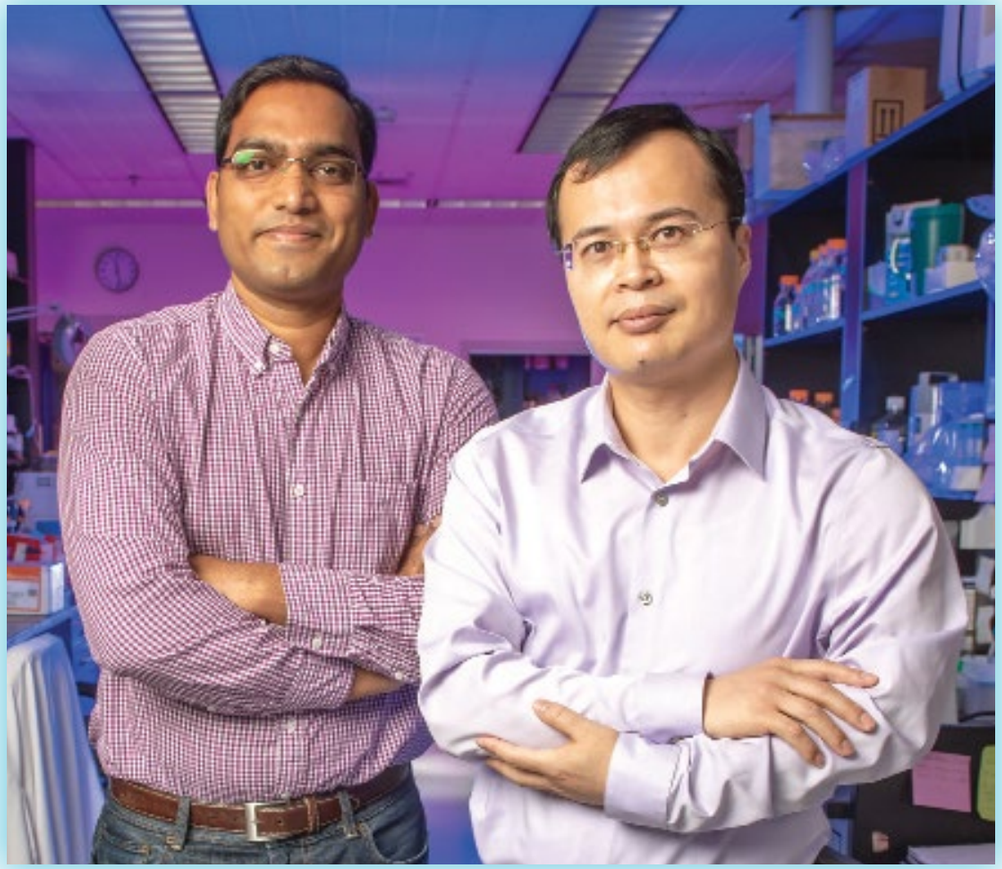
To try the recipes Patrick developed for "Terps vs. Pros", visit go.umd.edu/UBp.

> "I'm trying to get our students to think beyond the culinary possibilities of PB&J and the dollar menu at McDonald's."
>
> **PATRICK KEENAN, '19**

ON THE CUTTING-EDGE WITH CRISPR, THE MOLECULAR SCISSORS

By Samantha Watters

AS ADEL SHIRMOHAMMADI INTRODUCED IN OUR *ASK ADEL* COLUMN, THE CONCEPT OF GENE-EDITING IS NOT NEW, BUT HAS HISTORICALLY BEEN ACCOMPLISHED THROUGH SELECTION AND CROSS-BREEDING. BUT WITH BILLIONS OF ADDITIONAL PEOPLE, NO NEW LAND TO CULTIVATE, AND AN EQUALLY CRITICAL FOCUS ON ENVIRONMENTAL STEWARDSHIP, SCIENTISTS NEED TO FIND INNOVATIVE WAYS TO INCREASE YIELDS AND MINIMIZE LOSSES FOR CROPS AND LIVESTOCK.



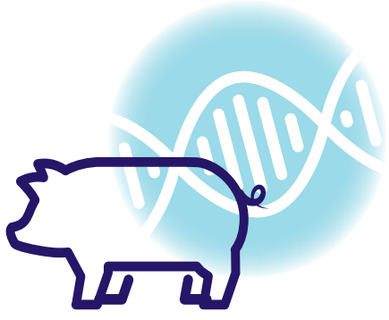
ASSOCIATE PROFESSOR BHANU TELUGU AND ASSISTANT PROFESSOR YIPING QI ARE AGNR'S LEADING CRISPR RESEARCHERS.

"MOLECULAR SCISSORS" LIKE CRISPR will enable scientists, breeders, and producers to do the same things done with traditional cross-breeding programs in a much shorter amount of time to account for new issues like disease resistance, pests, heat, drought, and other major concerns of a changing climate and growing population. With this technology, if scientists pinpoint the trait that breeders and producers hope to cultivate with traditional breeding, they can instead turn it on, off, up, or down quickly and see it in the next generation of the crop or animal, as opposed to waiting decades for results.

Researchers around the world are using gene editing tools. But AGNR is on the front lines of this work, helping pave the way with a commitment to agricultural innovation and a clear charge to address global challenges like food and nutritional security. The work of up-and-coming thought leaders like Associate Professor Bhanu Telugu in Animal & Avian Sciences and Assistant Professor Yiping Qi in Plant Science & Landscape Architecture have AGNR on the forefront of advances in plants and animals, with applications for agricultural production, animal welfare, and even human health.

“We are faced with serious issues that traditional breeding methods don’t work quickly enough to solve. I am excited to be able to work on these important applications and still contribute to the greater knowledge of functional genomics.”

ANIMAL AND HUMAN HEALTH MODELS



BHANU TELUGU is proficient in gene editing tools like CRISPR, and he is revolutionizing the way they are used in animals. Telugu is using CRISPR very diversely, in cattle and goats for dairy production, in pig models for agricultural and biomedical reasons, and in mouse models for developmental biology. Agriculturally, Telugu is looking at traits that increase disease resistance, improve animal welfare, and enhance agricultural yields. Biomedically, he is creating models for human diseases like flu and diabetes with implications for human health and treatment.

Telugu is fostering research to address both animal and human health, as well as the need for more studies in model organisms that are agriculturally relevant.

Pigs happen to have very similar metabolism and physiology to humans, making them a particularly valuable model organism.

In one example of his work in pigs, Telugu is working with Chad Stahl, professor and department chair, looking at a specific gene that has been shown to inhibit insulin signaling, and is linked in both animals and humans to low birth weight and diseases like Silver-Russell syndrome, as well as obesity, diabetes, and cardiovascular or metabolic diseases.

“If we can prove that this gene is instrumental in the development of metabolic diseases and diabetes, we can provide an additional screening tool to produce novel drugs that work on this signaling pathway, or even to prevent diabetes from occurring,” says Stahl.

In dairy cattle and goats, Telugu aims to not only increase milk yield, but also introduce traits to improve heat tolerance. With the climate changing rapidly, animals are suffering from heat stress, affecting animal welfare and production.

“Heat stress has become a serious issue in the United States in the last decade or so,” explains Telugu. “That is how quickly these problems are growing and changing. We are faced with serious issues that traditional breeding methods don’t work quickly enough to solve. I am excited to be able to work on these important applications and still contribute to the greater knowledge of functional genomics.”

ADVANCING TOOLS IN CROP PRODUCTION

“We don’t just test different kinds of molecular scissors in our lab, but we have to think about how the DNA goes back together, what else is altered, and whether we are turning a gene on, off, up, or down.”

YIPING QI has worked with rice, maize, and a variety of key global crops that are critical to feeding the world. But his work is unique, perfecting the editing tools themselves and providing them to researchers around the world to make substantial impacts. Qi is providing new and enhanced gene editing technologies to improve the specificity of genetic “cuts” that are made, ensuring the integrity of the entire genome and making sure CRISPR in its various forms and functions is as effective, efficient, and safe as possible.

“CRISPR technologies are revolutionizing biology, agriculture, and medicine.” says Qi. “We don’t just test different kinds of molecular scissors in our lab, but we have to think about how the DNA goes back together, what else is altered, and whether we are turning a gene on, off, up, or down. All of those specifics aren’t inherent in the scissors themselves and need specific tools and testing to accomplish.”

Tools from Qi’s lab are currently used by researchers in more than 36 countries around the world and counting, with the ultimate goal of advancing plant and crop yields. They have the ability to turn genes “up and down” as opposed to just “on and off”, which is very practical for crop productivity and sustainability. Continued development of these tools will not only aid basic research, but allow scientists to seek novel solutions to global challenges such as devastating plant diseases, economical bioenergy production, sustainable agriculture, and climate change.

With Qi and Telugu leading the way in CRISPR for plants and animals, AGNR and the agricultural industry has a lot to look forward to as a major player in meeting goals for global food and nutritional security.

COLLEGE OF AGRICULTURE & NATURAL RESOURCES

Global Challenges

Building Healthy Food Systems

Keynote Speaker:
Dr. Gebisa Ejeta, 2009 World Food Prize Winner

> "...we need to produce more food on less land, with less water, and with more sensitivity to the environment around us."
>
> Dr. Gebisa Ejeta
> Keynote Speaker and
> 2009 World Food Prize Winner

The Cornerstone Communique

By Graham Binder

ONCE THE PARKING GARAGE WAS FULL and the breakfast plates assembled, folks flooded the STAMP's Hoff auditorium in anticipation of Gebisa Ejeta, a World Food Prize Laureate and one of the world's most renowned experts and influential players in global food and nutritional security. Raised in rural Ethiopia, Ejeta has spent over 30 years researching international agriculture with an emphasis on African agricultural research. He is credited with engineering a superior type of sorghum, one of the five most important cereal crops on the planet. Native to warm regions of the Old World, it is a critical source of grain and feed for livestock. When confronting the grand challenge of feeding a rapidly growing global population, his solutions are second to none.

After introductions from UMD Provost Mary Ann Rankin and Dean Craig Beyrouty, Ejeta began his keynote address, and the Global Challenges: Building Healthy Food Systems Cornerstone Event was underway.

The name of the event was true to form. Ejeta identified 11 existing global challenges that must be addressed in our quest to feed an additional 2.5 billion people by 2050. Visually represented in a meticulously thorough presentation, attendees got a crash course in food supply, population, production systems, biodiversity and ecosystems, land tenure and land use, food systems, nutrition and health, climate and fossil fuels, water, energy, and global trade.

"The need to double food production in the next 30 years is very formidable," said Ejeta. "Moving forward, we need to produce more food on less land, with less water, and with more sensitivity to the environment around us."

Dr. Gebisa Ejeta delivers the keynote address.

Ejeta also stressed the importance of One Health as part an integrated approach to combating food insecurity. One Health is the concept that optimal human health is tied to healthy outcomes for animals as well as the environment.

"Interventions must take an integrated approach with a One Health goal to not compromise food and nutrition, and health in any food system. Research to address water shortages, global energy consumption, and climate change is needed."

If you were one of 500-plus people in attendance at the college's inaugural Cornerstone Event, you may have absorbed a nugget of information like, "Whole genome sequencing has been as useful and as impactful in microbiology and food safety as the Hubble has been to space exploration." Shared by Eric Brown, director, Division of Microbiology at the Federal Drug Administration at one of the event's post-keynote breakout sessions, this grand comparison reveals the magnitude of the challenges we face as a global society. Whole genome sequencing—a rapid way of figuring out the order of As, Cs, Gs, and Ts that make up the DNA of all living things—gives us the ability to track and trace food pathogens. With increased adoption and process improvement since the first methods in the 90s, we can now determine that an outbreak occurred in a specific geographic location. Developing countries like Ghana, Sudan, and Tanzania as well as international powerhouses like China and India are using whole genome sequencing as the price is dropping. It is becoming quick and easy-to-do. In support of the market demand, for a limited time only, Cambridge-based Veritas Genetics is offering a whole genome sequencing and interpretation service for just $200 down from $999. Of course, this is geared towards human genome sequencing, but you get the idea.

Another issue at the center of the global food safety and security conundrum is water quality and availability. A team of interdisciplinary faculty at UMD from the School of Public Health, AGNR, Computer, Mathematical, and Natural Sciences, and Engineering, as well as multiple other land-grant institutions and USDA-Agricultural Research Service have established CONSERVE (COordinating Nontraditional Sustainable watER Use in Variable climatEs): A Center of Excellence at the Nexus of Sustainable Water Reuse, Food, and Health (funded by USDA-National Institute of Food and Agriculture). The team is focused on facilitating the adoption of on-farm treatment solutions that can enable the use of recycled water to

Dean Beyrouty welcomes participants to the inaugural AGNR Cornerstone Event—*Global Challenges: Building Healthy Food Systems.*

irrigate food crops. They aim to reduce the nation's agricultural water challenges that are exacerbated by climate change. Amy Sapkota, director of CONSERVE, offered her thoughts on this particular challenge during the afternoon sessions. "We are running out of high-quality freshwater to grow our food. At the same time, within 30 years we will have close to 10 billion people on the planet, and we will need to find innovative ways to produce more food with less water while ensuring food safety and nutritional security and protecting public health. To achieve this task, we will need to embrace sustainable water reuse solutions and combine them with emerging water-saving technologies and farming practices that make use of every drop."

Malnutrition, the role of women in building developing countries' food security, precision breeding for crop improvement, and protecting the farm through proper business management; all of these areas were explored with takeaways and solutions offered from a diverse array of partner organizations. This is not AGNR's problem to solve in a vacuum, but one of that requires deep collaboration across academia, industry, government, and private citizenry. Not to be diminished, however, is AGNR's role as a national leader in adoption of strategies to help build a healthier worldwide food system. The knowledge of how to produce food and sustain yourself is incredibly powerful, and some will say that power has weakened in strength. The college aims to restore that connection.

Faculty & Staff Recognitions

Bill Hubbard

AGNR/UME'S NEW ASSISTANT DIRECTOR AND PROGRAM LEADER OF ENVIRONMENT & NATURAL RESOURCES

The college is pleased to welcome Bill Hubbard as the new Assistant Director/Program Leader for the Environment & Natural Resources and Sea Grant programs within UME. Bill joins the college with 31 years of experience, and brings a BS in Forest Management, an MS in Forest Economics, and a PhD in Extension Education. Most recently, he served as the southern regional extension forester at the University of Georgia, where he was the liaison between the 13 Southern 1862 Land-Grant Universities and the USDA Forest Service-Southern Region. His responsibilities included serving the southern Land-Grant University System and U.S. Forest Service through collaborative development of forestry and natural resource programs as well as technologies that improve the efficiency, effectiveness, and relevance of the supporting institutions. Within the last 25 years, he grew the department from a one-person position to a staff of over 12.

Prior to this role, he was a state extension specialist at the University of Florida for five years. He has been very active with Association of Natural Resource Extension Professionals (ANREP) since its inception, being one of the founding professionals, acting as its president, and serving on its Board of Directors. Bill is an elected Fellow with the Society of American Foresters (SAF) and most recently received the TEAM Award from the USDA Secretary of Agriculture.

Xiaoping Zhu

APPOINTED AS CHAIR OF THE DEPARTMENT OF VETERINARY MEDICINE

Dean Beyrouty is delighted to announce that Xiaoping Zhu will assume permanent duties as chair of the Department of Veterinary Medicine and associate dean of the Virginia-Maryland College of Veterinary Medicine.

Xiaoping assumes this role with a wealth of experience, beginning his career as a veterinary pathologist with China Agricultural University, Beijing. Since then he has occupied many roles at a variety of academic institutions, rising in the ranks from assistant lecturer to professor. From 2010–16, Xiaoping served as director of the Veterinary Medical Sciences (VMSC) Graduate Training Program at UMD, and from 2011 onwards has been a faculty member in the Virology Graduate Training Program. Since 2015, Xiaoping has held a valued role as co-director of at UMD. He is an adjunct professor at China Agricultural University in the College of Veterinary Medicine, as well as Ningxia Medical University in the College of Basic Medicine.

Xiaoping is a highly respected researcher and teacher, and he will be a wonderful addition to the leadership team. His vision for the department includes coordinating an even greater public presence of the people and programs in Vet Med and expanding collaborations with disciplines across the college and campus as well as with folks at the College of Veterinary Medicine at Virginia Tech.

Carolyn Fernandez

ASSISTANT DEAN OF EXTERNAL RELATIONS

The college welcomes Carolyn Fernandez to the College of Agriculture and Natural Resources as the new assistant dean for External Relations. Carolyn will step into the position recently vacated by Kashyap Choksi, where she will serve as the chief fundraiser for the college. Carolyn will work closely with the college's portfolio of 100+ prospects and current donors, leading efforts to secure major gifts in support of the college's strategic initiatives and achieve its capital campaign goals. The college is currently immersed in a strategic effort to raise $28 million by 2021 as part of the University's Fearless Ideas campaign, and Carolyn and her staff will be the driving force towards meeting that benchmark.

Carolyn comes to the college from the National 4-H Council, where she led the organization's fundraising efforts and served as a close advisor to the president & CEO. Carolyn has worked with 4-H for 27 years, beginning her career as an educational incentives specialist in 1991 and working her way up to Chief of Staff and then Director of Development, a position she held since 2015. During her tenure, she raised over $2M in annual revenue while stewarding an additional $1M in corporate and individual giving; served on the executive team which grew development revenue from $4M to $30M; and worked with 100+ land-grant universities to help grow their 4-H programs. Carolyn holds a Bachelor of Arts in International Studies from George Mason University.

Cheryl Hill

UNIVERSITY OF MARYLAND EXTENSION

Gary Seibel

DEPARTMENT OF ENVIRONMENTAL SCIENCE & TECHNOLOGY

The college wishes to congratulate Cheryl Hill (non-exempt) and Gary Seibel (exempt) for receiving the 2017-2018 University System of Maryland Board of Regents' Staff Award for Exceptional Contribution to the Institution and/or Unit to which the Person Belongs.

Gary Seibel, President Loh, and Cheryl Hill

Clarksville AGNR Open House

The Great Pumpkin weigh-in

Thousands of neighbors, families, and friends came to the AGNR Open House at the Central Maryland Research & Education Center in Clarksville on October 4. The day started with the ceremonial groundbreaking of a new office building on site, which will bring together research, Extension, and academic projects and programs to elevate the presence of AGNR's work.

Throughout the day, participants took hay ride tours, painted pumpkins, and learned about backyard poultry. New this year, the research farms participated in the Great Pumpkin Challenge. All research and education centers across the state grew their own pumpkin to enter in this friendly contest. The champion pumpkin was grown by the Lower Eastern Shore Research & Education Center-Poplar Hill Facility and weighed 180.9lbs. The winner received bragging rights and a turkey dinner for the farm crew. Stay tuned for next year's contest, as the planning has already begun!

Hayrides

UME 4-H robotics competition

AGNR leadership presented the Central Maryland Research & Education Center expansion plans for the Clarksville facility.

Demonstrations and exhibits were under a colorful tent.

Maryland State Fair

AUGUST 23 - SEPTEMBER 3, 2018

The fair is known across Maryland as "The Best 11 Days of Summer," and the college had a major presence throughout with demonstrations and showcases ranging from robotics to crop and livestock production, to a live birthing center. The University and the college hosted "UMD Day" on August 25. Visitors talked with Dean Beyrouty and other staff to learn about the impact we're making on the state of Maryland.

State Fair midway, exhibition halls, and competition rings

UME Master Gardeners answered all questions at their exhibit.

Maryland's Governor Larry Hogan and a 4-Her.

The Terpride bus at the fair on August 25 for UMD Day.

Football on the Farm

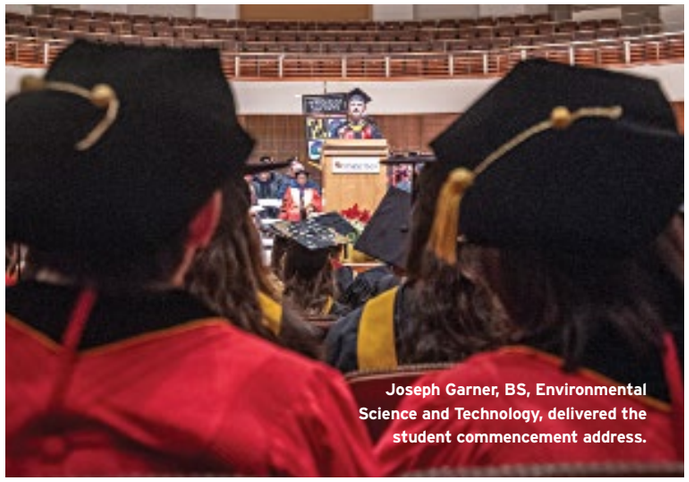
AGNR ALUMNI NETWORK TAILGATE

The AGNR Alumni Network cheered the Maryland Terps on to victory on Saturday, September 22, 2018 against the Minnesota Golden Gophers, and it all started with a fun and festive tailgate with a record-breaking 280 people in attendance! Industry partners from Site One Landscaping Supply, Pioneer, and Perdue came to network with students, alumni, and friends. Alpha Gamma Rho provided a hot breakfast off the grill. Being parents weekend, it was great to gather current students, family, friends, faculty, and staff together. **Mark your calendars for the 2019 AGNR "Terp-toberTailgate," tentatively, October 19, against Indiana!**

Winter Commencement

The AGNR 2018 Winter Commencement ceremony nearly filled the Dekelboum Concert Hall.

On December 19, 81 undergraduate students from the College of Agriculture and Natural Resources achieved a milestone in their lives at Dekelboum Concert Hall at the Clarice Smith Performing Arts Center. They celebrated earning their four-year degrees during commencement ceremonies.



Joseph Garner, BS, Environmental Science and Technology, delivered the student commencement address.

AGNR welcomed Mark J. Belton, Secretary, Maryland Department of Natural Resources, as the commencement speaker.

Dean Beyrouty congratulates the new graduates.

Farewells

George Spence

George Broughton Spence, Jr. (GB) passed away on September 15, 2018. In 1963, George moved to Maryland and began his service as the Calvert County agriculture Extension agent. He served in this capacity for 30 years, sharing the latest agricultural science with Calvert County farmers. Both his Bachelor's and Master's degrees were earned from North Carolina State. In his time with UMD Extension, he also served as the county director. On a small farm in Lower Marlboro, he and his wife Carol raised tobacco and then transitioned to food crops such as asparagus and blackberries, which he sold at the Takoma Park Farmers Market and at a roadside stand. He is survived by his son Broughton, his daughter-in-law Laurie, and his grandchildren George IV, Abigail, and Eleanor.

Dr. W. Ray Stricklin

William "Ray" Stricklin passed suddenly on September 5, 2018. Stricklin was professor of Animal Science at AGNR for nearly three decades, joining in 1980. He mentored countless undergraduate and graduate students. He retired from UMD in June 2018. His affinity for lively and challenging debate is warmly remembered. Passionate about applied ethology and the ethics of animal welfare, Stricklin traveled the world to attend conferences, give lectures, and teach classes. He served as associate dean of students for Animal & Avian Science and was the chair of the Institutional Animal Care and Use Committee. Stricklin was appointed as a Lilly Fellow for the 2002-2003 academic year. He is survived by his wife Dr. Pam Clark, his mother, daughter Sara Koelsch and husband Robert, and numerous family members.

Dr. Cecil M. Massie

Cecil Miles Massie passed away on August 20, 2018. Massie received his Bachelor's and Master's degrees from Virginia Tech and his PhD from UMD with additional graduate work at Ohio State University, University of Georgia, and Western Maryland College. He was on faculty at UMD's Institute of Applied Agriculture (IAA) for 21 years. Massie and his wife established the Cecil M. Massie Scholarship for students pursuing an IAA course of study. He served as president of the Maryland FFA Foundation, served on the Carroll County Agriculture Center Board, Carroll County Farm Museum, and many other community organizations. In addition to his wife, he is survived by a son Grant Massie and wife Nancy, grandsons Carter Massie and Zane Massie and wife Hillary, all of Nelson County, Va.

Dr. Guy S. Hohenhaus, DMV

Guy S. Hohenhaus passed on June 25, 2018. Hohenhaus was the state veterinarian and chief of Animal Health for the Maryland Department of Agriculture from 2005-2014. He previously served as Maryland's state public veterinarian for the Department of Health and Mental Hygiene. He was a professor at the Virginia-Maryland Regional College of Veterinary Medicine from 1990-2002 and director of its Veterinary Epidemiology residency program. Hohenhaus was a 1988 graduate of UMD. He was a 30+ year veteran of the U.S. Army Reserves. During his Army service, Dr. Hohenhaus designed and implemented food safety, zoonotic disease, and refugee programs in eight countries. He is survived by his wife Michelle and many family members.

Dr. John Harry Hoyert, DMV

John "Jack" Harry Hoyert, Jr. passed away on May 8, 2018. He was 95 years old. Hoyert graduated with a Bachelor's, Master's, and PhD from UMD and worked in the Agronomy department until retirement in 1981 as a Professor Emeritus. In 1954, he was hired into the Extension Service and was superintendent of the Maryland Experimental Tobacco Farm. Hoyert published over 50 articles and was a tireless advocate for farmers and their craft.

David Eigenbrode

David D. Eigenbrode passed away on October 28, 2018. He graduated from UMD with a Bachelor's degree in Agriculture Education and a Master's degree in Extension Education. He also served in the U.S. Army. During his professional career, he was the Frederick County 4-H agent, president and director of the Frederick County 4-H Camp Center, and acting state 4-H program leader for UMD Extension. David enjoyed judging flowers and vegetables at local and state fairs. He was National Chrysanthemum Society master judge and considered one of the nation's top chrysanthemum growers. He was an avid Maryland Terrapins fan.

Ellen Coale

Ellen Coale passed away on October 28, 2018. Ellen and her husband, Charles, were loyal supporters and friends of AGNR. One would often find the Coales at college events—Maryland Day, awards dinners, and scholarship receptions. Together, they established the H. Palmer Hopkins Scholarship fund for students pursuing an Agriculture Science Education, in honor of Charles's college professor. Charles is a graduate of UMD. Ellen brought a ray of sunshine to everyone she met and knew. She will be missed.

SAVE THE DATES

GIVING DAY
WEDNESDAY, MARCH 6

Mark your calendar and help the college reach its capital campaign goal through a gift on Giving Day, a 24-hour fundraising event on March 6.

Visit **givingday,umd.edu** to help raise critical funding and empower the next generation through world class education.

Eat, Drink & be Maryland
COLLEGE OF AGRICULTURE & NATURAL RESOURCES

TUESDAY, MARCH 26

The AGNR Alumni Network invites you to EAT, DRINK and BE Maryland on Tuesday March 26 to help celebrate our alumni and recent success stories within the college. The event will feature a four-course meal highlighting alumni businesses and college partnerships featuring Butler Orchards (Including thrilling new apple research from Chris Walsh), Robin Hill Wines, and Flying Dog Brewery with Extension agent Bryan Butler and AGNR hop-centric Field Notes beer!

Robert (Bob) Frazee and Linda Frazee

B.S. AGRICULTURAL & EXTENSION EDUCATION '77
COLONNADE SOCIETY MEMBER SINCE 2000

J. Robert (Bob) Frazee first visited the University of Maryland as a sophomore in high school, where he toured campus labs and learned about research with real life impacts. When he decided to enroll at the University of Maryland—a campus with more students than the county he grew up in—it was a huge adjustment. The sense of community within the College of Agriculture and Natural Resources helped him feel at ease and allowed him to explore beyond the college and take advantage of learning opportunities throughout the university. By the time he graduated in 1977, he was honored as the "Outstanding Graduating Senior."

Bob and Linda Frazee

Now, over 40 years later, Bob is a lifetime member of the Alumni Association, the Terrapin Club, and a representative to the Council on Agricultural Research, Extension and Teaching (CARET), a national effort which advocates for federal funds that provide core support for AGNR's work. He has led a successful agriculture career through the Farm Credit System, to which Bob and his wife Linda credit his education from the college. AGNR also helped provide them with resources they needed to engage in meaningful community support.

Bob and Linda Frazee stress the importance of giving back and supporting AGNR's work and vision. The college focuses on real life needs and issues, such as creating a sustainable environment, combating food insecurity around the globe, and making education accessible to all. The need for talented and passionate people is why they recently established AGNR's very first Maryland Promise Scholarship for AGNR, a matching scholarship program launched as part of the Fearless Ideas Campaign, which provides need-based scholarships to undergraduate students from underserved populations in the state of Maryland and the District of Columbia. The J. Robert and Linda Frazee Maryland Promise Scholarship will provide assistance to students that demonstrate the greatest financial need in the College of AGNR and who are committed to perpetuating the college's great work.

Bob and Linda know that donations like this provide opportunities for people who would not otherwise have them to take advantage of the intellectual capital and infrastructure at AGNR and the University of Maryland. They appreciate that what they have and where they are is because of the generosity of others before them.

For those who are interested in learning more about the Maryland Promise Program or opportunities to support AGNR during the Fearless Ideas Campaign, please visit **fearlessideas.umd.edu**.

COLLEGE OF
AGRICULTURE &
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