DECEMBER 2018

Agricultural & Biological Engineering

INSIDE

Looks a lot like Mars
What's it like to spend two weeks at the Mars Desert Research Station? One ABE student knows, and another is about to find out.

Another LORRE success story
Purdue researchers improve foodborne detection technology to deliver results in hours, not days.

How healthy is that plant?
An ABE professor hopes plant sensor research will benefit many farmers.

More PUPs in Kenya
The Purdue Utility Project wins a $10,000 Ford College Community Challenge grant.

We miss you, Monika
A tribute to Dr. Ivantysynova's legacy and two ways that you can honor the late professor.

PURDUE UNIVERSITY | Agricultural and Biological Engineering
COLLEGE OF AGRICULTURE

EVER TRUE

Unrecognizable now, but we know what's coming

This fall Purdue began celebrating 150 Years of Giant Leaps while looking forward to the impacts that students, alumni, staff and faculty will have over the next 150 years. Without a doubt, ABE is in the midst of taking a Giant Leap with our building project. The $80 million project is possible due to $69 million in support from the state and $10.6 million in support from our alumni and industry partners. We have a little less than $400,000 to raise in meeting the private fundraising goal and hope to reach this by the end of 2018. Thank you so much to all who have helped us to date. If you have been considering a gift, now would be a great time to help us reach the $11 million goal.

As I write this, the tower crane is being assembled — a clear symbol that we have moved from demolition and preparation for construction to the construction phase of the ABE building project. The project remains on schedule and on budget, both of which are important as we look to our future. Continue to visit our web page to follow construction via the web cameras, weekly photo updates and videos.

If you are wondering about the timeline of the ABE building project, the extended "camping" experience began in early May this year for about half of our program. We moved from the ABE building to space vacated

BASEMENT
Classrooms / Student Labs

FIRST FLOOR
Machine Systems / Agricultural Systems

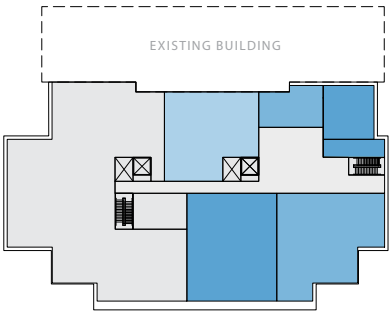
SECOND FLOOR
Computational Lab / Faculty and Grad Space

THIRD FLOOR
Environmental / Bioprocess Engineering / Faculty Space

FOURTH FLOOR
Bioprocess / Food Engineering

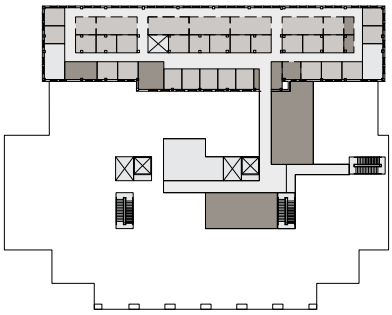
FIFTH FLOOR
Biological Engineering

BASEMENT



FIRST FLOOR

SECOND FLOOR



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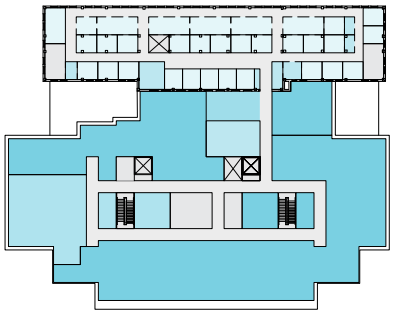
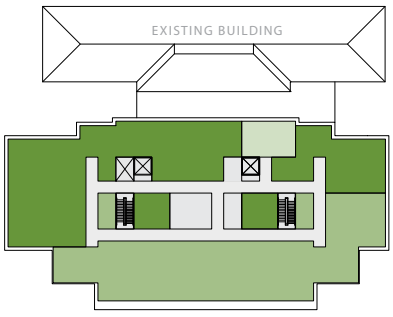
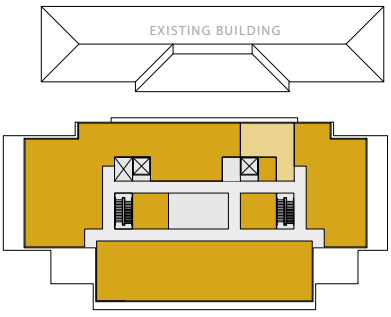


FOURTH FLOOR



FIFTH FLOOR



Floor plans are abstractions and may vary from the final building layout.

in Lilly Hall by Animal Sciences, which moved to the new Creighton Hall. The other half of the ABE faculty and staff remain in their current spots in nine buildings in spaces borrowed from other programs. We all look forward to December 2020, when we will begin coming home to renovated offices and spaces in the three-story portion of the building and classrooms, student laboratories, Maker Spaces, and research laboratories in the 125,000-square-foot new addition.

Your continued support, along with that of our industry partners, will be critical as we operationalize the new ABE building. New laboratories will require new equipment — in many cases, equipment that we only dreamed about, given the quality and capabilities of our old space. Enhanced opportunities for students require additional resources. And, as our facilities needs are met, we look forward to endowed faculty chairs to support areas of strategic importance to our program. More on that priority later.

In closing, I recently had opportunities to visit the now-gutted 3-story portion of the building. You may have seen the "Bernie the Builder" (*purdue.ag/bernie-the-builder*) video that was done during one of these visits. Having spent countless hours in the building over the past 30-plus years on an almost daily basis, this was an interesting and almost eerie experience. There is nothing left. The walls are gone. The stairwells and stairs are gone. Only the building shell, columns and parts of floors remain. Unrecognizable is an accurate description of the

A return to No. 1!

The Purdue ABE graduate program has returned to the top spot on the 2019 US News & World Report rankings. The program was second the year before. Prior to that, the program had ridden an 8-year streak as the No. 1 program.

inside of the building. It was difficult to imagine that nearly 80 and 90 years of rich, proud, Purdue ABE history had occurred in the respective portions of the building when standing there. On the way back to my temporary office in Lilly, I could imagine the new offices and spaces that will occupy the current shell of a building and the new addition – and the Giant Leaps that will be possible as a result.

We look forward to your continued support of our program as Purdue ABE takes a Giant Leap!

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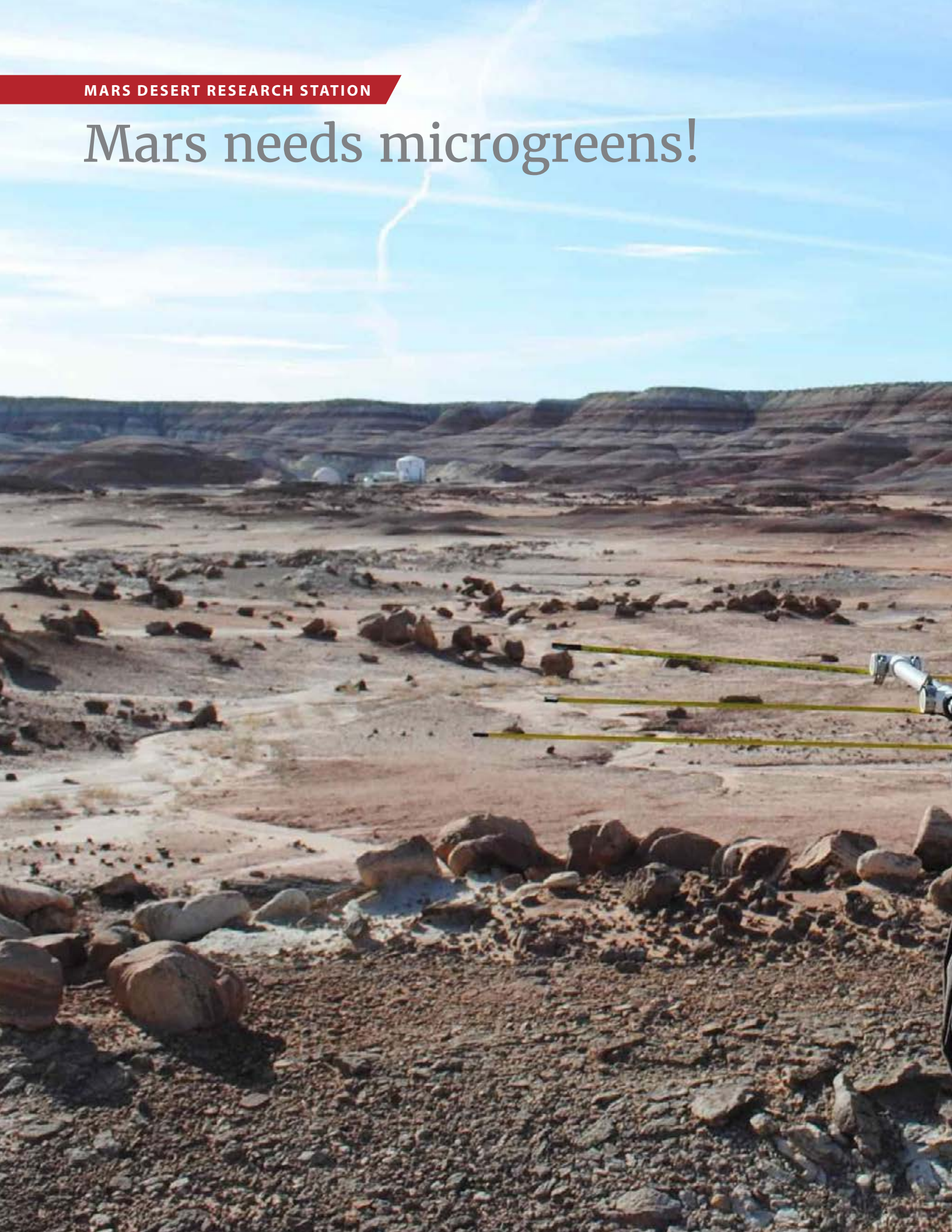
FOR MORE INFORMATION VISIT
purdue.ag/new-abe-building

MARS DESERT RESEARCH STATION

Mars needs microgreens!



What can be grown in space? 2 ABE standouts are working on that. First stop, Utah.

Since 2001, more than 1,000 people have chosen — and have been chosen — to spend two weeks about seven miles northwest of Hanksville in southern Utah. To conduct research that could prove useful if humans ever set out for the Red Planet, they head for the Mars Desert Research Station.

Last December an all-Purdue crew that included ABE's Mark Gee spent two weeks at the MDRS. This December, ABE's Jake Qiu will be in crew 202, hoping to advance what Gee worked on. Here are their after-and-before stories.

Mark Gee

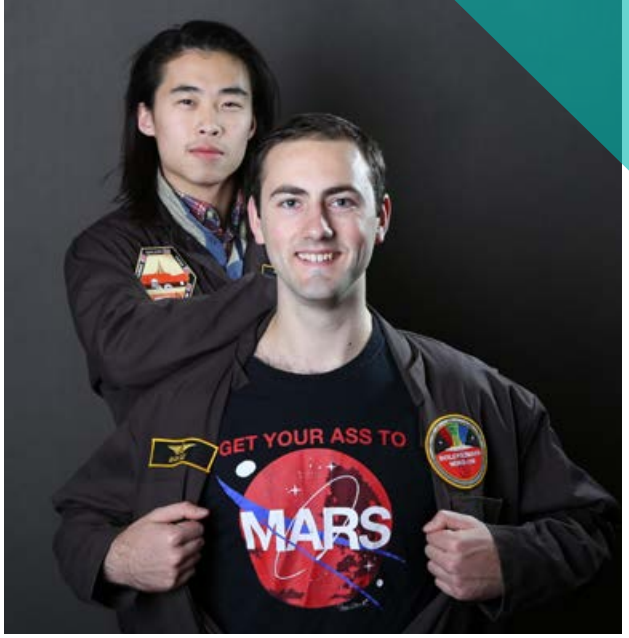
Hometown: Johnston, Iowa

Majors: Biological Engineering, Biochemistry, Agronomy

At the MDRS: From Dec. 31, 2017, to Jan. 13, 2018

Soon, later: Will graduate in May 2019. Will attend graduate school to study plant biology and sustainable agriculture.

Nice shirt! Buzz Aldrin, the second man to walk on the moon, gave Gee a T-shirt during an October 2015 visit to campus. The inscription: "Get Your Ass to Mars."



Mark Gee probably wasn't the only crew 186 member to put on a few pounds during a two-week stay at the Mars Desert Research Station.

'We got too good at using the bread machine," he admits, "and the food was mostly freeze-dried forms of fat, sugar, and salt." Brownie-maple syrup crepes and blueberry pancakes were favorites.

But Gee, a late addition to the all-Purdue crew dominated by students in the School of Aeronautics and Astronautics, was there to manage the greenhouse, aka GreenHab. And he proved his worth. From his summary report:

"The GreenHab has succeeded in its mission to provide food, house experiments, and bring stress relief to the crew. The harvest on the last sol of our rotation yielded a sampling of fresh microgreens, lettuce, green beans, dill, and cilantro, the first time this has been done this season. The previously planted tomatoes, cucumbers, green beans, and peppers are growing well along with the carrots, onions, arugula, radish, lettuce, and Swiss chard that were planted this rotation. Future crews should have a bountiful and tasty harvest."

His research project was growing microgreens with minimal inputs. "We learned that the microgreens are resilient to the evolving microbial conditions in the habitat, but we are still looking into whether they might be home for pathogens," Gee says.

One conclusion will never change: "After weeks of freeze-dried food, the fresh greens were very tasty."

Monthly dinners at homes before the trip brought the crew together, and the cohesion lasted through the mission, he says. Each morning began with a group yoga session that became a "crucial step given the cramped habitat and constant interaction." At the end of the day, dinner, cards, karaoke or movies filled the time. "We would usually turn in early," Gee says.

The heat, humidity, and scenery in the GreenHab made it a popular spot to hang out. That suited Gee. "I didn't like the red desert," he says. "Rocks just don't interest me that much. If I was to go to Mars, it would have to be to establish a living habitat."

In an 80-second career speech for ABE 490, Gee said if humans get to Mars, "The challenge is in keeping people alive. We've all seen 'The Martian,' and we know from Mark Watney's experiences just how many things can go wrong. (Matt Damon played astronaut Mark Watney in the 2015 movie.) We need to create closed-loop life support systems that are self-sustaining, and plants will be a critical role in these systems because of their ability to create oxygen, water and food while removing waste products.

"There are no plants today that can do everything we need, and a lot of work is left to be done to study plants on a molecular level and engineer them to be more useful."

Space travel has a lot of competition for the nation's attention. Gee recognizes that but believes that "the U.S. should go to Mars because it has a desire to explore, a desire to understand the unknown, and a desire to do something great."

Step aside, Matt Damon. "The next time you hear about a Mark on Mars," he told the ABE 490 class, "his last name will be Gee." The one with the cool T-shirt blessed by Buzz Aldrin.

Jake Qiu

Hometown: Fishers, Indiana; Carmel High School, 2014. Is 23.

Major: 5th-year senior; Biological Engineering major. Will pursue a Ph.D.

Involved with: Purdue chapter of Liberty in North Korea. Was acting vice president. Team helped fund and relocate a North Korean refugee who was displaced in China; she's now in South Korea. *linkglobal.org*

Someday wants to: Climb the Dawn Wall on El Capitan in Yosemite Valley. An avid rock climber, he's probably on the co-rec center wall right now. Or will be soon.

Helping hands: Current research with ABE Assistant Professor Mohit Verma; also, Dr. Yoon Yeo, associate department head, Industrial and Physical Pharmacy; and Dr. Yihua Pei, Dr. Yeo's post-doctoral research assistant.

He has a: Twin, "fraternal, though, so nothing like Scott Kelly and Mark Kelly," well-known NASA astronauts.

Jake Qiu happened to be listening to National Public Radio when the Mars Desert Research Station was being discussed. Its existence was news to him, and, he admits, "I didn't think much about it." Then he happened to hear about the Purdue Mars Activities and Research Society.

"I joined without realizing that they offered opportunities like MDRS," he says. "To be completely honest, I didn't think much about becoming an 'astronaut.' I was more excited about the research I proposed that related to space."

His application was submitted last November. On Dec. 28, he ships out as part of crew 202.

His first research proposal was rejected. Qiu, highly interested in inflammatory bowel diseases and gut-related issues, wanted to study whether crew members' fecal matter experienced diversity changes. The Mars Society, which owns and operates the station, concluded that privacy concerns should prevail.

Instead, Qiu says, "My assignment will actually further something that Mark Gee, Samuel Albert and Professor Marshall Porterfield (ABE) worked on from last year's MDRS mission. Nutrients are going to be limited resources in space. We will likely need to grow some of the essential nutrients that can be offered by plants like microgreens. Ideally, in space and Mars, it should be as sterile as possible. We do not want to introduce potential diseases to our crops.

"There is a continual source of contamination — us. We want to focus on how microbes from humans can affect the soil of the microgreens. Plants have their own microbiomes. We want to see how the community structure of microorganisms from us can affect the microbiome of the microgreens and determine if there are any potential pathogens or phenotypic changes, like leaf size."

Qiu has read logs from previous missions. "What's interesting is how casual some of these logs can be," he says. But not always. "I read about how the GreenHab had become way too hot. They immediately went to the GreenHab, without their spacesuits, to troubleshoot this emergency. You never know what to expect."

An MDRS crisis, large or small, of course pales in comparison, says Qiu, who wants to focus on the science of space biology. "Space is a very harsh reality, and we need to accommodate for this. Interestingly, there has been research showing that in the environment of space [microgravity, radiation, etc.], some microbes show evidence of increased pathogenicity. What about our own microbes? Within us, microbes make up the same number of cells that we have as humans. The question becomes, how can we best support our better half so that they can remain healthy and support their hosts.

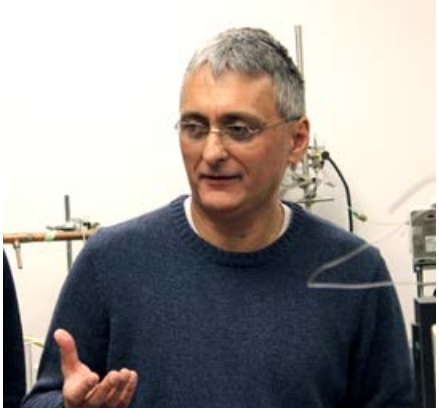
"I hope to advance these types of research questions. I want to work on understanding the causative roles of cellular communities and the relationship to our health, whether that be here on Earth or not."

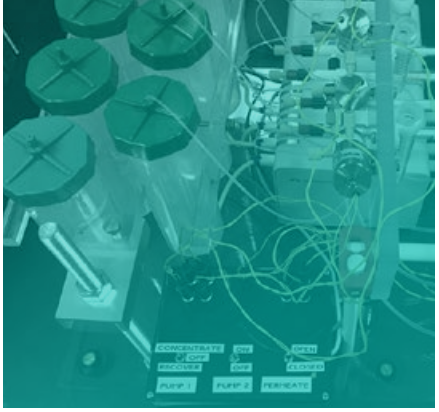
When Qiu ponders "the strain we are currently putting" on the planet, he can imagine conditions that "will eventually become unbearable for the organisms that inhabit it, either by the sky, land or ocean."

His favorite space-related movie is "WALL-E," which is (spoiler alert) about a robot who is a waste collector, cleaning up a desolated Earth. Humans have escaped. "It's a grim potential reality," Qiu says. "We discover that all of the humans are incredibly unhealthy. This is something that we should think about. We want to maintain the integrity of our health while traveling in space or inhabiting a planet.

"There are biological consequences to space travel, and 'WALL-E' reminds us of this."

► *Chuck Wineland, Agricultural Communication*





A faster path to food safety

LORRE researchers cut sample analysis time to six hours, not two days

Four years after a major breakthrough, researchers at Purdue's Laboratory of Renewable Resources Engineering (LORRE) have done it again.

In 2014, Michael Ladisch, an ABE Distinguished Professor, and Eduardo Ximenes, a senior research scientist at the lab, and their research team came up with automated filtration technology to detect salmonella. Manufacturers in the United States spend nearly $3 billion each year on food safety tests, so the Purdue accomplishment was significant enough to win the grand prize in the Food and Drug Administration's Food Safety Challenge.

In November came this update: The technology has been enhanced to allow multiple samples to be tested at the same time and to test for other foodborne illnesses, such as E. coli O157:H7.

Being able to test samples quickly to reduce detection time and prevent more people from becoming ill has been difficult. Purdue's technology involves flow-through filters that are the diameter of a hair to collect microbes for their analysis in food samples, Ladisch says. The innovation also uses enzyme formulations and software to analyze food microorganisms within six hours, instead of the current one or two days it typically takes.

"Our technology seeks to contribute to improving health by preventing more people from being sickened by foodborne illnesses," Ladisch says.

The Centers for Disease Control and Prevention estimates that foodborne pathogens sicken about 48 million people and kill about 3,000 each year in the United States. The news from the LORRE advances came as the nation was dealing with an ongoing deadly salmonella outbreak.

Ladisch's solutions for foodborne detection technology are a focus of Purdue University's Discovery Park District. They also align with campus-generated health innovations central to Giant Leaps, a yearlong commemoration of Purdue's 150th anniversary. Health is one of four themes of the celebration's Ideas Festival, highlighting Purdue's work as an intellectual center solving real-world issues.

The Big Idea Research Challenge research team includes Jessica Zuponcic (ABE Ph.D. student), Honggu Choi (Physics Ph.D. student), Kirk Foster (BME), Alex Lagutchev (Discovery Park), and Professors Yong Chen (Discovery Park), David Nolte (Physics), and Ladisch.

"Working together, the other great advancement we have made since 2014 is the ability to test up to four samples at once, and we are continuing to increase that number," Ximenes says, speaking on behalf of the team. "A foodborne illness outbreak results in hundreds of samples being sent to the FDA each day, so making the process faster is critically important."

The researchers are working with the Purdue Office of Technology Commercialization on patents for their innovation. They continue to look for partners to test and commercialize their technology.

MORE INFORMATION

prf.org/otc | *otcip@prf.org*

Research Assistant Ziling Chen uses the handheld sensor in a greenhouse behind Lilly Hall of Life Sciences.

High-end plant sensors for many, not just a few

Technological advances are transforming agriculture. The pace can seem dizzying. However, though the positives are vital for an increasingly hungry planet, the blessings are unevenly dispersed, says ABE Assistant Professor Jian Jin.

"We have 600 million farmers worldwide, and very few of them are benefiting from high-end plant sensor technologies," Jin says. "Now, with this handheld device, most farmers can benefit."

He's referring to a sensor that he and a multidisciplinary Purdue team have created. It gives plant scientists and farmers a more precise way of measuring the health of crops while gathering up-to-the-minute data that state and federal officials and others will find valuable.

Jin hopes the hyperspectral-imaging device will be used widely by plant scientists and farmers, nationally and internationally. The device determines if a plant is healthy or under stress by scanning it for physiological features, such as moisture, nutrient and chlorophyll levels, as well as different chemical spraying effects and disease symptoms.

Jin says the device will help farmers detect changes in plant health in the field hours to days before they are visible to the naked eye. Farmers then can make necessary changes to grow more food using fewer resources — less fertilizer and water, for example.

"My vision is this sensor will allow farmers walking through a field to use a handheld device and a smartphone to get the same information available from very expensive phenotyping systems constructed by big companies and big universities in recent years," Jin says.

Jin is looking for collaborators who could lead in commercializing the device, especially in marketing and mass manufacturing. He believes making the devices low-cost might be the best approach, with data being where the value is.

The sensor can scan a plant in less than five seconds and detect hundreds of bands of color in each pixel, compared with the three bands of color detected by traditional cameras. One version shoots a burst of fluorescent light off the plant. Both are used to measure stress and nutrition levels of the plant.

"We implemented both the hardware and software technologies into a handheld device that is light and easy to carry," Jin says.

The sensor integrated the advanced image processing algorithm and plant features prediction models developed by Purdue scientists. These models were developed with Purdue's database that contains years of plant research assays in both greenhouse and field. The models are constantly improved and updated, "so we always have the most accurate predictions for the farmer," Jin says.

There has been a rapid development of plant phenotyping in the past decade. Technology is increasingly being used to improve efficiency based on current conditions instead of farmers relying on regional conditions and historical data to make decisions. Most farms manually check plant health, a method that lacks precision and efficiency.

Jin says his sensor is more precise than current devices that clamp down on a leaf and measure the health of only a portion of the plant.

"Due to multiple technical reasons, the sensor's prediction quality is much more accurate than any other types of crop imaging sensors that people have in the existing market," Jin says. "It's also constantly getting better because we scan plants every day and are upgrading both hardware and software technologies."

Although the sensor is self-contained, the users have the option to upload the measurements with geo-locations to a web-based cloud map service developed by Carol Song and her team at Purdue's Advanced Computing Group. The system generates plant stress and nutrition heat maps based on the sensor measurements, and provides interactive ag data querying functions at both farm and regional levels. This digital ag map system with sensor data can support many potential applications. For example, the data collected will provide valuable information to state and federal officials about steps they can take to help farmers during severe crop stress periods as well as information about what types of crop yields can be expected.

"If we can successfully distribute the sensors around the region, we can generate this digital ag map service to monitor the plant growth all over the region — which areas are under stress and which areas are having a good performance," Jin says.

Jin's group at ABE is working on automation of this device. He and his graduate students worked last winter with a senior design group from Purdue's School of Mechanical Engineering and successfully implemented a robot to scan the leaves with the sensor automatically in the greenhouse. The robot utilized machine vision to recognize the target leaves and carry the sensor to the leaves for a quick scan operation along the leaf's natural slope. Encouraged by the success in the greenhouse, Jin and his team is moving on for the design of the next robot in the farm field environment.

The robot system may look like a spider transformer: It travels between crop rows, with each leg equipped with a sensor, waving and scanning leaves in the field with a very high speed. Jin expects the prototype to be functioning during the 2019 growing season.

"We hope to get a lot more data so we can have more valuable data services," he said. "We have great teamwork at Purdue to make it happen."

WHO'S HELPED

The technology in Professor Jin's handheld sensor aligns with themes and ideas of artificial intelligence discussed in Giant Leaps, Purdue University's yearlong celebration of its 150th anniversary.

Besides the engineers from ABE, the sensor's development has been supported by breeders and biologists at Purdue, including professors Mitch Tuinstra, scientific director of the Purdue's Institute for Plant Sciences, and Tony Vyn, the Henry A. Wallace Chair in Crop Sciences. Carol Song and her team of data scientists from Advanced Computing Group provided the GIS map functions. Gerald Shively from Agricultural Economics has promoted the application of the device as a social scientist. The Purdue Office of Technology Commercialization has filed three applications for provisional patents for the technology.

A video about the sensor is available at *youtu.be/xXDcZCDaIek*.

Winning $10,000 Ford Challenge means more PUPs for Kenya

The Jenga Vijana ("Build the Youth" in Kiswahili) parade last summer began in the heart of Eldoret, Kenya. Purdue University engineering students joined people walking and dancing their way to Tumaini Innovation Center. As the 2016 version of a Purdue Utility Project (PUP) vehicle passed by, filled with Tumaini students she had come to call friends, Margaret Hegwood saw the impact of the three-wheeled vehicle in a new light.

"I realized that this vehicle is more than a design project," the ABE graduate student said. "It's also an innovation that will be become an integral part of the story in Eldoret. And it has the potential to change the lives of farmers and students alike."

PUP teams have been improving farmers' lives for a decade. The multipurpose utility platform can transport large loads over rough terrain, power multiple attachments (water pumps, food processing equipment, generators, etc.), and perform tillage, planting, and weeding operations. Built locally for about $1,500, the vehicles' engines are simple to repair, and local technicians are trained on production and maintenance.

The Eldoret, Kenya-based Tumaini Innovation Center partnership was a result of winning a 2017 Ford College Community Challenge grant, combined with support from Purdue and the John Deere Foundation. The original $25,000 grant was used to equip a makerspace at the Tumaini Innovation Center. The PUP team helped complete three vehicles last summer, and now, after winning a $10,000 bonus

grant, a fourth is planned for 2019, along with additional engineering education and technical training opportunities. Economic opportunities include leasing the mini-PUP within the Eldoret community.

"I think winning the $10K challenge is really a testament to the strength of our partnerships with the Tumaini Innovation Center," said Hegwood, who interviewed farmers and, as the teaching assistant to faculty project advisor Dr. John Lumkes, supervised the PUP team students and helped with procurement, engineering education, and budgeting.

"We had friends and community members, from the U.S. and Kenya alike, voting to support our project because they believe in its power to create positive change. I am so grateful to everyone who voted and to the Ford Motor Company Fund for providing us with the opportunity to continue our work."

► *Chuck Wineland, Agricultural Communication. Photos: John Lumkes, ABE.*

Above: PUP team with Eldoret locals at the Tumaini Innovation Center, Kenya.

PUP team members
Dr. John Lumkes, team leader; David Wilson; Margaret Hegwood; Levi Bays, Anna Berghoff, Daniel Gentilini, Adam Hemmelgarn, David Hoglund, Skylar Kim, Peter Starr, Ryan Toth

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- *purdue.ag/pup-photos*

Building our future (home)!

Sure, the back half of the ABE building jutted out pretty far from the main building. But now that it's gone, when you walk past the construction site, one thing comes to mind: Wow, what a big hole! The old building took up that much space? Yep.

As for the main building, "There is nothing left," Department Head Bernard Engel says in his column that opens this newsletter. "Only the building shell, columns, and parts of floors remain." An "almost eerie experience" to be inside. But concrete is being poured. A crane graces the skyline. Soon that hole will be just a memory.

Looking forward

DECEMBER 2020
Move to renovated and new building begins

MARCH/APRIL 2021
Building dedication and ABE Centennial Celebration

Converting bad fat to good fat

Startup gets funding support from National Institutes of Health

Imagine being able to turn bad fat into good fat inside your own body without exercising, but rather with a simple injection.

That's the goal of technology from ABE Assistant Professor Meng Deng, founder of Adipo Therapeutics LLC, a Purdue-based startup that recently received a federal grant for its work to help people struggling with obesity and diabetes.

More than one-third of Americans are obese, and nearly 10 percent have diabetes, according to the Centers for Disease Control and Prevention.

Obesity is also a contributing factor to developing Type 2 diabetes, so removing excess fat through nanoparticle injections would likely decrease the odds of developing that disease.

A Small Business Innovative Research grant of $198,323 from the National Institutes of Health will allow Adipo to further develop and optimize its technology platform. The NIH/SBIR program funds early-stage small businesses that are seeking to commercialize innovative biomedical technologies.

Deng's work corresponds with ideas of innovative health advancement that are part of Giant Leaps, the yearlong celebration of Purdue's sesquicentennial.

"Obesity is driven by a systemic energy surplus in bad fat," says Deng, who is also an assistant professor in the Weldon School of Biomedical Engineering and the School of Materials Engineering. "Built upon our interdisciplinary collaboration with Shihuan Kuang, professor of Animal Sciences, this funding is very helpful and will allow us to further develop our engineered polymeric nanoparticulate system to safely and effectively convert energy-storing bad fat to energy-burning good fat through regulation of Notch signaling pathway."

Adipo Therapeutics integrates two platform technologies to develop polymer-based nanotherapeutics that act directly on fat tissue and maintain weight loss.

"Our technology holds great promise to offer unique value with targeted sustainable weight loss, improved glucose control, and minimized off-target side effects," Deng says. "The support from Purdue Foundry and the entrepreneurial ecosystem has been so incredible to help us get this far."

Adipo is seeking funding to support further development and clinical translation. The company also seeks partnerships with firms and pharmaceutical companies interested in the technology.

Adipo Therapeutics is developing a disruptive technology platform composed of polymer-based nanoparticulate drug delivery systems to induce adipocyte browning as a safe and effective therapeutic solution to treat obesity. This innovation combines the recent discovery of the role played by Notch signaling in adipocyte plasticity with advances in polymer-based drug delivery. This technology offers several unique value propositions, including sustainable weight loss, improved glucose homeostasis and systemic metabolism, and minimized off-target side effects.

youtu.be/9RK7nNbGwnU

Purdue Foundry is an entrepreneurship and commercialization accelerator managed by the Purdue Research Foundation.

purduefoundry.com
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Purdue Office of Technology Commercialization operates one of the most comprehensive technology transfer programs among leading research universities in the U.S.

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AI, ML and the Digital Agriculture Discovery Group

Agriculture is witnessing a rapid fusion of physical and biological worlds through adoption of Artificial Intelligence (AI) and Machine Learning (ML) technologies. Efforts to harness the potential of these technologies are also underway in the Digital Agriculture Discovery (DAD) group, led by Dr. Dharmendra Saraswat, an associate professor in the Agricultural and Biological Engineering department.

One such effort involves equipping an unmanned aerial system (UAS, also known as a drone) with sensors to capture images within the visible, near-infrared, and thermal spectrums and then use AI and ML to identify the optimal time for locating weeds with high accuracy in corn and soybean production systems. The end goal is to provide an integrated package of UAS with a suite of sensors as options for weed management strategy, and encourage selective application of herbicides instead of blanket application over the entire field.

To achieve this goal, a training set of images with extensive variation in crop and weed growth was created and regions of weed presence were fed into a deep neural network (an ML method) for processing. This training set helps in detecting weeds on previously unseen images and videos. The ability of this network to "find" a weed in this manner is an example of an AI system. Such technological solutions could be a major disruptor in agriculture by enhancing farmers' ability to understand and learn from intelligently processed data for managing dynamic situations faced in farm fields.

Saraswat is looking forward to using the maker space in the new ABE building. It will, he says, allow opportunities to invite undergraduate and graduate students to study the developed solutions and enhance them through their active involvement.

► *Associate Professor Dharmendra Saraswat*

Natalie Carroll: Moving Purdue in a positive direction

Natalie Carroll, professor in the departments of Agricultural and Biological Engineering and Agricultural Science Education and Communication, is chair of the University Senate for 2018-19. Here, she discusses her goals for the year.

How long, and in what positions, have you worked at Purdue?

I have been a faculty member at Purdue since 1995.

Why did you decide to become involved in University Senate?

Initially I was elected by my department, I think as a way to help me meet faculty members from across campus and to become more familiar with Purdue in general. I found that being involved in various committees did, indeed, allow me to meet many people from across campus and that the work was both interesting and rewarding.

What did you learn as vice chair or as a committee member that will assist you as chair this year?

I've become pretty familiar with how the University Senate works and what needs to be done because of the many years (11) that I've served on the University Senate and my work on various Senate committees (both standing committees and faculty committees that report to various standing committees).

What will the Senate be working on during the upcoming academic year?

The Senate will continue to work on a number of items that have carried over from last year, including those listed by each standing committee responsible:

- **Educational Policy Committee** — Math core and winter session pilot.
- **Equity and Diversity Committee** — Curriculum, faculty/staff recruitment and retention, freedom of expression, non-welcoming spaces at Purdue.
- **Faculty Affairs Committee** — Allowable travel expenses, benefits issues, continuing term lecturer cap, external threats on Purdue faculty related to social media, promotion appeal process, teaching evaluation resolution follow-up.
- **Student Affairs Committee** — Graduate student bill of rights and responsibilities, in-state tuition for members of Native American tribes from Indiana, jury duty absence policy, parental leaves for students, policy on extended leaves for students.
- **University Resources Policy Committee** — Sustainability strategic plan, space survey.
- **Special Committee** — Teaching evaluations.

Faculty members with suggestions and concerns that they would like the University Senate to consider should send them to Professor Gerald Shively, Steering Committee chair. The Steering Committee will then decide what committee should look into the issue/concern.

What are your own goals as the chair of the Senate? What do you hope to have contributed as chair to the Senate and to the University once your term ends?

As chair of the Senate I will facilitate the issues and concerns of the faculty and, when appropriate, share these with upper administration and the Board of Trustees, as required in our bylaws. I will remain impartial and strive to assure that each member is able to have their voice heard so the views of all departments are considered in any actions we take. I hope that the University Senate truly reflects the views and wishes of the entire faculty.

What would you like faculty and staff to know about the Senate?

I would like faculty and staff to know:

A KEY ISSUE

The major issue that the University Senate faced this fall arose in September, when the university announced changes to health insurance coverage for spouses of employees. Responding to concerns across campus, Senate leadership joined with others to request an open forum with the university's treasurer. On Oct. 11, Purdue postponed a decision on the matter, but the one-hour "town hall" went on as scheduled the next day. More than 300 people attended in the PMU North Ballroom, and others watched online. The issue remains under discussion.

- They can submit a concern or suggestion for consideration by sending them to the Steering Committee chair.
- It is important to get involved to help move Purdue in a positive direction for students, faculty and staff.

How can faculty/staff get involved?

The University Senate has mostly faculty representatives, but we also have members who are selected by the Administrative and Professional Staff Advisory Committee, Clerical and Service Staff Advisory Committee, Purdue Student Government and Purdue Graduate Student Government who serve on the Senate and some of our standing committees. Senate faculty members are elected by and represent their departments and, in some instances, colleges. All faculty (tenured, pre-tenure, and clinical) are asked each January to volunteer for various faculty committees. We need numerous volunteers for the committees, but we like to have many more than we need so we can create committees with members from different colleges (and schools) and as much diversity as possible.

I would ask the faculty to note, however, that even though they volunteer in January, the committees take some time to populate and those who are chosen will not be informed until late in spring semester for terms beginning June 1. I hope that every faculty member would self-nominate for one or two committees next January, unless they are already serving on a University Senate committee.

More information available at purdue.edu/senate.

Remembering Dr. Ivantysynova

By Professor Andrea Vacca; Ph.D. students Meike Ernst, Ryan Jenkins, Paul Kalbfleisch

After 14 years of innovation and success, the Maha Fluid Power Research Center must, for the first time, announce a tragedy: Dr. Monika Ivantysynova, our beloved lab director, passed away during the early morning hours of August 11th, 2018, after four months of bravely fighting cancer.

She was a fearless team leader, a caring yet exacting advisor, and a star in the international fluid power community. Her professional achievements are unparalleled: Two honorary doctorate degrees, the Robert E. Koski medal from the American Society of American Engineers, the Joseph Bramah medal from the United Kingdom's Institution of Mechanical Engineers, and Purdue's 2016 Morrill Award. Furthermore, she was a prolific author, with several best paper awards and numerous other academic recognitions, including being recognized as both an SAE fellow and an ASME fellow.

However, for us — Maha lab team members, past and present — she was much more. She taught us a research method, and she inspired us to do high-level research based on the values of hard work, courage and integrity. She could be a tough leader when necessary — but she was genuine. Her office door was always open for anyone in need of guidance. She was always there for us, even when meeting with one of us meant changing her personal schedule.

She taught us how to work together in an effective manner, how to appreciate diversity, and how to face even the most difficult research challenges. She cared deeply about every single lab member, knowing and appreciating the important and sometimes delicate balance between personal life and work. She endeavored to help us in every situation we encountered, celebrated our achievements, and included us in celebrating any achievement of hers.

She touched the lives of so many people — students, colleagues, members of industry and academia alike — and it is hard to imagine a world without her overflowing enthusiasm and untamable energy driving everyone forward. But now we must. We are very grateful for all the opportunities that Dr. Ivantysynova gave us, and we will continue focusing on our research efforts, knowing that she is keeping an eye on us from a much more peaceful place.

We at the lab will all miss Dr. Ivantysynova, and hope that we can do her incredible legacy justice in the years to come.

In her honor, a section of the Maha website will be set up for everyone to share their best thoughts and memories.

Maha Fluid Power Research Center, 1500 Kepner Drive, Lafayette, Indiana, is the largest academic hydraulics lab in the United States.

VISIT
engineering.purdue.edu/Maha

Two ways to honor Monika Ivantysynova

For the ABE and Mechanical Engineering departments, beginning an academic year without Monika Ivantysynova has been unthinkable since 2004, when she came to Purdue. She succumbed to her cancer fight in August 2018. Her absence is felt keenly throughout the campus.

In recognition of her profound impact on the lives of countless students, colleagues, and industry partners and professionals, Agricultural and Biological Engineering at Purdue University is establishing two initiatives to memorialize Dr. Ivantysynova. Monika was the founding director of the Maha Fluid Power Research Center and Maha Professor of Fluid Power Systems at Purdue University. She developed this center into a world-renowned operation, the largest academic fluid power research facility in the United States.

Dr. Ivantysynova's legacy and impact lives on through her research and numerous students who she advised on her research teams. The first initiative is the establishment of the Dr. Monika Ivantysynova Graduate Support Fund. This $50,000 endowment fund provides resources to support graduate students involved at Maha with their professional development opportunities. Monika's passion was evident in supporting and championing the graduate students under her tutelage, and this fund allows that legacy to endeavor for perpetuity.

The second initiative is to dedicate a named office in the Maha Fluid Power Research Center. This $25,000 effort will memorialize a faculty office in Dr. Monika Ivantysynova's name. As the 2016 Purdue Morrill Award acknowledged, Monika's excellence spanned both teaching and research. Therefore, dedicating a space in her memory in the center she helped found and loved is a fitting way to recognize her past and future impact on students, faculty, and research.

Gifts in support of either initiative can be made payable to Purdue Research Foundation with a memo indicating the Dr. Monika Ivantysynova Graduate Fund, or ABE Renovation and Addition in memory of Dr. Ivantysynova. Pledges can be made and payable up to five years for these initiatives and are tax deductible-eligible. If you would like more detailed information or have questions regarding making a gift in support of these two funds, please contact Joel Hartman, Senior Director of Development (*JBHartman@prf.org* / (765) 494-4785). If contributions do not meet the endowment thresholds within five years, funds will be utilized for the designated purpose but not be available in perpetuity.

► *Bernard Engel, Department Head*

2018 Outstanding Alumni

DARLA K. AKER, BS '98, MS '02

Darla left high school early and was a freshman at Purdue in January 1995. In May 1998, she graduated and begin working for Columbus, Indiana-based Cummins Inc. as a product engineer. She earned an MSE from Purdue in 2002 and an MBA from Indiana University's Kelley School of Business in 2014. She's the Executive Director of Quality and Service for Cummins' Components segment. Darla and her husband, Kevin, a fellow Cummins leader and Purdue alum, live in Columbus.

JEFF CANNADAY, BS '00

After serving in the Marines from 1990 to 1996, Jeff graduated in 2000. He immediately went to work for the Natural Resources Conservation Service in New Castle, Indiana. He was a Conservation Delivery Team engineer in Greencastle from 2003 to 2008. He returned to Lafayette in 2008 as the Northwest Area Engineer, covering 22 counties. He designs projects such as animal waste storage facilities, wetlands, and grassed waterways. He has been a very familiar face at Capstone project presentations.

JOHN A. "JACK" LASHENIK, BS '98

John "Jack" Lashenik is an executive vice president and partner of American Structurepoint, an engineering firm. The Gary, Indiana, native is responsible for overall growth for the company, which has 11 business units. He earned his professional engineering license in Indiana in 2004; he is also licensed in Arizona, Florida, North Carolina, and Washington. Jack resides in Indianapolis. Since 2015, he's been on the Purdue Engineering Alumni Association Board of Directors.

YULIN LU, MS '08, PHD '08

Yulin Lu grew up in Zhenjiang, China, a few hours west of Shanghai. He started graduate school at Purdue in 2003 and completed his M.S. in 2006 and Ph.D. in 2008. Since 2015, he's worked in the food tech sector in the San Francisco area. At Hampton Creek Inc. he developed technology using legumes to develop protein isolate as the main functional ingredient for plant-based scrambled eggs. Currently, he is managing Engineering and Process Development at Impossible Foods Inc., which aims to use a biotechnology platform to replace animal farming.

Brad Marks, Jack Lashenik, Yulin Lu, Darla Aker, Jeff Cannaday, S.T. Yang

BRADLEY MARKS, MS '92, PHD '93

Dr. Bradley P. Marks, P.E., professor and associate chair of biosystems and agricultural engineering at Michigan State University, earned his M.S. and Ph.D. in agricultural engineering from Purdue in 1992 and 1993. After six years at the University of Arkansas, he returned to his undergraduate alma mater in 1999. He leads a 28-member interdisciplinary research team in the area of microbial food safety. His current research focuses on improving methods for validating pathogen reduction processes for low-moisture foods.

SHANG-TIAN YANG, MS '80, PHD '84

ST earned a bachelor's degree in agricultural chemistry from National Taiwan University. ST came to Purdue in 1978. After earning a master's and a Ph.D., he joined The Ohio State University Chemical Engineering Department as an Assistant Professor in 1985. He developed the biochemical engineering program and was promoted to full professor in 1997. He is a professor in Chemical & Biomolecular Engineering, Biomedical Engineering, Food Science & Technology, Molecular Genetics, Biochemistry and Molecular, Cellular & Developmental Biology programs.

2018 Outstanding Students

CAITLIN NELLIGAN

A May graduate in Agricultural Engineering; focused on Environmental and Natural Resource Engineering. Treasurer of the Agricultural and Biological Engineering Ambassadors. Involved in research with Dr. Sara McMillan and her lab group for three years. During a 2017 internship with Red Gold Inc. she discovered her enthusiasm for lean manufacturing and efficiency in industry. Now working for Armstrong Flooring in its Engineering Leadership Development Program.

KATIE CARNAHAN

A May graduate in Agricultural Systems Management. Career in precision agriculture sales support. Was Helena Chemical Co.'s intern of the year. Member of the ABE Ambassadors, Alpha Mu Honor Society, and President of the Agricultural Systems Management Club. Graduated in three years; on Dean's List every semester. Studied abroad in Costa Rica, examining sustainability in agriculture.

ALEXA PETRUCCIANI

A 2018 graduate in Biological Engineering (Cellular and Biomolecular track) with a degree in Mathematics and a minor in Dance. Involved with Purdue Contemporary Dance Company, Dance 2xs, and iGEM. Conducted synthetic biology with the iGEM team and computational biology research in the lab of Dr. David Umulis. Next: Medical Scientist Training Program at Indiana University School of Medicine.

ZANE GOTTSCHALK

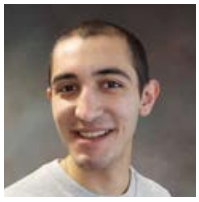
A senior from Rossville, Indiana, pursuing a degree in Agricultural Engineering with a concentration in Machine Systems. Involved with Alpha Gamma Rho fraternity, Alpha Zeta Honor Society, American Society of Agricultural and Biological Engineers and Purdue Society of Professional Engineers. Currently working for Caterpillar's Lafayette Engineering Division through a parallel co-op program.

DEREK NEUHOFF

A senior pursuing a degree in Agricultural Systems Management with a minor in Food and Agribusiness Management. Grew up on a grain and livestock farm in southern Indiana and plans to have a career in the agricultural industry while growing and sustaining the family farm. A member of the Alpha Mu Honor Society and vice president of the ASM Club.

MARGARET HEGWOOD

In ABE's 5-year B.S./M.S. degree program for Biological Engineering. Active with Purdue's Global Engineering Programs and Partnerships as a graduate assistant. A Global Engineering Learning Community instructor, aids in the development of First-Year Engineering global competency course development, and provides program support for the Innovation for International Development (I2D) Lab. In 2016 was one of 11 Emerging Leader Interns to work for the Land O'Lakes, Inc. Global Food Challenge Program. Was a Next Generation Delegate for the Chicago Council's Annual Global Food Security Symposium and a panelist for the Global Youth Institute of the World Food Prize.



ILYAS YILGOR

A junior studying Agricultural Engineering Machine Systems and minoring in Physics and Mathematics. From the Mediterranean coast of Turkey, where his family has olive and lemon orchards. Recently joined Professor Sadegh Dabiri's research team, working on heat transfer in bubbly flow. Will pursue a doctoral degree.

JEROD PUTT

Raised in the small town of Francesville, about 40 miles north of Purdue. Worked on a hog and grain farm through high school. Student body president and valedictorian at West Central High School. President of the Purdue Young Group.

LAUREN NOVAK

Majoring in Biological Engineering (Cellular and Biomolecular Engineering track.) In the Process Validation co-op for Catalent Biologics in Bloomington. Small group leader for Purdue's Women in Engineering Program, member of the Society of Women Engineers and American Society of Agricultural and Biological Engineers; a teaching assistant to a first-year engineering course. In summer 2017, studied in England and Ireland and spent last summer in Germany. Will pursue a career in the pharmaceutical or biotechnology industry.

CHASE GRIPP

Came to Purdue from a 6th-generation family farm and custom application business in western Illinois. Was heavily involved in FFA. Member of FarmHouse fraternity, Ag Council, Collegiate Farm Bureau, Diesel Club, and Dean's Scholars. Has rented his own farmland since the sixth grade.

KEVIN MASSA

Pursuing a degree in Biological Engineering (Food and Biological Process track.) Working on two minors: Food Science and Economics. Member of the American Society of Agricultural and Biological Engineers and National Society of Leadership and Scholars. Wants to work in the food processing industry.

New Faculty

DR. JOHN EVANS

jevansiv@purdue.edu;
(765) 496-6620

Assistant Professor Evans joined the department on Nov. 1, 2018. He grew up in central Kentucky on a farm that produces corn, soybeans, cattle, sheep and tobacco. During his master's project he developed and tested a method of aerating compost bedded pack barns, a type of dairy housing system. His Ph.D. research involved the development of a harvest logistics model for single harvester grain operations. The model allowed comparison of machine parameters on a user's specific field data by optimizing the harvester and grain cart in-field travel.

His research program will focus on Agricultural Machine Automation, Machine Logistics, and Precision Agriculture. Specifically, he hopes to investigate the value of autonomous machinery in precision agriculture applications.

Degrees: *Bachelor of Science, Master of Science, Biosystems Engineering: University of Kentucky; Ph.D., Biological Systems Engineering, University of Nebraska.*

Promotions

To Associate Professor:
Margaret Gitau (tenure), Kingsly Ambrose, Sara McMillan

To Full Professor:
Klein Ileleji, Andrea Vacca

Lifetime Achievement

The ABE Department honored C. Thomas Haan (BS '63, MS '65 AE) with the ABE Lifetime Achievement Award. Dr. Indrajeet Chaubey presented the award to his major professor on Oct. 12 at the Haan Mansion Museum of Indiana Art in Lafayette.

Retirements

Professor Richard Stroshine officially retired Aug. 31 after 38 ½ years, and the department hosted a celebration on Friday, Sept. 28, 2018, at the ADM Agricultural Innovation Center. Dr. Stroshine rose through the ranks from Assistant to Associate to Full Professor after serving as a Lieutenant (jg) in the United States Navy. He created and taught ABE 305 Physical Properties of Biological Materials until Fall 2018 and taught several other courses, including ABE 450 Finite Element Analysis in Design and Optimization. His work produced more than 130 journal articles, four book chapters, and multiple instructional materials and teaching modules, many in the area of grain drying.

Larry Theller retired from Purdue and ABE on Feb. 28, 2018, after 19 years with the department. He co-taught the GIS course with Dr. Jane Frankenberger and mentored hundreds of GIS students from ABE and across campus. Larry built numerous GIS applications and web-based decision support tools addressing important environmental and water issues.

Professor Vince Bralts officially retired in May 2018. During his 23 years at Purdue, Dr. Bralts served 10 years as Department Head and eight as Associate Dean for Resource Planning and Management in the College of Engineering. He also spent 12 years on the faculty of Agricultural Engineering at Michigan State University. His work in irrigation produced more than 85 professional presentations, 30 journal articles, four book chapters, and three software packages.

Patents

Laurie Parker, Joseph Irudayaraj, Andrew Lipchik, Nur Damayati: Methods for detecting enzyme activity using fluorescence lifetime imaging. No. 10,023,902; July 17, 2018.

Klein Ileleji, Kyle Probst: Apparatus and method for producing bio-based carriers from byproducts of biomass processing. No. 10,051,858; August 21, 2018.

Faculty/Staff Awards

AgrAbility – 27th Annual National Black Farmers Conference Partner of the Year Award

John Lumkes – Undergraduate Advising Award, College of Engineering; 2018 Faculty Awards of Excellence

Natalie Carroll – Universities Council on Water Resources Board of Directors

John Lumkes, Jose Garcia Bravo, Dan Taylor – 2018 Sustained Faculty Impact Award (CoA PK-12 Council's Outreach and Engagement Awards)

Jane Frankenberger – PUCESA Team Award for Purdue Rainscaping Education Team

Nathan Mosier – Team Award (Bicentennial Torch Team); 2018 Faculty Awards of Excellence

Bernie Engel – Learning Communities Distinguished Faculty for Research

Kevin Solomon – Learning Communities Most Outstanding Faculty

Dennis Buckmaster – Learning Communities Exceptional Event Planner

Andrea Vacca – Best Paper Award for "Real-Time Parameter Setpoint Optimization for Electro-Hydraulic Traction Control Systems," by Alexander A. and Vacca A., presented at the 15th Scandinavian International Conference on Fluid Power (SICFP2017), June 7-9, 2017, Linköping, Sweden.

Andrea Vacca – Best Paper Award for "Influence of Surface Roughness Effects on the Lubrication Performance of External Gear Machines" by Thiagarajan D., Bratto A. and Vacca A., presented at the 2017 ASME/Bath Symposium on Fluid Power and Motion Control, FPMC 2017, Oct. 16-19, 2017, Sarasota, Florida

Keith Cherkauer, Abigail Engelberth, Michael Ladisch, Kevin Solomon – College of Engineering Outstanding Engineering Teachers

William Field, Jian Jin – College of Agriculture Millionaire's Club

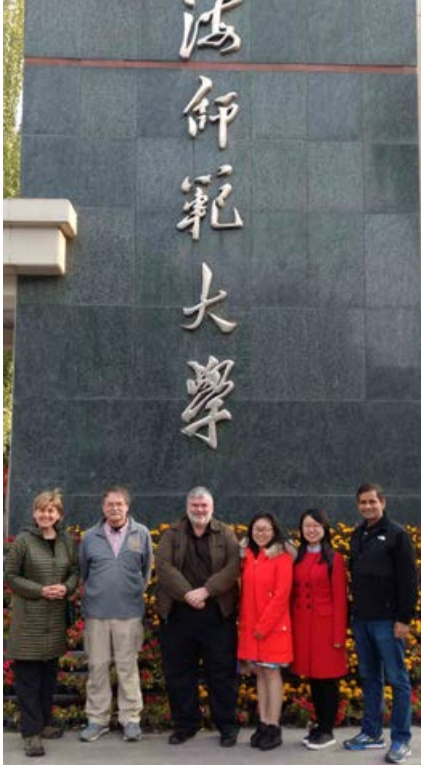
Laura Bowling (Agronomy), **Keith Cherkauer** (ABE) – contributed essays to "How to Feed the World," a book by a multidisciplinary team of Purdue researchers.

Bernard Engel, Kevin Solomon, Dennis Buckmaster, Margaret Hegwood – Learning Communities and Residential Academics Initiatives

Michael Ladisch – Fellow, AIChE

Dennis Flanagan, Argentina visit, November 2017

Nathan Mosier, Martin Okos, Kevin Solomon, Nathan Engelberth, Raymond Red Corn — AIChE, Purbrew, best poster at inaugural brewing competition



Dr. Bernard Engel, Dr. Jane Frankenberger, Dr. Indrajeet Chaubey, Dr. Jon Harbor, Larry Theller, and **Jingqui Chen** and **Shuyuan Wang** spent time in Xining, China (pictured). Their visit to QingHi Normal University, in a city with a population of about 2 million, was spent learning local soils and agriculture, and working on watershed modeling. Larry Theller gave a series of lectures on GIS and L-THIA modeling, and Drs. Engel, Frankenberger, Chaubey, and Harbor gave a series of lectures at two separate symposiums on the campus. The government is spending billions of dollars on sustainable water infrastructure to connect city residents with the water quality efforts.

ASABE

Margaret Gitau – Outstanding Service as Associate Editor

Dharmendra Saraswat – Standard Development Award for "#EP621: Guidelines for Calibrating, Validating, and Evaluating Hydrologic and Water Quality Models"

ANNUAL INTERNATIONAL MEETING RECOGNITION

Kingsly Ambrose and Klein Ileleji – Educational Aids Blue Ribbon for "Grain Drying, Handling, and Storage Handbook MWPS-13)"

Richard Stroshine and Klein Ileleji – Superior Paper Award for "Differences in Kernel Shape, Size, and Density between Healthy Kernels and Mold Discolored Kernels and Their Relationship to Reduction in Aflatoxin Levels in a Sample of Shelled Corn"

Indrajeet Chaubey, Fellow, ASABE

Sushant Mehan, New Faces of ASABE – Professionals.

Michelle Dixon, 3rd Place, K.K. Barnes Student Paper Awards

Jamie Arabshahi, Marisol Pantoja Otero, Janice Chan, Elena Haskins – Undergraduate Research Poster Symposium

Paul Brayton, Samantha Kowalski, Dani Winter – featured in 2018 ASABE Resources magazine

Graduate Student Awards

Stuart Smith, Ahmed Hashem – Graduate Teaching Excellence awards

Malithi Wickramathilaka – Outstanding Graduate Student Teaching Assistant

Samuel Noel – part of winning team for Nutreco Agrivision Hackathon, an international competition to promote the potential of data and technology innovation in livestock farming.

Divya Thiagarajan – Best Paper at the American Society of Mechanical Engineers (ASME) ASME/Bath 2017 Symposium on Fluid Power and Motion Control. Professor Andrea Vacca, faculty mentor.

Casey Hooker – NSF Graduate Research Fellowship. Kevin Solomon, faculty advisor.

Lizhi Shang – 2018 Global Fluid Power Society Best Paper Award for "Advanced Heat Transfer Model for Piston/Cylinder Interface."

Stuart Smith – Teaching Academy Graduate Teaching Award

Ahmed Hashem – Graduate Teacher Certificate

Credits

***Page 3**, "Bernie the Builder" video: Department of Agricultural Communication*

***Pages 5-8**, Mars Desert Research Station photos by Mark Gee. Photo of Gee, Jake Qiu: Tom Campbell, Agricultural Communication.*

***Page 9**, LORRE story. Photos by Antonio Freitas dos Santos, postdoctoral researcher, LORRE. Original reporting: Chris Adam, cladam@prf.org*

***Page 10**, plant sensors story: Photo by Tom Campbell/ Agricultural Communication. Original reporting: Tom Coyne; tcoyne@prf.org*

***Page 18**, Natalie Carroll. Story and photo, Purdue Today*

***Editor:** Chuck Wineland, Agricultural Communication*
***Designer:** Kiri Northam, Agricultural Communication*

Undergraduate Student Awards

International Genetically Engineered Machine (iGEM) team, 2017: regional Silver Award at the jamboree in Boston. Students: **Katie Atherton** and **Kevin Fitzgerald**. Professors **Jenna Rickus** and **Kevin Solomon**, faculty advisors.

International Genetically Engineered Machine (iGEM) team, 2018: Bronze medal at the October jamboree. Team developed a rapid, cost-effective, paper-based assay for yeast infections to be used in low infrastructure environments. Advised by professors **Kevin Solomon** and **Mohit Verma**, graduate instructors and BE graduate students **Kok Zhi Lee**, **Ethan Hillman** and **Casey Hooker**. Team members included BE students **Zach Berglund**, **Janice Chen**, and **Kevin Fitzgerald**.

Margaret Hegwood – Learning Communities Student Staff Advocate Award

Christopher Stichter (ASM) and **Susan Hubbard** (BE) – part of the team that won the Indiana Soybean Alliance 2018 Student Soybean Innovation Competition for SoyTack, a fast-curing, formaldehyde-free soil stabilizer. Undergraduate students were also members of the 2018 Indiana Soybean Alliance Student Soybean Innovation Competition 2nd- and 3rd-place teams: I am BOBA and Team Soy Soft

Nick Murphy, Jeremy Weigand, Kraig Tumey – FFA American Farmer Degrees

2018 agBOT Challenge team: **Treg Beer, Andrew Bowling, Paul Thieme,** and **Tim Williams** (students), with **Roger Tormoehlen** and **Richard Fox** (advisors)– Purdue again placed second (tied with IUPUI).

PURDUE
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