

WINTER 2018

A PUBLICATION OF THE NOBLE RESEARCH INSTITUTE

LEGACY



THE ENCORE

As he steps off the stage and into retirement, Bill Buckner knows there is still so much left to do before he calls it a career.



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2/6

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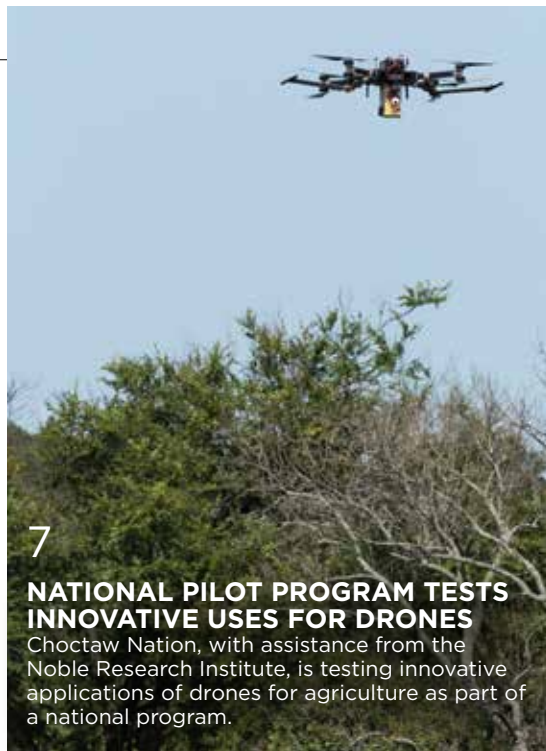
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TO OUR READERS: SAYING THANK YOU, NOT GOODBYE

As I wind down my tenure as president of the Noble Research Institute, I find myself filled with the bittersweet sense that accompanies change: melancholy for what I am leaving behind yet energy from the potential of the new season.

These seven years at Noble may be the most rewarding and inspired era of my career. Projects and programs were developed and launched from virtually every segment of the organization. Moments of significant change were handled with perseverance and kindness. New opportunities were explored as we sought — as our founder taught us — to cast our eyes toward the horizon so that we could anticipate solutions to tomorrow's challenges.

As I run through the snapshots of memories in my head, it is not the work or even the successes I see. It's the people. It's the men and women who have filled every day with remarkable moments of joy and camaraderie, the individuals who have made these years possible. And I'm filled with overwhelming thankfulness. So in this, my final president's message, I'd rather devote these words to saying "thank you" than "goodbye."

First and foremost, I must thank the Noble Research Institute's governing body. Thank you for entrusting me with responsibility to steward the Noble legacy. Thank you for the willingness to take bold steps and attempt daring projects. Thank you for the hard conversations, the compromise and, ultimately, the friendship we've forged. It has been my pleasure to serve you all.

Thank you to each and every employee of the Noble Research Institute. Your passion for agriculture and devotion to your work will undoubtedly lead to great success. You inspired me daily with your ingenuity and integrity. You have left an imprint on my life, and I will treasure all the little moments we shared.

To my Leadership Team, thank you for the tremendous amount of hard work.

The long meetings and even longer days. The short timelines. The seemingly insurmountable assignments. You delivered each and every time. You are the men and women who make this organization go. There are no words to express my gratitude for your endless dedication.

Thank you to my wife, Kathy. For decades you've stood by me. You've tolerated midnight business calls and countless last-minute changes of plans. You've moved across the continent and around the world with me, all while wrangling our four children and managing our lives with military precision.

You found a way for us to stay close even when we weren't in the same time zone. You've been my partner, my sounding board and my best friend. You've done it all with grace and class. And when I said I wanted to go to Oklahoma so I could change agriculture, you said, "Go for it."

When I see you, I still see that college sophomore who took a chance and went with me on a blind date to a Missouri Tigers football game. We cheered on our team together that day, and you've been cheering me on ever since. Thank you for walking with me through this life.

And finally a note to my two young grandsons. Thank you for being the constant reminder of why I pursue this never-ending journey in agriculture. Someday you will read these words and understand why I went to Oklahoma, why I worked so hard, why I was gone so much.

I believe that agriculture is the cornerstone of our lives and society. It must be cultivated through collaboration, research and technology. It must be protected so that the soil and the land can be productive for your generation and for the ones to come.

The fruits of agriculture's labors are guaranteed to no one. They are not a birthright but a privilege that each generation must earn through sweat equity. Noble is a touchstone of change and innovation for agriculture. It was here that



I was able to help build a better world for you both even though I may never fully witness the results of my efforts.

See, boys, here's one of those life lessons from Grandpa: You never accomplish as much as you want and you may never see all the outcomes, but there is untold satisfaction in planting seeds with the knowledge that the future harvest will enrich the next generation.

So now it's time for Grandpa to come home. I'm not done supporting agriculture, but I have a few more things I want to teach you.

Sincerely,

BILL BUCKNER, PRESIDENT AND CEO

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ON THE COVER: Bill Buckner will step off the stage as Noble Research Institute president and CEO when he retires at the end of 2018. Buckner has led the organization through some of its most significant organizational shifts, including the transition of the Noble Foundation to the Noble Research Institute. His seven years at Noble represent both the encore to his 18 years of senior leadership at Bayer Crop Science and the first act in his next encore, which will focus on soil health and time with family.

HOW GPS WORKS: THE SHORT ANSWER

GPS might seem complicated, but thinking of it in terms of secret fishing holes helps clear up the confusion.

by Mike Proctor, Noble Research Institute ag technology research associate

As a youngster, I spent a lot of time with my grandpa, fishing on Lake Texoma. He had dozens of secret fishing holes scattered all around the west end of the lake. These included rises, drop-offs, creek channels, points and sub-merged brush piles.

Grandpa's method of finding these spots again and again is probably something of a lost art today but bears a great similarity to how GPS works. Rather than marking anything with a float or a jug like normal people — "I don't want those Texans finding 'em!" he'd say — we located landmarks on the bank and oriented ourselves based on how those landmarks lined up. We needed at least two points of reference that were close to 90 degrees from one another to get the boat positioned over the point of interest.

I instinctively understood that I was sworn to secrecy and that "They'd have to kill me first!" to get the coordinates of these hush-hush honey holes. Imagine my confusion when, upon our return to the docks, someone asked Grandpa where we caught all those fish and he proceeded to tell them all about our secret location and how to find it. He even told Texans! Later on I made the connection that if you wanted to catch fish, my grandpa was the guy to talk to.



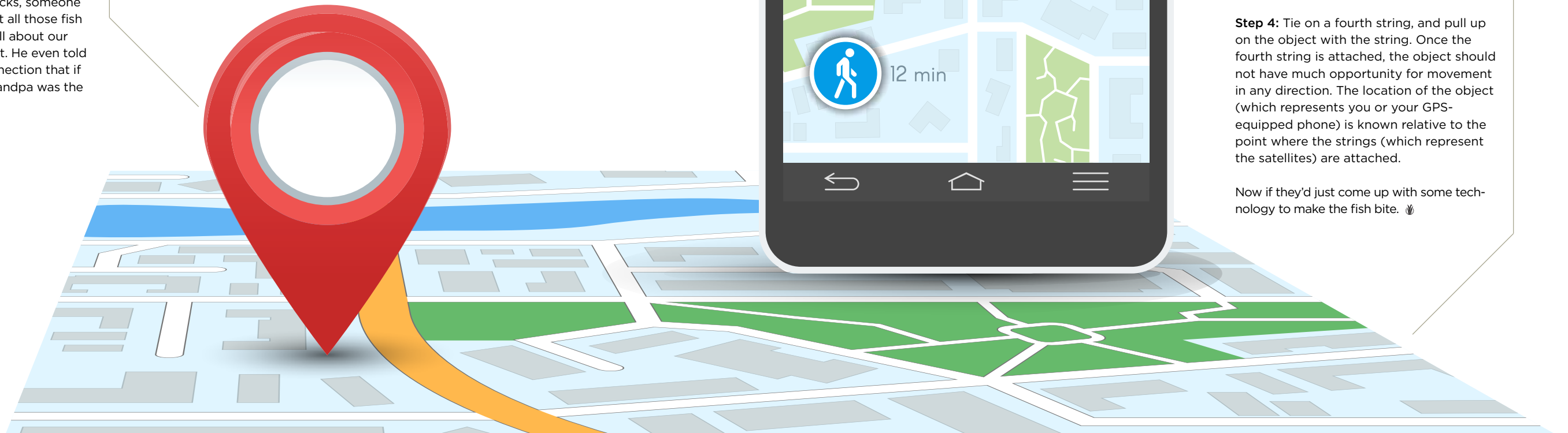
MEET THE NOBLE EXPERT SOURCE
Mike Proctor serves as an agricultural technology research associate at the Noble Research Institute, which he joined in 2010. A field botanist by training, Proctor is especially interested in the role of fire and herbivores (including cattle) in maintaining diversity in rangelands. Learn more about Proctor at www.noble.org/staff/mike-proctor and follow him on Instagram @rangeroaster.

THE BASICS OF GPS

If you have several points with known locations and you know the distance to all of them from where you are, you can calculate your location. Well, maybe you can't, but your GPS receiver can.

The Global Positioning System consists of 24 satellites in orbit arranged so that there should be at least four satellites overhead at any location and time. Each satellite broadcasts its location and the time of that broadcast. A GPS unit receives that broadcast and identifies the satellite, its position and the time elapsed since that broadcast was sent. It then calculates its distance from the satellite based on the time it took for that broadcast to reach the GPS unit.

The receiver's location will be at that distance somewhere in a sphere around that satellite. This is not all that helpful. However, if the same process occurs with another satellite, the location can be narrowed down to two locations in space — where the spheres around the satellites intersect — and only one of those locations should be on Earth's surface. Add a third satellite, and the location becomes much more precise. With three satellites that were in a similar plane, there could still be some confusion. The point could still move perpendicular to them. If, however, we add a fourth satellite, we achieve a "3D" position — we know latitude, longitude and altitude.



MAKE YOUR OWN GPS

You can demonstrate how GPS works with the following activity.

You Will Need:

- A small object
- String
- Scissors
- Tape
- A flat surface, like a tabletop

Step 1: Take your object, and tie a string to it. Tape the end of the string to a tabletop. Move the object around while keeping the string tight. The object is constrained to a certain extent, but it can still go lots of places.

Step 2: Tie another string to the object. Stretch the string out, and tape the end to the table. Depending on the location of the ends relative to each other, the object's movement should be further constrained.

Step 3: Try a third string. Lift the object above the table's surface; it can still move that direction.

Step 4: Tie on a fourth string, and pull up on the object with the string. Once the fourth string is attached, the object should not have much opportunity for movement in any direction. The location of the object (which represents you or your GPS-equipped phone) is known relative to the point where the strings (which represent the satellites) are attached.

Now if they'd just come up with some technology to make the fish bite. 🎣

A CLOSER LOOK AT ROOTS

Computational models allow Ana Paez-Garcia, Ph.D., to look inside roots and gain knowledge that could eventually yield crop varieties better able to withstand drought.

by Courtney Leeper

Roots are the unsung heroes of a plant. Like a behind-the-scenes stage hand, roots set the scene for a productive show of tasty growth that will nourish animals and humans. A tiny root is the first to emerge from a seed, and roots grow to provide the foundation for the entire plant. Roots also act as ambassadors that form beneficial partnerships with neighboring creatures in the soil. They seek out water and nutrients then act as pipelines that transport those necessities to other parts of the plant. But not all roots are created equal.



Rooted in Water?

Ana Paez-Garcia, Ph.D., a postdoctoral fellow at the Noble Research Institute, is interested in what makes some wheat varieties better able to remain productive in drought conditions. Farmers and ranchers in the Southern Great Plains, and many other parts of the world, are all-too-familiar with their crops dying of thirst because of drought. They need varieties that excel at using water, a process that starts with roots.



Looking for Answers

Paez-Garcia knows that not all root systems develop the same look. Some grow deeper into the ground or form more branches off of primary roots. Every aspect of a root's composition, down to the thickness of individual root cell walls, could influence how easily water moves through the root. To determine which roots take up water best, Paez-Garcia needs to do a lot of counting and measuring. She does this by taking wheat plants from the field, washing off their roots, and collecting information about the roots from general, big-picture characteristics to individual cell characteristics.



MEET THE NOBLE EXPERT SOURCE

Ana Paez-Garcia, Ph.D., has studied roots as a postdoctoral fellow in the Noble Research Institute Cell Biology Laboratory since 2014. Paez-Garcia traveled to Belgium to learn how to use computational models to explore root systems. The knowledge she gains can be applied to developing crop varieties that use less water resources. Paez-Garcia is originally from Madrid, Spain.



The Problem

It takes time to manually count the number of cells in a root system and measure the angles of each root. To understand the root's hydraulic properties, or its ability to suck water up into the plant's shoot system (the part that grows aboveground), Paez-Garcia needs to look inside the root. This means she has to cut into the root to look at its cross section, a process that can only be done once before it ruins the root. These processes require complicated equipment and countless hours.



A Tech Solution

Paez-Garcia maximizes her time by applying a series of computational models that help her visualize the insides and outsides of roots and predict how these factors, combined with soil characteristics, will affect the plant's ability to take up water. With this information, Paez-Garcia will have a better idea of which root characteristics best help plants access water. Plant breeders will then be able to apply this information when developing cultivars more tolerant to drought.

NATIONAL PILOT PROGRAM TESTS INNOVATIVE USES FOR DRONES

Land managers could gain a new ally in the fight against feral hogs: drones.

Choctaw Nation of Oklahoma, with assistance from the Noble Research Institute, Oklahoma State University and other collaborators, is testing innovative applications of drones for agriculture as part of the U.S. Federal Aviation Administration Unmanned Aircraft Systems Integration Pilot Program. The Choctaw Nation group was one of 10 selected from across the country to participate in the program, which seeks to advance the safe integration of drones into the national airspace.

"Noble is bringing the practical eye toward agriculture to the project," said Mike Komp, agricultural technology program manager. "We're looking for ways that drones could help farmers and ranchers, and we've started with an application that could help land managers control feral hogs — a \$2 billion problem in this country."

So far, the partners have used a drone to drop 10 pounds of corn in a BoarBuster feral hog trap 4,000 feet away from a launch site.

Drone pilots had a direct line of sight during the complete operation and mission of this initial test, which took place in August 2018. However, the idea of the program is to test innovative uses in a safe, selective environment so that opportunities and concerns can be identified.

The partners hope to eventually test the possibility of using a drone to bait feral hog traps in difficult-to-access places as far as 3 to 4 miles away, out of the line of sight. In the long-term, the team hopes to drop larger quantities of bait. Other tests could include nighttime flights.

Program findings will help shape rules and regulations on future commercial drone use in the U.S.



Learn more about the program at www.cnoaa.com

Participants in the U.S. Federal Aviation Administration Unmanned Aircraft Systems Integration Pilot Program demonstrate drone flight at the Choctaw Nation's Daisy Ranch in Stringtown, Oklahoma, on Aug. 15, 2018.

U.S. Ag Secretary appoints Ellis to natural resource group on advisory board

Chad Ellis, Noble Research Institute industry relations and stewardship manager, has been selected to serve on the U.S. Department of Agriculture's National Agricultural Research, Extension, Education and Economics (NAREEE) Advisory Board under the direction of U.S. Secretary of Agriculture Sonny Perdue.

In October, Ellis became one of 10 new appointees who will serve three-year terms. He represents national conservation or natural resource groups on the NAREEE Board, which advises Secretary Perdue and land-grant colleges and universities on top national priorities and policies related to food and agricultural research, education, extension, and economics.

"Chad is a knowledgeable advocate for conservation and land stewardship issues," said Bill Buckner, president and CEO of the Noble Research Institute. "He is effective in communicating those issues to farmers, ranchers, landowners and others in the agriculture industry."

The board's main objective is to contribute to effective federal agricultural research, education and economics programs through broad stakeholder feedback and sound science. Board members also perform an annual review of the relevance of and adequacy of funding for those programs.

"It's an honor to be selected to represent national conservation and natural resource groups and to continue our national efforts to keep working lands productive and intact for years to come," Ellis said. 🌱



Chad Ellis

Johnson, Payne gain opportunities to explore agriculture through Oklahoma Agricultural Leadership Program



Dillon Payne (left) and Myriah Johnson, Ph.D.

Myriah Johnson, Ph.D., Noble Research Institute economics program lead and agricultural economics consultant, and Dillon Payne, agriculture technology applications coordinator, have been selected to participate in Oklahoma Agricultural Leadership Program (OALP) Class XIX.

"I am excited for the opportunity to participate and better understand the many facets of agriculture in Oklahoma, in the U.S. and internationally," Johnson said. "This program will not only facilitate engagement with classmates and professionals in different agriculture sectors, but will stimulate the passion we all have for learning about and working in the agriculture industry."

The OALP mission is to develop leaders for Oklahoma agriculture. This program focuses on three specific objectives: to help potential leaders develop a deeper appreciation and understanding of people, to help them develop a better understanding of basic systems of economics and government, and to help them use this appreciation and understanding to solve problems and advance Oklahoma agriculture.

"We have a tremendous opportunity to experience agriculture across our country and around the world then bring that knowledge back to improve agriculture in our home state," Payne said. "I'm proud to be a part of Oklahoma agriculture, and I'm excited about learning new ways to support and propel our industry even further." 🌱

Noble releases new forage crabgrass called Impact

The Noble Research Institute has developed a new crabgrass cultivar called Impact.

Impact crabgrass was released for forage livestock producers needing a later-maturing cultivar than Red River, the main commercial crabgrass cultivar. Impact is also broadly adapted, high-yielding and has improved nutritive quality and good reseeding ability.

In Noble's grazing systems research trials, steers grazing Impact averaged 1.56 pounds per day of weight gain and 192 pounds of live weight gain per acre during a five-year period (2013-2018) following graze-out wheat.

Impact has an adaption area that includes the south-central and southeastern U.S. It is particularly productive in dryland situations but also performs well under irrigation. Green chop, silage and hay production are potential uses of Impact, and it is adapted to both tilled and no-tilled livestock production systems. Impact crabgrass seed is available from Barenbrug USA. 🌱



Learn more at www.noble.org/impact-crabgrass



Moseley selected for Society for Range Management state board

Will Moseley, wildlife and fisheries consultant, was elected to the Oklahoma section board this year. He will serve for three years.

"This is quite an accomplishment for Will," said Hugh Aljoe, Noble Research



Will Moseley

Institute producer relations director. "It's a testament to his professionalism and the respect his peers have for him. He is a knowledgeable advocate for rangeland management issues and is effective in communicating those issues to producers and others in the agriculture industry."

Moseley has worked with producers at the Noble Research Institute since 2008. 🌱

New calculator helps pecan growers estimate dollars lost to inefficiency, wild pigs



The Noble Research Institute and Oklahoma State University have developed a pecan loss calculator that estimates the number of pounds and dollars lost as a result of pecan harvester inefficiency and wild pig rooting damage.

Research conducted on Noble's Red River Farm found that 10 percent of pecans, whether native or improved, were not harvested because of pecan harvester inefficiency. In areas damaged or rooted by pigs, 33.7 percent of pecans could not be harvested, bringing the total nonharvestable loss to 43.7 percent in areas damaged by pigs.

The calculator estimates for both forms of loss in either native groves or improved/planted orchards. Long-term averages for production (pounds per acre) and price per pound are prepopulated and specific to native or improved varieties. The user can overwrite these values by entering current and site-specific production and pricing. 🌱

 Find the calculator at www.noble.org/pecan-loss-calculator

Davis, Mattson receive national communications awards

Rachael Davis, Noble Research Institute creative manager, received the 2018 American Agricultural Editors' Association Designer of the Year award. This annual award recognizes the top graphic designer in the agricultural industry. The Designer of the Year must demonstrate fresh, relevant and innovative approach to his/her work related to agriculture graphic design and publications.

Davis has more than 14 years of professional experience in graphic design and marketing. Davis leads the graphic design, web and photography team within the Noble Research Institute's communications department. As part of the Noble team, Davis has received more than 30 state and national awards.

Rob Mattson, Noble Research Institute photographer and imaging specialist, received the 2018 American Agricultural Editors' Association Photographer of the Year award. This an-



Rachael Davis

nual award recognizes a photographer who presents a portfolio of top quality based on subject matter, originality, technical excellence and versatility.

Mattson has more than 25 years of experience in documentary storytelling,



Rob Mattson

studio and on-location portraiture, sports and politics photography, breaking news coverage, story sourcing, and picture editing. As part of the Noble team, he has received more than 70 awards on the state and national levels. 🌱

WHAT'S ONLINE

HEALTHY FOR YOUR HEART

The pecan, which is native to North America, contains more than 19 vitamins and minerals, including vitamin A, vitamin E, folic acid, calcium, magnesium, phosphorus, potassium, vitamin B and zinc. This super nut is the most antioxidant-rich nut in the world, and it has been connected to reductions in LDL (or "bad") cholesterol. You can find out more about the health benefits of pecans at www.ilovepecans.org.

PECANS, PECANS,
PECANS

The American nut is not just a holiday treat. It's rich in history and health benefits.

Pecans have only been commercially produced within the last **200 YEARS.**

Pecans are now sold as whole nuts, halves, pieces, granules or meal.

There are more than **1,000 NAMED VARIETIES** of pecans.

Many pecan varieties are named after Native American tribes: Cheyenne, Mohawk, Choctaw, Sioux and Shawnee.

The pecan tree at the Alamo is the **OLDEST TREE ON THE PROPERTY.**

It was planted in 1850.


 The Noble Research Institute is exploring pecan to find genetic tools and in-the-field practices that could benefit pecan producers and consumers. Access resources and news at www.noble.org/campaigns-pecans.

FROM OUR FEEDS


FOLLOW ALONG  @nobleresearchinstitute  @nobleresinst

We love to connect with colleagues and friends on social media. Join us today to see what people have been saying, and follow #everyNoblestory to see more science serving agriculture through the eyes of Noble researchers.



 Here at Noble, we're producers helping producers. Becca McMillan, executive assistant to the director of agricultural systems research and technology, and her husband, Zeno, operate a #cattle operation here in southern Oklahoma. Read more about their family and #ranch life in their producer profile brought to you by the Oklahoma Beef Council. oklabeef.org




 It's always a great day to help share the stories of science serving agriculture. It's an even greater day when you hear those stories are in the hands of U.S. Secretary of Agriculture Sonny Perdue (left). Thanks to Trey Lam (right), executive director of the Oklahoma Conservation Commission, for sharing *Legacy* magazine.



 Providing #livestock with high-quality forage year-round is a major goal for producers. Researchers at Noble are working hard to make it happen by studying a variety of alternative #forage systems and developing new technologies. #research #agriculture

 Congratulations to Syed Adnan Uddin, one of our 2018 Lloyd Noble Scholars in Plant Science! He was selected as the top undergraduate presenter in the agricultural, soil and natural resources division at the Sigma Xi Student Research Conference in October. Syed spent the summer working in the plant cell biology laboratory alongside mentor Cheng Lin Chai, Ph.D.

 A great day for learning from the best of the Noble Research Institute [@jimmy_emmons](https://twitter.com/jimmy_emmons)



 Did you know that the @nobleresinst has its own electric substation on site? The "Growing Together" video series highlights how @OGandE supports our #research efforts with quality service and consistent #power. Watch the full feature here: bit.ly/2A8n3AV

 @soil_institute releases #WorldSoilDay gift for educators: *Living Soil* film and lesson plans. livingsoilfilm.com

IN CASE YOU MISSED IT:

LIVING SOIL: A DOCUMENTARY

Soil was once thought of as solely a medium for growing food, but we now know it is the living, dynamic foundation of our society. *Living Soil*, a documentary released by the Soil Health Institute, tells the story of the soil health movement through the eyes of farmers and ranchers who are managing their land to enhance the soil.

Watch the film at livingsoilfilm.com



Instagram STORIES

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NOVEMBER 11

Meet Ray Olsen, a 95-year-old World War II veteran who worked for founder Lloyd Noble's oil drilling company from 1948 to 1962. In 1945, Ray served our country on the battleship *USS New York* in the Pacific theater. Three years later, he served Noble Drilling as assistant to the Gulf Coast Division director. During that time, Ray remembers picking Lloyd Noble up at the airport and showing him around New Orleans. Ray says he is proud of two things: serving in the U.S. Navy and being part of Lloyd Noble's legacy. "Lloyd Noble was a wonderful person," Ray says. "Starting the Noble Foundation (now the Noble Research Institute) is just one example of the many wonderful things he did for agriculture and Oklahoma." This #VeteransDay we thank Ray and all of the other men and women who have bravely protected our country. We are forever grateful.

3 Things to Look Up

Lipstick Comes From Cows?

Name some products that come from a cow: steak, burgers, jet fuel. Yes, you read that right. In fact, you'd be surprised to learn that there are many more unusual products that come from cattle.

According to *Business Insider*, "About 60 percent is harvested for food. The other 40 percent ends up in places like lipstick and jet fuel."

 Read the article at bit.ly/cow-products to learn more about inventive uses for cattle products.

Graze Better, Plan Ahead for Drought Resilience

Drought is a recurring problem for farmers and ranchers, but there are ways to be better prepared for a rainless season. Noble consultants recommend developing grazing and drought plans and knowing your forage base, expected forage productivity and soil fertility.

 See the story at bit.ly/graze-drought-plan

Telling the Beef Story: From Ranch to Restaurant

The U.S. beef industry already has a great story of progress to share. Now, producers from across the beef supply chain are working together on a national beef sustainability pilot project coordinated by the Noble Research Institute. By working together to understand and address each sector's challenges, the beef industry can achieve its goal of continuous improvement.

 Learn more about the project and other ways the beef industry is improving sustainability in the article at bit.ly/supply-chain-sustainability

Q

AND

A

Question: If you could have dinner with any person, who would it be and why?

“

I would have dinner with Theodore Roosevelt, a man of many talents who impacted the United States for the better. He was a strong, charismatic and independent man who believed one man could make a difference. I want to hear the stories of the man whose life was a series of adventures: from his time as a rancher and lawman in the West, to those of a hunter whose passion for conservation led to our National Park System, and as a president who believed his role was to represent the people not a political party.”

JENN SCOTT,
YOUTH EDUCATION ASSOCIATE



“I would like to have dinner with my grandparents who passed away several years ago. They moved from North Korea to South Korea about 65 years ago and never in their lifetime visited their hometown again. I would like to visit their hometown with them and have a traditional Korean noodle dish, Pyongyang naengmyeon, since it is now a symbol of peaceful relationships. That would be a very happy day.”

MYOUNG-HWAN CHI, PH.D.,
SENIOR RESEARCH ASSOCIATE,
MICROBIAL SYMBIOLOGY



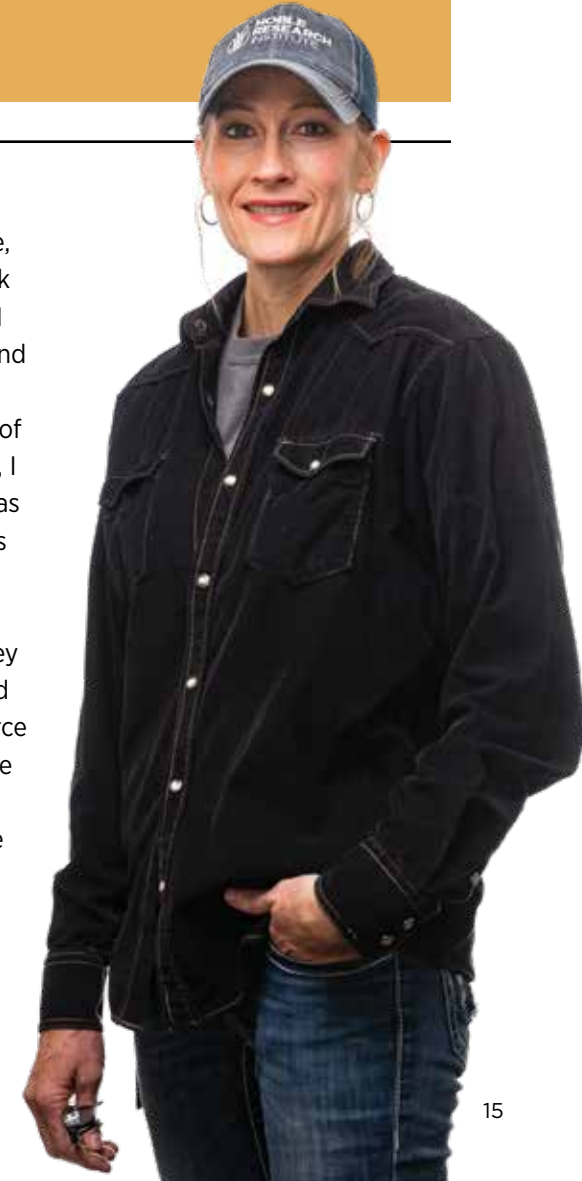
“I would love to have dinner with Steve Jobs, founder of Apple. Jobs’ contribution to the personal computing revolution, perhaps the defining advancement of this era, cannot be understated. Also, his unrelenting pursuit of excellence in creating products that are both beautifully designed and highly functional would make him a fascinating dinner guest. Based on his reputation, however, I would be slightly terrified of him.”

RYAN McNEILL,
SENIOR DIGITAL PRODUCER

“

If I could have dinner with anyone at any period in time, I would choose to have a talk with myself as a young girl. I would encourage her to spend more time learning as much as possible from the wealth of knowledge around her. Now, I see how special that time was and how many opportunities I had spending time with my grandparents, who lived through the early 1900s. They knew how to live off the land and how to use every resource available. I would try to make that young, uninterested girl understand how much those things would benefit her later on in life.”

KAREN HARTMAN,
GREENHOUSE OPERATIONS
MANAGER





THE ENCORE

As he steps off the stage and into retirement, Bill Buckner knows there is still so much left to do before he calls it a career.

BY J. ADAM CALAWAY

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Bill Buckner's plan was elegantly simple.

Step 1: Retire from Bayer Crop Science after 18 years of senior leadership that saw him hopscotch around the world.

Step 2: Find a place where he could help reshape agriculture.

"This was the last act of my career," says Buckner, who has spent the better part of 40 years working in the agriculture sector. "I wanted to find a place where I could have an impact on agriculture, really make a difference."

The place he found (or more accurately that found him) was the Noble Research Institute. In 2011, Noble's Board of Directors selected Buckner as its eighth president and chief executive officer. For seven years, Buckner mixed his brand of high octane, outcomes-focused leadership with an organization dedicated to providing solutions to great agricultural challenges.

This September, after feeling the pull of home, Buckner stood before his employees and announced his retirement effective the end of 2018. "There are no words to properly express the thankfulness I have for my time here," Buckner says. "Every day at Noble, I have the opportunity to positively impact agriculture and contribute to something greater than myself. I am honored to be a part of the Noble legacy, and I'm excited to see the next chapter unfold for myself and the organization."

Russell "Rusty" Noble, a member of the Board of Director's executive committee and founder Lloyd Noble's grandson, hailed Buckner's tireless pursuit to advance agriculture. "When you meet Bill Buckner, you know one thing for sure: he loves agriculture. He is a passionate advocate for the sector," Noble says. "During his time as president, Bill worked tirelessly to promote soil health

and create innovative new solutions that could open up more opportunities for farmers and ranchers. Everyone at Noble offers a whole-hearted thanks to Bill for all of his work."

During Buckner's tenure as president and CEO, Noble experienced one of its most dramatic organizational shifts in its 73-year history. Originally known as The Samuel Roberts Noble Foundation, Noble separated its research and education operations from its philanthropic activities in 2017.

The organization's research, education and consultation activities continued forward under a new name, the Noble Research Institute, LLC, and became one of the country's first agricultural research organizations, a new type of 501(c)(3). The philanthropic activities, including grant-making and scholarship programs, of the original organization were placed in a new, private foundation, which carried the name traditionally associated with the organization's community giving, The Samuel Roberts Noble Foundation.

The Buckner era also saw Noble expand its educational and community service efforts, dive deeper into cover crop research, establish the Land Stewardship Program, increase its national collaborations, and re-establish soil health as a core competency.

Buckner brought together farmers, ranchers, soil scientists, economists, environmental interests, agribusinesses, nongovernmental organizations and government agencies together to examine the role of soil health. Their work identified the need for a national organization to serve as a hub for measurement standards, economic data and coordinated research. Noble then launched the Soil Health Institute in 2015. The soil-focused nonprofit aims to safeguard and

enhance the vitality and productivity of the soil through scientific research and advancement.

In recent years at the Noble Research Institute, Buckner has been spearheading the creation of the Ecosystem Services Market, an ambitious national effort to incentivize farmers and ranchers to improve soil health systems through a large-scale program that would finance, generate and sell ecosystem service credits from agricultural working lands.

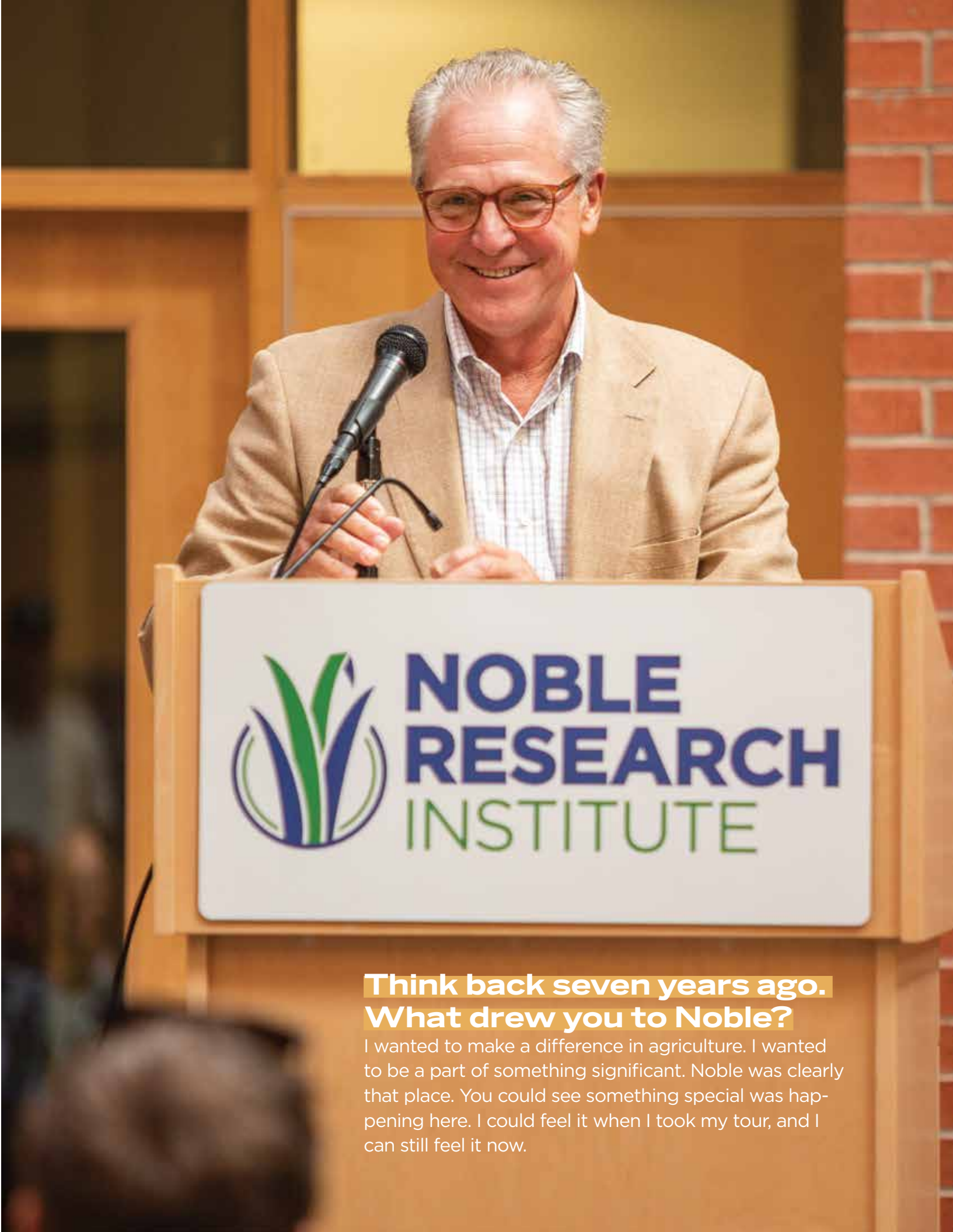
"I am so proud of what we've accomplished over the past seven years," Buckner says. "As our founder once said, 'No individual accomplishes anything worthwhile by his effort alone.' I know that to be true. Any success I have experienced is a direct result of the tremendous men and women I've worked with every day here at Noble and our collaborators across the country."

Looking forward to 2019, Buckner anticipates spending more time with his family, especially his two grandsons, but the itch to continue advocating for agriculture has yet to subside. Interpretation: The last act of his career may have a curtain call.

On an unusually quiet fall day, Buckner returned to the black, meeting table in his office for another question-and-answer session with *Legacy* magazine. Seven years prior, he sat in the same chair, introducing himself and outlining his thoughts and hopes for Noble.

This time around, Buckner reflected on a tenure gone too fast, taking stock of accomplishments, musing about his wife and grandsons, and discussing opportunities that may lead to a career encore (or two).

RIGHT: Bill Buckner joined the Noble Research Institute, at the time called the Noble Foundation, in 2011.



Think back seven years ago. What drew you to Noble?

I wanted to make a difference in agriculture. I wanted to be a part of something significant. Noble was clearly that place. You could see something special was happening here. I could feel it when I took my tour, and I can still feel it now.



What makes Noble special in your eyes?

Our people. Our mission. Our founder's vision. We have 380 extraordinary people from 25 different countries who have come together to pursue Lloyd Noble's vision of providing solutions to great agricultural challenges. You can't find this level of expertise and focus on agriculture anywhere else.

Do you still feel the same today?

More so. Noble is a once-in-a-career opportunity. When you arrive and become part of the organization, you realize you're part of something much bigger than yourself. You're a living legacy, and that's exciting.

How has Noble grown and changed during your tenure?

We've changed in so many ways. Back when I started, we were just tiptoeing onto the national stage. Today, thanks to the hard work of our employees and Leadership Team, we're clearly considered a national thought leader in agriculture. I also think we're more focused as an organization. We've identified what

great challenges we'll pursue. We've honed our research efforts around these challenges. We've built new processes and internal collaborations that link all activities of the Institute together.

Why is Noble important to advancing agriculture?

Noble demonstrates the critical nature of private investment into agricultural research. The federal government can only do so much. Mr. Noble, our founder, lived through the Dust Bowl and established our organization in 1945 as a way of safeguarding the soil and fostering land stewardship. We need the next generation of philanthropists to follow his example and become passionate about helping solve the challenges that face agriculture.

Additionally, Noble has become the place to convene people — people from all sectors, backgrounds and philosophies — to find common ground, rally around a common goal and provide solutions that advance agriculture. We unite people and create critical strategic alliances that just would not happen without us.

Why are these alliances important?

Our founder once said, "You can never run alone." The challenges facing agriculture require more than any one individual or single organization can handle. We can no longer play in our silos. It is critical to form collaborations across industries to build competencies and bring in fresh perspectives. That is why Noble's convening efforts are so critical. We are

ABOVE: Bill Buckner speaks with postdoctoral fellows as part of a reception to recognize them for their contributions to the Noble Research Institute. OPPOSITE PAGE, TOP: Bill Buckner honors Liz Aldridge (left), executive assistant to the CEO, for 25 years of service in 2016. RIGHT: Bill Buckner thanks retirees of the organization during a special, annual luncheon.



a neutral space where people can come together, set aside their differences and work toward a common goal.

How has Noble helped the agriculture industry respond to consumers?

We're good listeners. We seek out and listen to the industry, consumers and producers. You must hear what all three sectors are saying to understand their challenges, needs and hopes. Consumers want more transparency in food production. So Noble is currently conducting a national project with four industry partners — McDonald's, Tyson, BMG and Golden State Foods — that examines the entire value chain of the forage-based beef cattle system.

We are looking for gaps in the communication process and testing specific metrics as beef moves from one stage in the system to the next. This entire project is about transparency, traceability and improving the methods used throughout the entire process.

What is the most significant challenge facing agriculture today?

There are countless natural, economic and social challenges facing agriculture. Of course, there always has been and there always will be challenges. That's part of being in agriculture.

However, the most significant of these challenges is a general global lack of understanding and appreciation for our soil. In the 15th century, Leonardo da Vinci said, "We know more about the movement of the celestial bodies than the soil underfoot." More than 500 years later, this statement unfortunately remains true.

Why is soil so critical in your mind?

Three reasons: It is the foundation of our world, it's disappearing quicker than we can imagine and it holds the answers to so many of society's problems. According to the United Nations' Food and Agriculture Organization, 33 percent of our world's soils are moderately or highly degraded. Many agricultural soils have lost 30-50 percent of their precious organic carbon, thereby reducing a soil's capacity to withstand drought, naturally suppress plant pathogens, filter



There are so many other challenges facing agriculture. How do you address them all?

Like we always have — through collaboration, research, innovation and technology, and good old fashioned hard work. That's the thing about the agriculture sector: We have faced insurmountable challenges, like the Dust Bowl, and we have found our way through.



chemicals, and provide nutrients to plants and to the animals that eat them (including humans). Like our founder said, "No civilization has outlived the usefulness of its soils. When the soil is destroyed, the nation is gone."

What do you mean the soil holds answers to society's problems?

A teaspoon of healthy soil can hold 1 billion bacteria, several thousand protozoa, and a wealth of fungi and nematodes. This biome holds the potential to provide humanity with new antibiotics, ways to effectively store large quantities of carbon (which leads to cleaner water and a more resilient planet), and the potential to use less water and synthetic inputs in food production. This is why we must all become fervent advocates of the soil.

How did the creation of the Soil Health Institute come about?

In 2013, we launched the Soil Renaissance to advance soil health and make it the cornerstone of land use management decisions. The Soil Renaissance brought together people from all walks of life and with all different perspectives and opinions to examine the role of soil health. Their work identified the need for a national organization to serve as a hub for measurement standards, economic data and coordinated research. Thus the Soil Health Institute was born.

Is launching the Soil Health Institute your proudest accomplishment?

That is very difficult to answer because we've accomplished so much in the last

seven years. I'm proud of everything we've done at the Noble Research Institute, and I appreciate the generosity of the Noble family to focus our efforts on serving agriculture. The Soil Health Institute was certainly a major milestone for our organization and it proved that we could think outside the box, rally around a need and actually make it happen. This was both an internal and external team effort. We proved we could work across the industry for the greater good.

What technologies excite you and why?

Today's technology is redefining agriculture. UAVs, drones, sensors and precision agriculture technologies all provide farmers and ranchers with more tools and information than they've ever had before. More information leads to better

LEFT: Bill Buckner led the organization in collaborating with farmers, ranchers and national groups, including the Foundation for Food and Agriculture Research, to further investigate cover crops as an opportunity to boost soil health and productivity. ABOVE: Bill Buckner recognizes employees, including postdoctoral fellow Barbara Nova-Franco, Ph.D., (standing, left) for their achievements and contributions to the Noble Research Institute, agriculture and the science community.



decisions. Better decisions lead to more efficiency and improved land management. For the first time in history, we're able to look at the entire ecosystem and make holistic decisions.

Of course, we cannot forget the lessons we have been taught. Cover cropping is a technique we learned from our grandparents and great-grandparents. Cover crops are regaining rapid acceptance worldwide because of the value they bring to protecting the soil and creating healthy soil biomes, which results in increased production and decreased need for inputs.

When we combine the best of our heritage with today's newest innovations, we will be able to provide the world with a sustainable and safe food supply.

What challenges do you still see in front of Noble?

Noble can never be seduced by success. We must never rest on past accomplishments; rather, we must constantly push the boundaries forward and look for ways to improve what is already great.

Why was this the right time to retire?

There is no wrong or right time to retire. There is just an internal awareness that you're ready to go to the next chapter of your life. For me, I've spent a career traveling the world. And for the past seven years, I've been away from my family on this grand adventure in Oklahoma. I'm ready to be home. I have a beautiful wife, four adult children, two sons-in-law and two grandsons. They are my motivation, and I want to spend as much time as I can with them.

What has been your favorite memory at Noble?

There's no way to pick just one. All my favorite memories involve the people here at Noble. I will never forget playing softball in the rain or hashing through a challenging problem in a boardroom. I'll always remember turkey hunting with some of our ag guys and laughing with employees at the Christmas party. I love being a part of teams, and here at Noble I've had the best team of my career. I will miss them all very much.



What has been your greatest lesson learned?

Patience. (He laughs.) When an idea hits, I want to get moving right then. I have always been results-driven, but my years at Noble have helped build more patience in me — somewhat. I still like to get things done. (He laughs again.)

What would you change about your time at Noble?

There are a thousand decisions that as a president you look back and see how you could have done it better, but that's part of being a leader. You know that you can't change the past, so you focus on the future and try to be the leader your organization deserves.

What has your time at the Institute meant to you?

Working at the Noble Research Institute has been a blessing and an honor. I've had the privilege to help shepherd this great organization's legacy for seven years while working with a team of skilled, intelligent and dedicated individuals. It's one of the highlights of my career and life.

What do you hope your leadership has meant to the Institute?

I hope that I have made as big a difference in the organization as it has made in me. I came into work every day inspired by the vision of our founder, by our incredible mission and by the people who work here. As a team, we have made great strides. I am proud to be a part of everything we've done together, the risks we've taken and the projects that will continue to impact people long after we're all gone.

What words of advice do you have for the next president?

No advice. The next president will find his or her own path and — I'm quite certain — will excel. We have a great board and amazing employees, so success

is assured in my mind. I just have a friendly request: Noble is a rare and special organization, so take care of this place and these employees.

So are you really retiring?

From full-time organizational leadership? Yes. From supporting agriculture? No. There is too much left to do.

So what's next?

The encore of my career will be spent advancing soil health through the Soil Health Institute and the various for-profit boards on which I serve.

And when you're done with these projects will there be another encore?

I'm not sure what "done" means. I'd like for you to elaborate, but I have to get going. Too much to do! 🌱

OPPOSITE PAGE, TOP: Bill Buckner visits with participants of the Lieutenant Governor's Invitational Turkey Hunt in 2016. OPPOSITE PAGE, BOTTOM: Bill Buckner plays softball as part of the Parkway Series, which brings together all employees for a day of fun and competition, in 2015. ABOVE: Bill Buckner looks forward to spending time with family and continuing to support agriculture after he retires as Noble Research Institute president and CEO at the end of 2018.

MORE THAN A CEO

As Noble Research Institute President and CEO Bill Buckner retires, his kindness, friendship and generosity leave as large a mark as his on-the-job accomplishments.

by Jimmy Emmons, farmer and rancher from Leedey, Oklahoma

Bill Buckner is a type of man you just don't see in this world anymore. His work ethic, kindness and vision for the future of agriculture are one of a kind. He possesses business sense and common sense, both rare characteristics these days. He has a big heart for his employees, and he passionately supports all of us farmers and ranchers.

Bill has become one of my most prized friends in the past several years. He is true to his word and is always willing to step up and help.

This year is a perfect example. On the day that Ginger and I received the Leopold Conservation Award, a wildfire broke out in Dewey County, Oklahoma, near our home.

“[BILL] HAS BEEN INSTRUMENTAL IN MOVING THE NOBLE RESEARCH INSTITUTE TO A NEW LEVEL IN ONLY SEVEN YEARS. HE HAS BEEN A GREAT CEO, A GREAT ADVOCATE FOR AGRICULTURE AND A GREAT FRIEND.”

—Jimmy Emmons

When Bill heard about the fire, he immediately called to check on us, and he continued calling each and every day. On the fourth day, I received a call from Bill that I remember well. He said, “Jimmy, how is it up there?”

“Well, Bill, it is hell around here,” I said. “I think the whole county is going to burn.”

Bill said, “OK, we’re loading up generators and supplies, and we’ll be there tomorrow.” The next morning, Bill and Noble consultant Jim Johnson showed up just as he had promised. Ginger and I were overwhelmed by his generosity and compassion. Bill and Jim stayed for two days, working and helping us as we were trying to rebound from the devastation. We lost half of our rangeland and some equipment, but hard times are always eased by friends like Bill.

When Bill announced his retirement, I told him I was happy for him but sad at the same time. Replacing Bill will be a difficult task. He has been instrumental in moving the Noble Research Institute to a new level in only seven years. He has been a great CEO, a great advocate for agriculture and a great friend. 🌱



THE MODERN AGRICULTURE ADVOCATE

Throughout his career, Bill Buckner has emphasized the importance of modern agriculture and prioritized soil health.

by Jay Vroom, chief information officer of Vroom Leigh Agriculture, LLC and former CEO of CropLife America

Bill Buckner has lived his life and worked his entire career as an advocate for modern agriculture. Bill has been learning about, sharing, and advancing modern agriculture techniques and technologies at every stage of his life, from his Missouri farm upbringing and his education at the University of Missouri to his working life at Bayer and the Noble Research Institute.

As chairman of the board for CropLife America from 2009 to 2011, Bill brought focus to members of the crop sciences industry. He showed that clarity of communication was (as it is today) essential for society and government to “get” the fact that agriculture has made tremendous advancements, especially since World War II — and that these advancements better all who eat and our environment.

Bill supported opinion research which clearly showed that the American public held only negative views of the science and technology that is agriculture today. Under his leadership, we perfected a “modern agriculture” brand and supported the creation of a communication outreach plan. We then pivoted to our many allies, partners and related constituencies to gain alignment for this messaging approach.

All this effort was captured in a cover story by CropLife magazine in the fall of 2010. In the article, Bill says, “There is a collective need for all in agriculture to communicate a modern agriculture message.” And so it began.

The concepts that Bill’s leadership helped frame almost a decade ago are still a core part of public outreach today.

When Bill wrapped up his commercial career at Bayer, he moved on to expand his advocacy for modern agriculture in his role at the Noble Research Institute, reaching out and connecting many not-for-profit partners, government agencies, and other private and public research entities.

From my perspective, the single most profound focus of this chapter of Bill’s work is expressed in two words: soil health. Of course, Bill inherited an amazing legacy of soil stewardship at Noble, but he took that legacy — and his own lifelong commitments to advancing farming productivity and reducing environmental footprint — to do something more. Significantly more.

First Bill led the Noble Research Institute and the Farm Foundation to join forces on the topic of soil health in the modern science context. He engaged a broad cross section of stakeholders from production agriculture (farming and inputs suppliers), governments, academics, environmental groups and more to form the Soil Renaissance.

The work of the Soil Renaissance resulted in identification of the need for more research into the frontier of soil health. Not satisfied with just defining this need, Bill did something about it, which led to the formation of the Soil Health Institute. Now in its third year, the Soil Health Institute is supporting substantial new research to improve the health of our soils.

I can’t wait to see where he’ll put his energies next. But as he wraps up his role at Noble, it is time to pause and say, “Thank you, Bill Buckner.” 🌱



A NATIONAL LEADER FOR SOIL HEALTH

Bill Buckner is driven to benefit the agricultural community, starting with the soil.

by Wayne Honeycutt, Ph.D., Soil Health Institute president and CEO

It is widely known that Bill Buckner's vision, commitment and leadership have significantly contributed to the surge of national and international interest in soil health. In 2013, Bill spearheaded the Soil Renaissance (jointly led by The Samuel Roberts Noble Foundation — now called the Noble Research Institute — and the Farm Foundation). At that time, the die was cast for Noble to emerge as a leading organization in the soil health movement under Bill's stewardship.

While leading those efforts to identify key gaps and priorities in soil health, Bill frequently traveled to Washington, D.C., to ensure the U.S. Department of Agriculture (USDA) was informed, engaged and supportive. In the process, he brought the Noble Research Institute to USDA. With its national scale and farmer focus, USDA found a ready partner in Bill. Recognizing that national impact would require long-term commitment and leadership, in 2015, he then worked to establish the Soil Health Institute.

While leading these efforts, Bill made it abundantly clear that all who wanted to participate could do just that. Organic farmers, conventional farmers and ranchers, scientific associations, individual scientists, trade associations, private labs, and others were all given the opportunity with only one caveat: They must contribute their ideas and expertise with a guiding principle of working for the common good of all farmers and ranchers.

Those who know Bill know that he is driven to benefit the agricultural community. He is also drawn to the big challenges, challenges that most people would never dare tackle but that if effectively addressed could have far-reaching benefits. He does not shy away from difficult issues like conducting a national soil health assessment, establishing ecosystem service markets or understanding the effect of chemical inputs on the soil microbiome. Instead, he jumps in with both feet; and while describing a vision of what is possible, he inspires others to jump in too.

It may not be widely known, but it should be noted that one of the many reasons why Bill is so effective in leading the soil health movement is because he practices what he preaches. On family farms in Missouri and North Carolina, he experiments with cover crops and other soil-health-promoting practices, experiencing the same trial and error so often reported by other farmers. Through this process, he provides a level of ground-truthing that has always kept him focused on giving farmers the knowledge they need to make well-informed decisions appropriate for their own particular farms and their own personal situations.

It is difficult to imagine where the national soil health movement would be today if not for the visionary leadership of Bill Buckner. We, and future generations, owe a great deal of gratitude to Bill for all he has done to ignite and fuel this effort. While we celebrate his retirement with him, we are heartened to know that he will continue serving the agricultural community as an effective advocate for soil health, ensuring that his legacy, and indeed the legacy of Lloyd Noble, will continue well into the future. 🌱



A PASSION FOR ADVANCING COVER CROPS

During the last seven years, Bill Buckner has raised attention for cover crops and brought people together to tackle the challenges facing farmers and ranchers.

by Rob Myers, Ph.D., regional coordinator for North Central Sustainable Agriculture Research and Education (SARE) at the University of Missouri

First became acquainted with Bill Buckner in 2013 during the process of organizing the first National Conference on Cover Crops and Soil Health. Bill reached out to let me know about the Soil Renaissance, an effort led jointly by what was then called the Noble Foundation and the Farm Foundation. It quickly became clear that Bill was a strong advocate of not only the broad aspects of soil health but also cover crops as a key soil health practice that could impact millions of acres. Bill ended up being a luncheon speaker at the conference, and it was the first of many times in the last five years that I've heard Bill deliver an inspirational message about regenerating our soils through practices such as cover crops.

Bill's inspirational role has not been limited to public speaking. He's been an extremely effective and passionate advocate for cover crops and other soil health approaches by getting people to come together in identifying barriers to overcome and goals for adoption. For example, he has catalyzed multiple strategy meetings of leading cover crop experts, collectively identifying a consensus target of 100 million acres of cover crops in the U.S. and planning for how to best reach that target.

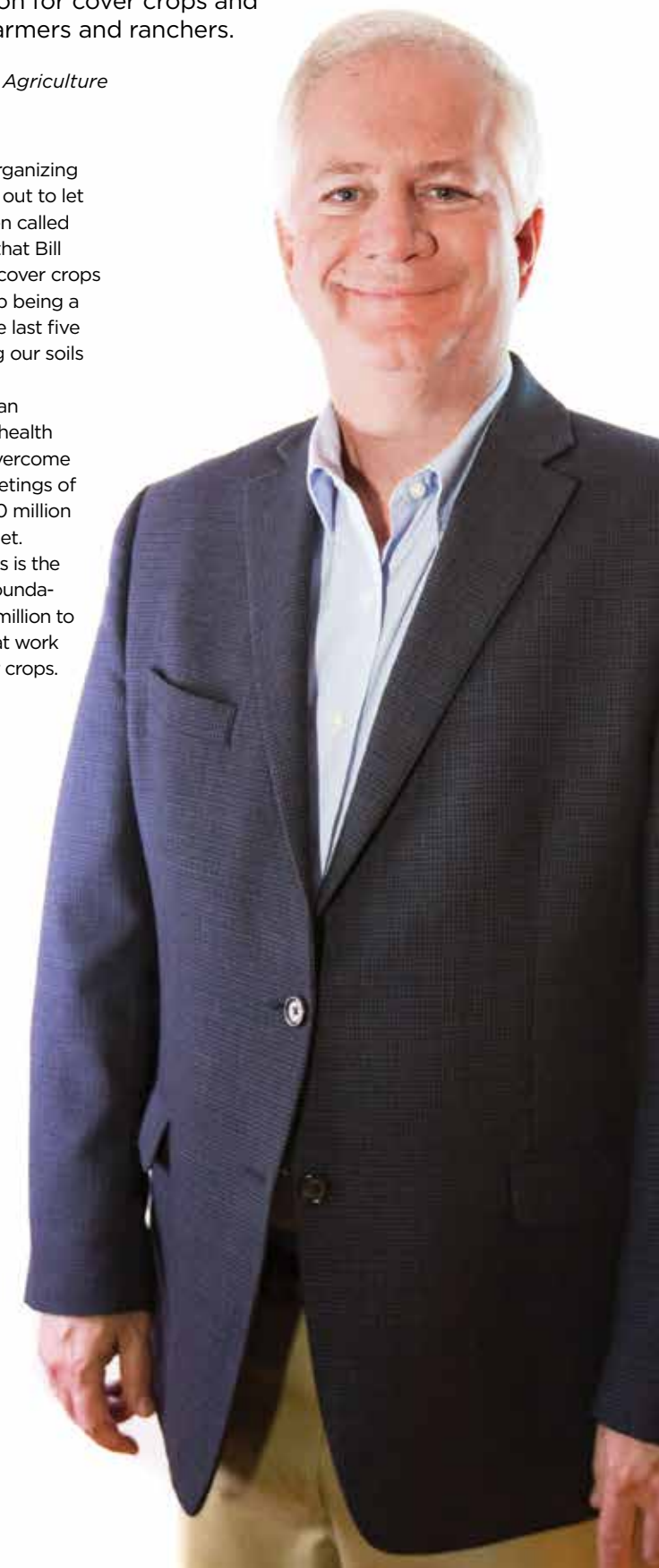
One of the key barriers to cover crop expansion that Bill has helped address is the need for new, locally-adapted cover crop varieties. By teaming up with the Foundation for Food and Agriculture Research, he was able to create a fund of \$6.6 million to advance cover crop breeding and development across a five-year period. That work got underway in 2017 and holds much promise for future progress with cover crops.

“PROGRESS ON COVER CROPS HAS SIGNIFICANTLY INCREASED BECAUSE OF BILL'S OUTSTANDING LEADERSHIP EFFORTS...”

—Rob Myers, Ph.D.

Bill's commitment to the use of cover crops has extended to his own family farm in central Missouri, which he jointly manages with his brother. Working with their tenant farmer to implement cover crops across the farm, they saw benefits with soil organic matter improvements, protection of the soil from erosion and general soil health. Those first-hand experiences with cover crops have allowed Bill's message about cover crop benefits to resonate with farmers as well as public- and private-sector agriculture organizational leaders. Bill has managed to elevate attention to cover crops within national groups such as the American Seed Trade Association and promote increased industry action on cover crops.

Progress on cover crops has significantly increased because of Bill's outstanding leadership efforts, including his great motivational skills in interpersonal settings, his inspirational messages in public speeches, and his ability to see the big-picture challenges in agriculture. In fostering diverse partnerships and shared vision, Bill has catalyzed significant conservation improvements on thousands of American farms and ranches. His passion, efforts and actions have created a lasting impact upon both countless people and our land, creating a brighter future for all of us. 🌱



THE FIRST THREE YEARS

In 2015, Lee Wayne Stepp embarked on a journey to improve his southwestern Oklahoma soil through cover crops and no-till. Three years later, he shares some of the ups and downs and why he is keeping to the path.

By Courtney Leeper

Lee Wayne Stepp grows wheat for his cattle to graze through the winter. In 2015, he began no-tilling these wheat fields and incorporating different forages into his rotations to improve soil health.



Lee Wayne Stepp had enough of caterpillars crunching through his wheat pasture. Each fall was bringing more armyworms hungry for the forage Stepp planted for cattle on his 3,700-acre farm in southwestern Oklahoma. Stepp was also fighting fungal and bacterial diseases along with other insect pests in his fields.

By the early 2010s, Stepp knew his wheat, which has been his family's staple crop for more than 50 years, needed reinforcements. During a search for a crop to rotate with wheat, he came across the concept of cover crops.

Traditionally, Stepp plants wheat in the fall. Cattle eat the young forage through the winter and into the spring, and then the cattle are sold and the ground lies bare until wheat is planted again in the fall. But with cover crops, one or more different crops are planted between seasons of wheat.

The idea is to keep the ground covered year-round and to expand biodiversity in the soil. Just like a successful community

needs people with different skills — builders, teachers, doctors — the soil gains strength when a variety of species contribute to its underground society.

WORKING SMARTER, NOT HARDER

Stepp hoped to use cover crops to improve his forage production and to reduce costs associated with curbing pests and diseases. First, like anyone looking to adopt cover crops, he faced a question, "What do I plant?"

"Every farm is going to be different," says Jim Johnson, the Noble Research Institute soils and crops consultant whom Stepp called upon for advice.

The pair developed a three-year rotation. Every third year, Stepp would switch out his wheat for a multispecies mix his cattle could graze. Every year, he would plant a mix as a cover crop to grow in the summer.

During these conversations, Johnson also encouraged Stepp to try no-till. Tillage has long been thought to be the



Jim Johnson, soils and crops consultant, has tested more than 100 CROPS currently marketed as cover crops to see what grows best in the Southern Great Plains.

Find out what he's learned at www.noble.org/the-great-cover-crop-test



BUILD SOIL HEALTH, FIGHT ARMYWORMS?

Armyworms are a major foe for forage producers on the Southern Great Plains. It's too early to proclaim cover crops a solution for fall armyworm infestations. However, some producers, including Lee Wayne Stepp from Comanche, Oklahoma, in 2017, have reported experiencing little to no armyworm pressure in their wheat pastures after a diverse, mixed-species summer cover crop. The anecdotal evidence is enough to pique the interest of Brett Peshek, a Green Cover Seed representative who is looking further into the matter. Peshek warns growers that there is no guarantee they won't face armyworm issues if they plant cover crops. But cover crops, through increased biodiversity, can attract beneficial insects that act as natural predators to pests like armyworms. Learn more in his article at www.greencoverseed.com/build-resistance-armyworms.



Lee Wayne Stepp feeds cattle on his ranch near Comanche, Oklahoma, on April 12, 2018.



ASK THE EXPERT: JAMES ROGERS, PH.D.

James Rogers, Ph.D., Noble Research Institute associate professor of pasture and range, is currently investigating how cover crops and no-till impact the production and economics of winter wheat. The system is commonly used to graze cattle from fall through spring in the Southern Great Plains.

Q: Why does it take so much time to see results from soil-building practices like no-till and cover crops?

A: I don't think there are any simple answers, but for starters, when you look at the volume of soil, there are 2 million pounds of soil in the top 6 inches of 1 acre. To change that soil structure, it's going to take a lot of forage mass and time. The amount of time it takes will also depend on the health of the soil to begin with.

From what we are seeing in our research field plots, one of the greatest immediate benefits of cover crops (even more so than no-till) is erosion control. Seeing soil wash away is what really hurts me. When soil washes, you're moving nutrients and organic materials. And once it's gone, it's gone. When we had heavy rains in late September/early October, we saw the cover crop hold the soil in place. The rain pushed soil from our tillage fallow (no cover crop) plot to a neighboring tillage cover crop plot, where it just stopped.

There is no doubt that improving soil health is beneficial for both producers and society at large, but there are challenges associated with adopting soil-building practices like cover crops and no-till. Every producer will have to figure out how to incorporate these practices in ways that work on their operation. Our research aims to help inform their decision-making by looking at questions they might face, like when to graze and how long to grow covers, from the perspectives of soil health, crop and cattle performance, and economics. 🌱

best way to prepare soil for planting. But in the process of breaking ground and burying weeds, plowing reduces the richness of the soil microbial community. And once left bare, freshly turned soil is easily swept away by wind and water.

"I've plowed my whole life, and my dad and grandpa plowed their whole lives," Stepp says, recalling dirt-covered tractors as a symbol of hard work. "But when you see the rain wash out the ditches and the diseases you have to be fighting, it seems like you're making more work than it has to be."

A DIFFERENT MINDSET

Johnson helped Stepp select his first cover crop, a mix of turnips, black oats, sorghum-sudan and triticale, which Stepp planted in 2015. The same year, he began working toward going 100 percent no-till in three years.

"The first year was rough," Stepp says. "My goal is to reduce inputs while increasing outputs, and that doesn't happen in Year 1."

While wheat production fell by as much as half in Stepp's no-till fields that year, the sorghum-sudan cover crop grew taller than his tractor. So, in addition to buying no-till planting equipment, Stepp had to put a GPS on his tractor to help him "see" when sowing wheat into the cover crop in the fall.

The unruly vegetation was enough to garner skepticism from neighbors. People asked why he wasn't brush-hogging or baling it for hay, Stepp says.

"It's a completely different mindset," Johnson says. "The tendency is to want to use every bit of what you plant, but we want to leave some of it to feed the soil. The difficulty is you don't get paid for feeding the soil. You get paid for putting beef across the scale."

MORE TIME FOR CATTLE

Stepp saw some improvement in his no-till fields during the second year, but he anticipates each field will need at least three to five years to make the transition.

While wheat production is down in some fields for now, the cover crop provides a source of forage that Stepp typically wouldn't have in the summer. As a result, he's been able to tend more cattle, which he says is his favorite aspect of the operation.



Lee Wayne Stepp and his border collie, Abbie, check cattle. Abbie works alongside Stepp, who has trained her from a puppy.

"Dad always said you didn't need to have stockers in the summer because you couldn't take care of them. You were busy plowing to get ready for the stockers to come in the fall," Stepp says. "But guess what? Now we'll have time to see to stockers in the summer."

In April 2018, Stepp welcomed his third bunch of summer stockers (essentially the teenagers of cattle) to the farm. In May, he planted his cover crop. By June, drought dried up the land. Most of the cover didn't sprout until rains returned in September.

It was the first summer in Stepp's life that no field on the farm was plowed, but drought meant he spent much of his extra time baling hay to feed his cattle for the coming winter. While the stockers weren't able to enjoy the cover crops until their last two weeks on the farm, some of Stepp's home-raised calves grazed them in September.

"I was disappointed, but we still wouldn't have been able to run as

many calves if we hadn't had the cover crop," Stepp says. "That's just part of it. It's not the first time I've planted a crop and didn't get a good stand."

To provide even better cover crop options for farmers and ranchers, the Noble Research Institute and the Foundation for Food and Agriculture Research are funding research to improve plants for use as cover crops and forage.

Field tests will take place across the country. Learn more at www.noble.org/ffar

SOIL HEALTH IS AN INVESTMENT

This year, it wouldn't have mattered if the ground had been no-tilled or plowed, Stepp says. But he looks at improving soil health as an investment that could help him better weather future drought.

"As you get organic matter back into the soil, it's going to hold more moisture there," Stepp says. "No-till isn't going to solve a drought, but it could help us survive drought better."

But it won't happen overnight, Johnson says. He encourages producers to start small and to surround themselves, even if only online, with others who are on the same journey. Be patient and persistent, he adds. It will take time for the weakened soil to gain strength.

"It's been difficult at times, but I see how no-till and cover crops can help me be more effective," Stepp says. "I want to be better at what I'm doing, so I'm going to keep down this path." 🌱



Elison Blancaflor, Ph.D., professor of plant cell biology, explores how roots grow in harsh environments, including reduced-gravity situations. His work could help develop space-resilient plants as well as more resource-efficient plants for Earth.

SPACE ON EARTH FOR PLANTS IN SPACE

Elison Blancaflor, Ph.D., has sent plants into orbit twice thanks to NASA grants. Now he gets the opportunity to study plants in space-like conditions on Earth.

by Arielle Farve

Millions of twinkling stars peppered the night canvas above Elison Blancaflor as he squinted at the once-lopsided pineapple stem. Somehow the plant had corrected itself, fascinating Blancaflor, who worked as a pineapple field supervisor in the Philippines. He shifted his gaze up while he mused, “How did the plant know how to correct its growth so it could stand back up?” The stars flickered as though winking to assure the future scientist that he would one day find the answer.

He’s expanding on the same question 30 years later. Blancaflor studies root growth as a Noble Research Institute principal investigator and professor. He has made a remarkable number of breakthroughs in his career and continues to patiently weave discoveries into a grander tapestry of plant knowledge. His masterpiece will create more resilient crops not just on this planet but beyond.

Blancaflor has devoted more than a decade to understanding how plant roots grow down toward the soil, a process called gravitropism. It’s critical work because gravity not only anchors plants but also guides root systems to nutrients



Elison Blancaflor, Ph.D., (right) and postdoctoral fellow Ana Paez-García, Ph.D., dig up roots from a Noble Research Institute farm field for studies related to understanding how root systems develop.

and water and shoots toward light for photosynthesis — all of which is essential for agriculture.

His explorations into gravity’s impact on plant growth long ago surpassed the bounds of what is possible on Earth. It’s challenging to understand or improve plants’ response to gravity if

it’s always present.

But the stars aligned for Blancaflor to send seedlings soaring into space. Blancaflor’s work has implications for NASA’s space colonization ambitions because astronauts will depend on plants when missions launch them millions of miles away from the nearest grocery store.

Encountering Different Environments

NASA has partnered with Blancaflor for 11 years. Together, this dynamic duo has grown plants in space twice. Blancaflor discovered that without the force of gravity to guide root systems and shoots, plants craft ways to grow in an environment they've never before encountered. He's recently received two additional NASA grants to replicate his interstellar discoveries with technology on Earth.

"During spaceflight we found that a number of plant processes were altered by microgravity," Blancaflor says. "They responded to the new environment by changing the expression of genes related to building the cell wall, a component of the plant that keeps it upright and mechanically strong. Imitating reduced-gravity conditions on Earth is a more convenient and cheaper way to validate genes that control plant growth in space so that we can design more spaceflight resilient plants."

Harsh environments may no longer be such a significant adversary to agriculture. Blancaflor's discoveries could bring up a generation of plants tailor-made to thrive in extreme environmental conditions of space. If plants can be engineered to survive in space, then they should flourish on Earth, which could contribute to world food security.

simulator. Plants slide into a cylinder suspended above the rectangle. The plants rotate hypnotically as the instrument randomizes gravitational direction. NASA used the Noble-built clinostat to design some of the equipment at the Kennedy Space Center Microgravity Simulation Support Facility, or MSSF, where Blancaflor will move his experiment from DIY to high-tech.



“... I dreamed of having greenhouses in space or on Mars. Maybe the research we're doing can help design the ideal space plant.”

—ELISON BLANCAFLOR, PH.D.

Blancaflor will be a nomad scientist for the next three years as he routinely journeys the 1,286-mile pilgrimage from the Noble Research Institute to the Kennedy Space Center. While flames leap from rocket boosters to blast them out of atmosphere, Blancaflor and his research team will launch their own celestial mission. Behind pressurized doors,

they will conduct some of the most painstaking work critical to the future success of space exploration.

"In space, astronauts have more things to do than take care of plants," Blancaflor says. "With the simulator, we can be more hands-on with the plants and watch them more closely."

True microgravity is impossible to mimic on Earth. Rather than eliminate gravity, the MSSF neutralizes its influence with a counterforce. This exposes plants to near weightlessness without the expense of space travel. Blancaflor is among the first wave of scientists to conduct experiments at the MSSF.

Galactic-Sized Solutions

For the Noble Research Institute, this experiment further fulfills its charge to deliver solutions to great agricultural challenges.

"The research we are doing is only a small but a significant part of the great challenges the Noble Research Institute is working to overcome," Blancaflor says. "We feel that learning about how plants put down roots on Earth and in space will address great agricultural challenges by positively impacting soil health and improving the crop's efficiency in acquiring resources it needs to grow."

Blancaflor's work also advances NASA's mission to pioneer the future in space exploration. His results could mean that living away from Earth isn't such a far-off dream. Science fiction is barely ahead of space exploration. If astronauts are going to embark on long-duration space missions, they're going to need some veggies.

"When I watched the film *The Martian*, I dreamed about having greenhouses in space or on Mars," Blancaflor says. "Maybe the research we're doing can help design the ideal space plant. I don't even know if I'll be around to see that."

Blancaflor's curiosity burns as brightly as the stars glittering in their heavenly finery over the pineapple fields. When the International Space Station glides above him, he intentionally scours the sky. If he doesn't spot the vessel, he gazes at the stars while they flicker like pinpricks on a black curtain.

They are still winking. 🌌

Bringing Space to Earth

Blancaflor's surroundings have advanced along with his questions. Pineapple rows have given way to shelves bedecked with lab equipment in his state-of-the-art laboratory at the Noble Research Institute. Constellations of neatly labeled jars with colorful tops adorn workstations. Family photos and children's drawings garnish the industrial countertops. Machinery hums rhythmically. Pipettes drip fluid from one tiny tube to another.

One primitive object rests inconspicuously among the sophisticated technology. The wooden open rectangle resembles a B-grade middle school science project. This unassuming gadget, called a clinostat, functions as a microgravity

DO-IT-YOURSELF



A TASTE OF THE WORLD

When the Noble Research Institute community gathers for a potluck meal, you'll smell the aroma of Indian spices and see Chinese dumplings next to European specialties. With people from 20-plus different countries coming together to deliver solutions to great agricultural challenges, the annual International Luncheon has become a favorite way to raise money for local charities and educational organizations. In 2018, the Noble community raised \$1,360 for area 4-H programs (with matching dollars from the organization). This year's crowd favorites included Yuhong Tang's Thai chicken curry (see page 46), Lia Kouri's Greek salad, Suresh Bhamidimarri's mint-infused coconut rice (see page 44) and Nikki Charlton's Baklava. We can easily say these Noble scientists are also great chefs. 🍴

Visit the Noble kitchen and watch our chefs in action. To see Suresh Bhamidimarri's coconut-infused rice, go to www.noble.org/coconut-infused-rice. For Yuhong Tang's Thai chicken curry, go to www.noble.org/thai-chicken-curry.

Mint-Infused Coconut Rice

Suresh Bhamidimarri, Ph.D., a newcomer to the International Luncheon, shares his fan-favorite recipe for a twist on classic South Indian coconut rice.

INGREDIENTS

- 2 cups long grain or Basmati rice, dry
- 4 cups water
- 1 fresh coconut or 1 package unsweetened coconut flakes
- 1 can coconut milk
- 2-3 sprigs mint, leaves only
- 2-3 serrano peppers, chopped
- 2-3 sundried Kashmiri chili peppers
- 1 teaspoon black mustard seeds
- 1 ½ teaspoons cumin seeds
- 1 ½ tablespoons cashew nuts, whole or split
- 2 ½ tablespoons coconut oil
- 1 sprig curry leaves
- 1 tablespoon split lentils
- ½ cup frozen green peas
- Salt

Yields: 4-6 servings

DIRECTIONS

Step 1: Cook the rice using a rice cooker or stovetop. You will need about 4 cups of water to 2 cups of dry rice.

Step 2: If using a fresh coconut, break open the coconut and collect the water. You won't need the water for this recipe, but it makes a refreshing drink. Separate the coconut meat from the shell and cut the meat into small pieces.

Step 3: In a blender, mix the coconut pieces, one serrano pepper (chopped), mint leaves and about a quarter of the coconut milk. Pulse three to four times or until the consistency becomes creamy with some graininess. Adjust ingredients if needed.

Step 4: Heat the coconut oil in a cast-iron pan on medium heat.

Step 5: Begin tempering the spices by placing one spice in the oil at a time in the following order: First, place the lentils in the oil and stir. Once they start browning, add the cumin seeds.

Once the cumin seeds start crackling, add the mustard seeds. Next add the chopped serrano peppers based on your desired level of heat. Then break the chili peppers in half and add them as desired. Finally, add the whole curry leaves. Throughout the tempering process, use a spatula and keep stirring the spices so that they do not burn.

Step 6: Add the coconut mint mixture to the spices and stir. Then add the rest of the coconut milk. Allow the mixture to simmer and thicken. As the coconut milk reduces, it will bind all the flavors together.

Step 7: Taste and add salt as needed. Once the mixture has thickened, add frozen green peas and mix well.

Step 8: Once peas are heated through, slowly incorporate the rice. Pay special attention to make sure the rice does not clump but comes out as individual grains. Fold the rice into the mixture on low heat. Taste and add salt as needed, and eat plain or serve with a coconut-based curry like Yuhong Tang's Thai Chicken Curry.



WHAT IS TEMPERING?

Tempering is the process of roasting whole spices in oil. It allows the essence of the spices to seep into the oil and any other foods cooked with it. The order in which you roast the spices will strongly influence the flavor of the dish. You will want to give each spice time to roast, but be careful not to burn the spices. If needed, turn the heat down.

Suresh Bhamidimarri, Ph.D., leads the Noble Research Institute Forage Legumes and Cover Crops Breeding Laboratory. He also served the organization as a postdoctoral fellow from 2007 to 2009. When Bhamidimarri is not experimenting in the laboratory, he is experimenting in the kitchen.



TWIST ON A CLASSIC

Suresh Bhamidimarri says coconut rice is a staple in South India, where he was born and raised. Every cook makes coconut rice, and the ingredients used are typically the same. However, the final product tastes different from house to house. Bhamidimarri developed this recipe through trial and error and after talking with different people about what makes their coconut rice unique. His recipe features the flavor of mint, which is not a traditional ingredient used in this rice-based dish.



CUSTOMIZE YOUR CURRY

You can adjust the ingredients in this curry based on your preferences. Not crazy about spice? Turn down the heat by using less curry paste. Want a health-conscious variation? Reduce the amount of oil and use coconut milk instead of cream. You can also exchange almonds for any other nut, like pecan or cashew, or you can leave them out altogether.



Thai Chicken Curry

Yuhong Tang's chicken curry is a long-time favorite of the Noble community. She's been cooking this dish for the International Luncheon since the event's beginnings in 2012.

INGREDIENTS

- 1 ½ to 2 pounds chicken breast, cut into thin slices
- 1 cup vegetable oil
- 1 teaspoon salt
- 3 tablespoons Thai curry paste
- 3 tablespoons sugar
- ½ cup slivered almonds or other nut (optional)
- 1 14-ounce can coconut cream
- 4 pieces citrus leaves such as kaffir lime, chopped (optional)
- Cooked white rice (for serving)

Yields: 8-10 servings

DIRECTIONS

Step 1: Set the stove to high and heat the oil, salt and curry paste in a pan. Once the mixture becomes aromatic, add in the sugar. Continue to stir the mixture until it is slightly browned.

Step 2: Add the chicken to the pan and stir fry until half-cooked. If you choose to use nuts, stir them into the chicken mixture.

Step 3: Add coconut cream, mix and cover the pan with a lid. Turn the stove down to medium, and let the mixture simmer until the chicken is fully cooked.

Step 4: Turn the heat off on the stove. With the pan still on the stovetop, add salt to your preference and mix once more.

Step 5: Dish the curry into bowls with cooked, hot white rice. Top with citrus leaves, if desired. Enjoy!



Yuhong Tang, Ph.D., joined the Noble Research Institute 13 years ago after working at the Oklahoma Medical Research Institute (OMRF) for 21/2 years. While at OMRF, the China-native learned how to make this chicken curry from the mother of a Thai co-worker and friend. Today, Tang manages Noble's Genomics Core Facility, which provides services to researchers who want to know the genetic code for individual plants and microbes.



JANUARY
15 USING PRESCRIBED FIRE TO BENEFIT WILDLIFE AND LIVESTOCK

8:30 a.m.-3 p.m. | Tues., Jan. 15, 2019
 Noble Research Institute
 Coffey Ranch
 16877 State Highway 32
 Marietta, OK 73448

Registration Fee: \$25, includes lunch

Prescribed fire is a natural process in the Southern Great Plains, where the landscape evolved under fire and grazing. Fire can improve wildlife habitat, reduce woody plants, remove thatch, and improve forage quality and quantity for livestock.

During this course, you will learn about fire behavior and plant response to burning during the dormant season. You will also learn about prescribed burn plans, fireguards, weather parameters, equipment, labor and contingency plans among other topics.

17 MANAGING YOUR PECAN ORCHARD

9 a.m.-4 p.m. | Thurs., Jan. 17, 2019
 Noble Research Institute
 Kruse Auditorium, Entry 5
 2510 Sam Noble Parkway
 Ardmore, OK 73401

Registration Fee: \$25, includes lunch

Understanding some of the best ways to manage the different aspects of your pecan trees and crop can make the difference between having a good operation and a great operation. In Pecan 101, you learned the basics for what it takes to grow pecans in the Southern Great Plains. In this course, we will build on the basic management into the advanced management practices that move a production system forward.



31 SO YOU WANT TO GROW VEGETABLES IN YOUR BACKYARD?

6:30-8:30 p.m. | Thurs., Jan. 31, 2019
 Noble Research Institute
 Kruse Auditorium, Entry 5
 2510 Sam Noble Parkway
 Ardmore, OK 73401

No registration fee

Each year, home gardeners use new methods to increase yields and minimize risks associated with growing vegetables in Oklahoma. This course is designed to introduce you to the many tools and techniques you can use to successfully grow vegetables.

At the end of the program, you will have a more complete understanding of the various practices you can use to grow vegetables in your backyard.



FEBRUARY

12 PRUNING PECAN TREES FOR IMPROVED PRODUCTION

1-4 p.m. | Tues., Feb. 12, 2019
 Basil Savage's Orchard
 21955 Savage Road
 Madill, OK 73446

No registration fee

Proper pruning and maintenance will ensure ease of operation and longevity of tree life. This field day will provide a demonstration of the different techniques used in pruning pecan trees. You will learn how to properly prune both young and producing pecan trees through in-field demonstration.

What You Will Learn:

- Proper techniques for removing limbs
- Proper tree maintenance
- Influence of pruning on pest management
- Pros and cons of wisping, hedging and thinning pecan trees

Who Should Attend:

- Pecan producers interested in learning proper pruning techniques

29 SO YOU WANT TO GROW FRUIT IN YOUR BACKYARD?

6:30-8:30 p.m. | Tues., Jan. 29, 2019
 Noble Research Institute
 Kruse Auditorium, Entry 5
 2510 Sam Noble Parkway
 Ardmore, OK 73401

No registration fee

Producing fruit in your backyard presents special challenges, including limited space and lack of resources available to commercial growers. This course is designed to help you maximize resources available to you in order to grow small and tree fruits.



FEBRUARY
22 DEVELOPING YOUR REPLACEMENT HEIFERS

9 a.m.-3 p.m. | Fri., Feb. 22, 2019
 Noble Research Institute
 Oswalt Ranch
 18414 Dixon Road
 Marietta, OK 73448

Registration Fee: \$25, includes lunch

Heifer development is the most costly management practice used to improve herd genetics. Proper heifer development is critical to improving longevity in your herd. Selecting for maternal traits is important for improving efficiency in your cow herd and complementing your production goals. This class will provide selection traits and strategies that are critical for developing heifers that match your production goals and environment.

What You Will Learn:

- How to select heifers at weaning using multiple traits (phenotypic and genotypic)
- The basic nutritional requirements for heifer development
- The proper tools for a successful breeding season
- How and when to determine pregnancy
- How to market heifers that are not retained
- The nutritional needs of a first-calf heifer



MARCH
5 MANAGING SOIL NUTRIENTS FOR PASTURES AND HAYFIELDS

1-4 p.m. | Tues., March 5, 2019
 Noble Research Institute
 Kruse Auditorium, Entry 5
 2510 Sam Noble Parkway
 Ardmore, OK 73401

No registration fee

Join the Noble Research Institute's soil and crop consultants as they discuss concepts in pasture and hayfield fertilization. Efficient and economical fertilization to increase yields while minimizing environmental risks is imperative to any operation using fertilizers. This seminar will cover the essential information you need to implement an effective nutrient management program.

For more information or to register for one of our agricultural events, visit www.noble.org/events or call 580-223-5810. Preregistration is requested. If you have other agricultural questions, please call our Ag Helpline at 580-224-6500 or submit a question using the online form at nobleapps.noble.org/aghelpline.

12 PREPARING SOILS FOR SPECIALTY CROP PLANTING

1-4 p.m. | Tues., March 12, 2019
 Noble Research Institute
 Small-Scale Agriculture
 Demonstration Area, Entry 2
 2510 Sam Noble Parkway
 Ardmore, OK 73401

No registration fee

This event will showcase techniques used to improve soil and prepare for planting fruit and vegetable crops on both a large and small scale. You will have the opportunity to see various tillage, bedding and mulch-laying equipment in action.

Procedures to be demonstrated include: primary tillage, secondary tillage, seed bed preparation, bed construction and plastic mulch application.

What You Will Learn:

- How to improve soil tillage for better nutrient availability and water holding capacity
- The difference between different types of tillage and how they are used
- How cover crops can be used for soil improvement
- The advantages associated with fruit and vegetable production using plasticulture
- Various tools and techniques available for preparing soil, including bedding and mulch-laying equipment



14 TRAINING AND CERTIFICATION FOR BEEF QUALITY ASSURANCE

1:30-5 p.m. | Thurs., March 14, 2019
 Noble Research Institute
 Kruse Auditorium, Entry 5
 2510 Sam Noble Parkway
 Ardmore, OK 73401

No registration fee

Beef Quality Assurance (BQA) helps guide the daily ranch activities of cattle producers who embrace it. The nationally coordinated, state-implemented program is designed to educate producers on the importance of best management practices, such as vaccination and medicine handling and records as well as proper nutrition for each stage of production. Other topics to be discussed include the importance of a defined breeding program, biosecurity on the ranch, proper animal handling and carcass quality.

Attendees can earn BQA certification by completing this program and a short test. The certification allows the industry to document to consumers that cattle producers are engaged and properly producing a safe, nutritious, wholesome product.

UNEXPECTED BLESSINGS

by J. Adam Calaway, editor

Thousands of people visit the Noble Research Institute each year. Wide-eyed students ready to conduct hands-on experiments. Agricultural producers eager to improve their operations. Visiting scientists, civic groups, teachers, the steady flow of people offers a familiar backbeat to the organization's rhythm.

Then Jim and Marge walked in. Parents of a friend of a friend, they visited Noble for a personal tour on a frenzied day that had exploded to-do lists across campus. Both in their 80s, Jim and Marge had no agenda other than fulfilling their curiosity.

The couple were celebrating their 67th wedding anniversary, and they had returned to Ardmore's Lake Murray for the first time since their honeymoon. They heard about this Noble Research Institute and — to quote Jim — "We wanted to see what all the fuss was about."

The frenetic morning faded as the three of us swapped stories. Me about Lloyd Noble's vision for agriculture and our programs. Them about their globe-trotting as part of Jim's military career.

We toured the campus and laughed together. They gazed and giggled and asked questions. The day's pace slowed, and my full attention focused on the present. By the time we returned to the front lobby, Jim and Marge had managed to reshape a day with nothing more than their kindness. So unexpected. So appreciated.

Several weeks later, another busy day ended with me standing in the glass-fronted foyer of my building. Email and meetings had worn me out like an old sock. The heating grate offered some solace from the Arctic front outside while emails still held my attention hostage. Suddenly, a passel of children came streaming out from the building's lower level.

The Botball class downstairs had dismissed. (Botball is an international

competition-based program that teaches elementary through high school students how to program mobile computers with sensors — think small robots — to accomplish tasks. Noble Learning trains elementary school teams in the Ardmore area.) The students moved as a single organism, a mass of arms and legs, bright coats and scarfs. They bolted into the parking lot to find their awaiting parents, never seeing the adult standing to the side. I returned to my phone.

A few minutes later, I looked up to see one boy alone. He wore an overstuffed coat and paced outside in the cold. I popped open the door and asked if he'd like to wait in the warm lobby. A silly smile spread across his face, and he marched inside.

We were both waiting on a woman — me my wife and he his mother.

He surveyed me through his heavy-framed glasses in silence. His steady gaze communicated an unspoken request for conversation. I obliged. He immediately smiled and answered all of my questions in short, respectful clips, rising onto his toes with each response. Marshall was in fifth grade. He attended a local elementary school, and this was his second year participating in Botball.

Marshall was like many of the students who traipse through our halls and laboratories each year. They carry with them unexplored potential, dry kindling looking only for a spark. They may come here to play with robots or conduct pint-sized experiments, but they experience something so much greater. Noble invests in youth programs hoping to cultivate a sense of wonder in a life just emerging.

Marshall and I chatted for a moment more before headlights pulled into the semicircle drive in front of the building. One of us was headed home. As I slipped into the driver's seat, I looked back at a young man I may never see again. His nose pressed against the glass, waiting



on a ride today but preparing for a much grander journey tomorrow.

In the quiet moments since, my mind has wondered back to Jim, Marge, Marshall and the countless other visitors of the past 12 years. So often in life, we fixate on immediate circumstances and miss the unexpected blessings right in front of us. The couple who has stood by each other for almost seven decades that infuse an average Tuesday with wisdom and whimsy. The young student filled with potential and energy, a reminder that hope for a better future can actually shape the future.

All of these individuals are so much more than visitors. They are the embodiment of our mission.

The outcomes of Noble's work are not measured in abstracts; rather, it is fully realized in the lives we impact. Every Noble employee works for these men and women, for the students and teachers, the farmers and ranchers, the researchers and collaborators, and the world beyond. It is our passion and privilege.

Because in the end, despite all that we give, we are the ones who are blessed. 🌱



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 **LEGACY** | Winter 2018 | Vol. 12, Issue 2

Bill Buckner, Noble Research Institute president and CEO, announces his retirement to employees on Sept. 18, 2018. Buckner will retire at the end of 2018 but will continue supporting agriculture and soil health.

