

A PUBLICATION OF THE SAMUEL ROBERTS NOBLE FOUNDATION

LEGACY

WINTER 2014



FIELDS OF GREEN

Noble Foundation researchers tackle the year-round grazing challenge, hoping to unlock its economic potential and improve sustainability.

Right now, he can only dream about his future.

But what begins in a child's imagination quickly grows into a lifelong love affair with the land. Soon he will take his father's place, initiated into a heritage of stewardship. He will overcome unyielding obstacles. He will spend his days pulling life from the ground. And we will be there to stand by him. For 70 years, the Noble Foundation has remained dedicated to helping farmers and ranchers thrive. He's dreaming about his future. We're already preparing for it.

THE SAMUEL ROBERTS
NOBLE
FOUNDATION

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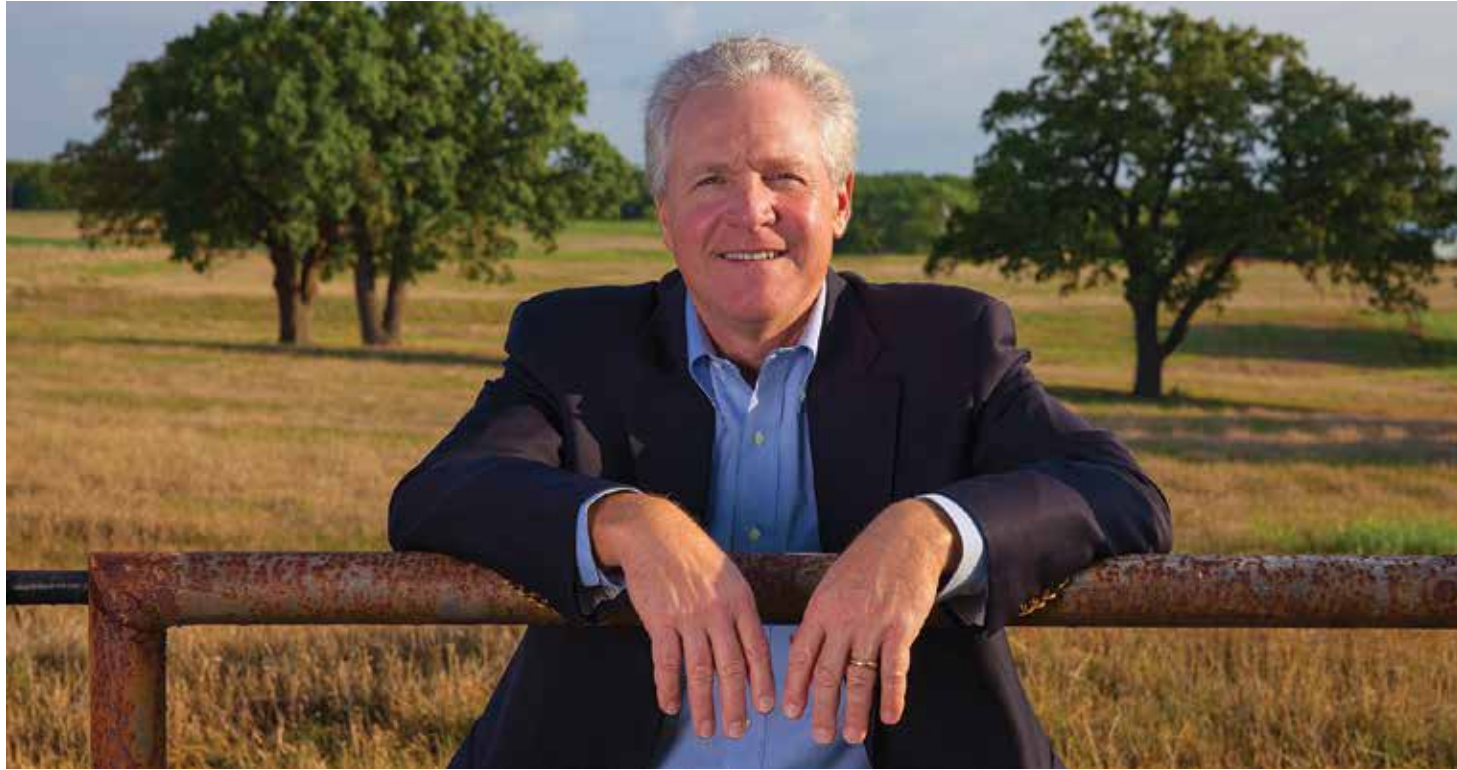
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ON THE COVER: Noble researchers stand in a field of winter wheat behind Jackie Cunningham, a cattleman from southern Oklahoma. These researchers are contributors to the Forage365 initiative, a project to develop year-round grazing on ranches in the Southern Great Plains.

The Hay Factor



Growing up on my family's mid-Missouri farm, my brothers and I inevitably found ourselves playing on hay bales.

In the imaginations of three boys, hay bales were a magical backdrop for any game. They were boulders in a sea of hot lava. They were the fort for our stick-gun wars. They were the mountains, and only one of us could be king.

Never did we think of the cost associated with our playground. Sure, we knew the true purpose of hay, but the financial ramifications of growing, cutting and storing, or just purchasing it were entirely lost on us. The ones and zeroes of hay are not lost on the countless ranchers across the United States. If you're in the cattle business, particularly in the Southern Great Plains, you're in the grass business. And if you're in the grass business, you know there are times of the year when quality grass simply can't be produced.

For generations, most ranchers have followed a tried-and-true system: feed cattle grass from spring to fall; then during the winter months (and other lean times), supplement with hay.

The process is not broken; it is just an accepted cycle as are the costs that go along with feeding hay for months on end. Because it is impractical to think otherwise, no one has ever truly considered being able to subtract the hay factor from the cattle production equation. Until now.

The Noble Foundation launched **Forage365** in 2014. This new research initiative brings to bear all of the Noble

Foundation's expertise in genetic research, plant breeding, economics and agriculture with the express purpose of doing what is considered improbable - reducing the need to feed hay.

As you will read in our cover story, **Forage365** will create a system of forages - grasses and other plants grazed by livestock - that will provide year-round grazing, filling in the gaps left by traditional grass systems. Noble researchers, along with a select group of important collaborators, will improve the hardiness and productivity of four key species readily available to producers. The process sounds simple, but these forages will be stretched beyond their typical growing seasons and remain productive or, in many instances, increase productivity.

The goal is lofty, but the ramifications of success would be widespread. Reducing the use of hay is good for ranchers. It's good for the environment. And, ultimately, it's good for the consumer.

There's just one downside - fewer hay forts.

Sincerely,

Bill Buckner, President and Chief Executive Officer

Noble Spotlight



ARDMORE RANCHER EARNS 2014 LEONARD WYATT AWARD

The Samuel Roberts Noble Foundation presented Kent and Gayle Donica of Ardmore, Oklahoma, with the Leonard Wyatt Memorial Outstanding Cooperator Award this fall. Donica was selected for the award because of his hard work, critical thinking skills and willingness to try new methods.



MOEN ASSUMES REINS OF BUSINESS DEVELOPMENT OFFICE

The Noble Foundation selected Jeff Moen as the new director of business development. Moen has acted as the organization's corporate counsel and assistant general counsel for eight years, and has been involved in many aspects of business development efforts during the past year. Moen will identify opportunities in the agricultural industry and the Noble Foundation's research programs, and facilitate building mutual areas of cooperation between Noble and industry to deliver Noble technologies and discoveries to the marketplace to advance agriculture.



NEW MOBILE APP AIDS STUDENTS, FARMERS WITH RECORDKEEPING

To assist FFA and 4-H students in its Junior Beef Excellence Program, the Noble Foundation released a mobile recordkeeping app that will capture key pieces of information. While the app is designed for students, it can be used by any producer for logging body weight measurements, steer health conditions, medical treatments,

feeding information and much more. The app is titled Noble Jr. Beef Journal and is available free via download on iTunes and Google Play. There is a Web-based version of the app that can be used on computers as well. To download the app, please visit www.noble.org/ag/jrbeef.



NOBLE RELEASES FOUR NEW SMALL GRAINS VARIETIES

In the early 1950s, the Noble Foundation established its forage breeding program, specifically developing improved cultivars of four small grains species: rye, wheat, oat and triticale (a rye/wheat hybrid). Through the generations, the program has developed historic new cultivars, such as Elbon, Oklon and Maton rye varieties, that have enhanced agricultural production.

This ongoing work has produced four new small grains cultivars (Wheat NF101, Triticale NF201, Maton II Rye NF306 and Oat NF402) over the past few years that have been released by the Noble Foundation and will be commercialized by Oklahoma Genetics Inc. (www.okgenetics.com).

For more information about the varieties, visit www.noble.org/ag/pasture/nf-small-grains.



GROWN FOR YOU MOBILE TRAILER KEEPS ROLLING

Last winter, Noble Academy (the Noble Foundation's youth education and outreach program), Oklahoma Farm Bureau, and the Oklahoma Farming and Ranching Foundation launched a new mobile agricultural education trailer called the *Grown For You* mobile classroom to provide students a fun, fast and factual look at Oklahoma agriculture.

In its first year on the road, the *Grown For You* mobile trailer has been to 35 different events in 25 counties across Oklahoma. More than 9,800 people - ranging in age from pre-kindergarten to sixth graders - have interacted with the trailer.

The mobile classroom is currently scheduled for 40 upcoming events. The trailer is scheduled and operated through Oklahoma Farm Bureau. Anyone interested in bringing the trailer to their area can call 405.205.0090.

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Upcoming Event

TEXOMA CATTLEMEN'S CONFERENCE:

All phases of the cattle industry are experiencing record high markets. This year's conference will provide insight on how to successfully manage livestock operations during these record markets. Beef industry leaders will also discuss sustainability.

9 a.m.-4 p.m., March 21, 2015
Ardmore Convention Center
Registration Fee:
\$40 - includes lunch

What is the most pressing challenge facing agriculture?



A pressing challenge facing agriculture is the disconnect between the agriculture industry and the general public. Individuals and families are not as directly linked to agriculture as they once were. The viability and success of agriculture impacts us all (providing food, fiber, shelter and natural resource stewardship), but our value will be overlooked unless this disconnect is closed.

Evan Whitley
CAAST Center Manager

Nature evolved a balanced and sustainable model for plant health, which includes genetics, soil, microbes, etc. In the last few centuries, these were studied separately. This led to an imbalance in plant and soil health. In recent years, researchers have worked to correct this. Today's challenge lies in integrating this knowledge to develop new sustainable models that can meet our global needs.

Prasanna Kankanala
Postdoctoral Fellow

Water drives agriculture, and water resources in many areas are becoming scarcer. Tremendous advances have been made in irrigation technology which increase water use efficiency. Advances must continue to be made in irrigation and in the water use efficiency of plants so that acceptable levels of production can be maintained in arid geographies.

Bryan Nichols
Livestock Consultant

Agricultural illiteracy affects the majority of the population, including, most critically, policy-makers who can impede the progress of agriculture. Awareness of the science behind modern agriculture should replace fear in guiding the regulatory process. Then we might see greater support for research to solve problems like sacrificing food quality for higher yields, continued depletion of the soil and improper management of resources.

Amy Mason
Research Associate

Legacy

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AGRICULTURE

BY THE NUMBERS

AGRICULTURE IS THE **SINGLE LARGEST** EMPLOYER IN THE WORLD.



AGRICULTURAL LAND PROVIDES HABITAT FOR

75%

OF THE NATION'S WILDLIFE.

\$ AMERICANS SPEND ABOUT **6%** OF THEIR INCOME ON FOOD, AMONG THE LEAST IN THE WORLD.



THAT'S COMPARED TO **9%** IN ENGLAND, **14%** IN FRANCE, **25%** IN BRAZIL, **35%** IN INDIA, **45%** IN KENYA.



U.S. FARMERS PRODUCE



46% OF THE WORLD'S SOYBEANS.



20.5% OF THE WORLD'S COTTON.



41% OF THE WORLD'S CORN.



13% OF THE WORLD'S WHEAT.



American agriculture provides jobs - including production agriculture, farm inputs, processing and marketing, along with retail and wholesale sales - for more than **22 million** of the U.S. population.

However ...



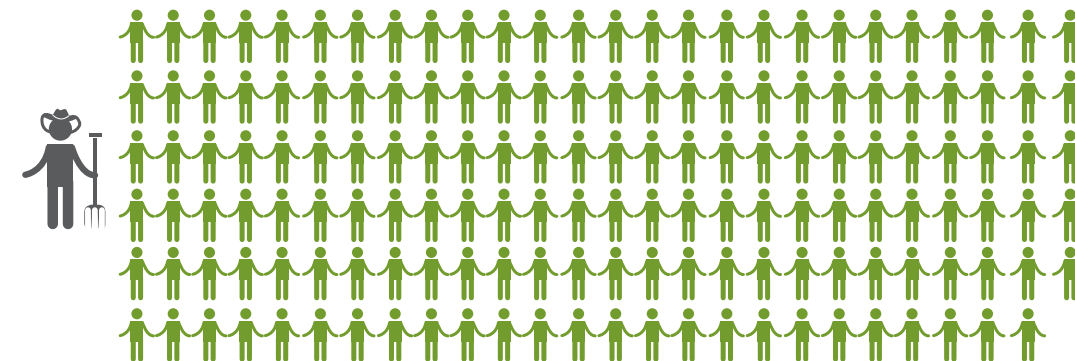
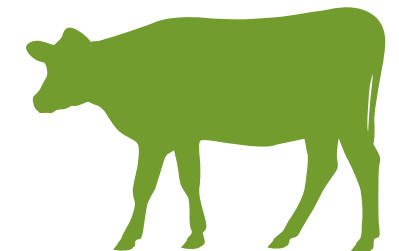
ONLY **4.6 MILLION** OF THOSE PEOPLE LIVE ON FARMS -

SLIGHTLY LESS THAN **2%** OF THE TOTAL U.S. POPULATION.

ALMOST 98%

OF U.S. FARMS ARE OPERATED BY INDIVIDUALS OR FAMILY CORPORATIONS.

FARMERS AND RANCHERS ARE PRODUCING MEAT LOWER IN FAT AND CHOLESTEROL, RESULTING IN RETAIL CUTS THAT ARE **15% LEANER**. LEANER BEEF CUTS ARE BEING PRODUCED TODAY THAN 20 YEARS AGO.



IN THE 1960S, ONE FARMER SUPPLIED FOOD FOR **25.8** PERSONS. TODAY, ONE FARMER SUPPLIES FOOD FOR **155** PEOPLE IN THE U.S. FARMERS AND RANCHERS USE MODERN PRODUCTION TECHNIQUES TO INCREASE THE QUALITY AND QUANTITY OF THE FOOD THEY PRODUCE.

Mike Trammell

by Robyn Peterson

Growing up on a 60-acre farm in Oklahoma, Mike Trammell had agriculture in his DNA. If you'd asked Trammell in high school about his future, though, he would have confessed that science piqued his curiosity more than agriculture. But it took a favorite college professor and a few semester-long outings into the wilderness to cement his path as a plant breeder.

For the past 12 years, Trammell has served as a plant breeder for the Noble Foundation, learning from some of the industry's most renowned breeders and continuing a tradition that stretches back to the earliest years of the organization. On a typical Monday afternoon, he discussed the moments that shaped his life and career, and the job that still inspires him.

What inspired you to pursue a career in agriculture?

In high school, I had an interest in science and always did well in the classes, but I owe my career path in the plant sciences to one of my college professors at Southeastern Oklahoma State University. He convinced me to go to graduate school

at the University of South Dakota, where everything changed for me.

What happened?

I lived in the Theodore Roosevelt National Park in the North Dakota badlands during the summer from 1991 to 1993, studying the physiology of invasive plants. It was one of the scariest moments in my life because the only technology connection was a single radio station out of Canada. I had never been that far from home before. However, it was a once-in-a-lifetime experience that shaped my future because it propelled me into plant breeding.

Where did you go after college?

I worked as an associate forage specialist for the University of Nebraska. The job entailed both extension and field-based forage research. It connected me to agriculture, then served as the stepping stone to my current position.

How did you get to the Noble Foundation?

I came to the Noble Foundation in 2003. I saw an opening, and it was a chance for me to get back close to home. My position

as a plant breeder at the Noble Foundation allows me to continue working with forages and with agricultural producers. From my point of view, it's the perfect job description. I'm appreciative of having the opportunity to benefit agriculture while living in my home state of Oklahoma.

What do you do as a plant breeder?

I breed perennial forage crops, such as tall fescue and alfalfa. The new varieties we develop are targeted to improve forage-based livestock operations for agricultural producers in the Southern Great Plains and the southeastern United States.

What are some challenges of your job?

Working with field-based plant breeding trials is a long, continuous process. We are constantly working to narrow down broad populations of plants to the specific ones that have all the main traits our producers want and need. It can take anywhere from 10 to 15 years to develop a perennial forage variety. It takes time to evaluate the selection of superior plant material, the hybridization of the selected material and

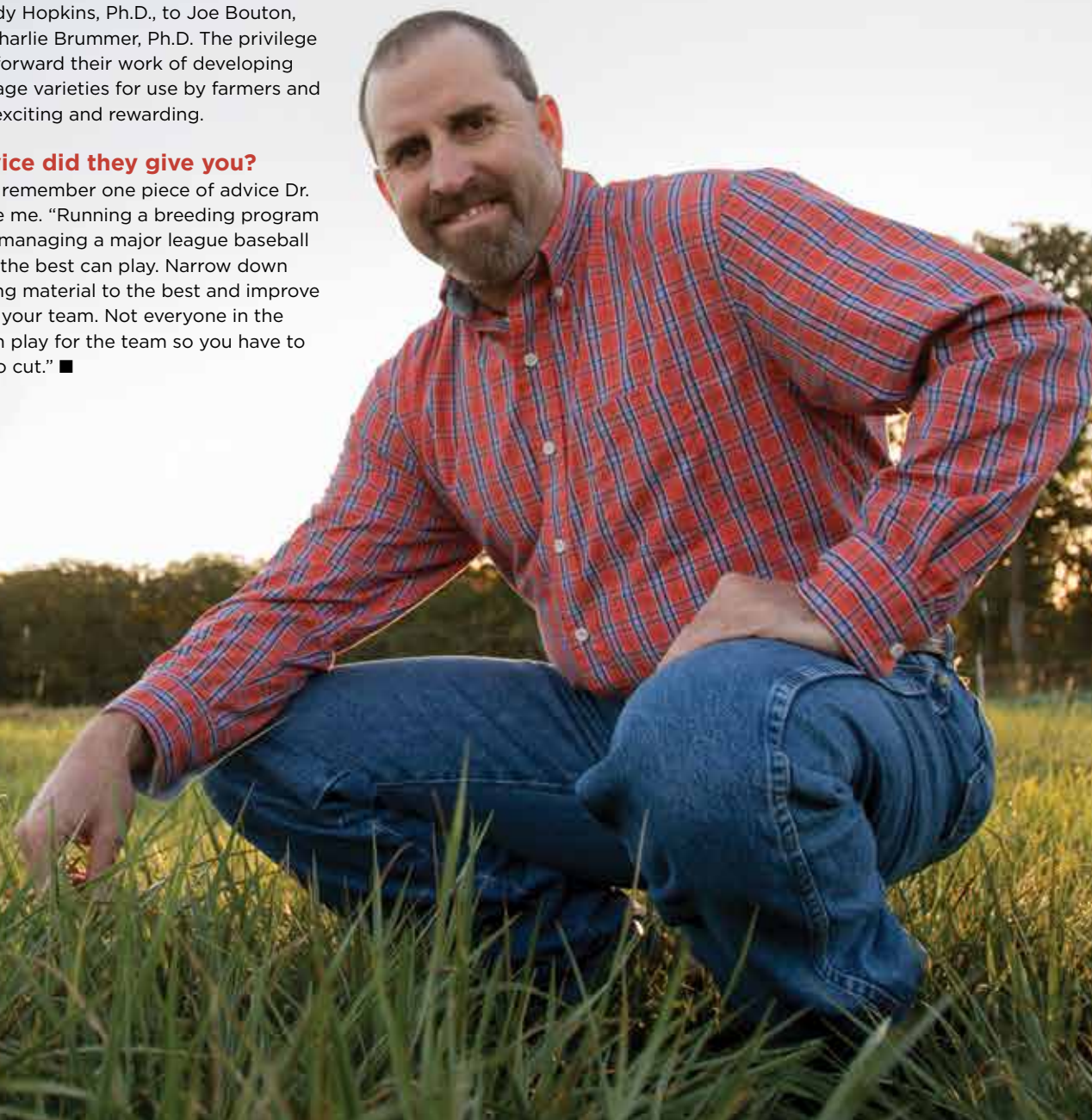
the recombination to produce new generations for traits such as grazing persistence or yield.

How do you feel about continuing Noble's tradition of plant breeding?

I have had the opportunity to work with some of the best forage breeders in the world, starting with Andy Hopkins, Ph.D., to Joe Bouton, Ph.D., and Charlie Brummer, Ph.D. The privilege of carrying forward their work of developing tangible forage varieties for use by farmers and ranchers is exciting and rewarding.

What advice did they give you?

I will always remember one piece of advice Dr. Bouton gave me. "Running a breeding program is similar to managing a major league baseball team - only the best can play. Narrow down your breeding material to the best and improve them; that's your team. Not everyone in the program can play for the team so you have to know who to cut." ■



Generation to Generation



The Varner family has passed two constants from father to son to grandson: a love of the land and a redefining relationship with the Noble Foundation

by Courtney Leeper

An overcast sky hung over the Varner family barn on a late summer morning. Gray clouds lingered in a thick ceiling above, a reminder of recent rains that softened the lane leading up to its door. A harvested wheat field lined one side of the lane, round hay bales the other. The backside of the barn exposed more hay waiting for a visit from a nearby dairyman. The Varner family welcomes the cool, damp weather and the promises it brings.

Keith and his wife, Lori, sat atop the grassy hill near the barn on the tailgate of a white pickup truck, a *Finding Nemo* sippy cup mixed in the bed with tools. Just a year ago, they welcomed the third and fourth generations back to the area and farm. Their son, Brandon, stood near them holding 2-year-old daughter Brinley; Audra, his wife, had 4-month-old Kylie tucked in the crook of her arm. And Cade, their 7-year-old son, dressed in plaid and boots just like Dad and Grandpa, bounced from place to place until settling on Grandma's lap.

It's been more than 50 years since the Varner family began working with the Noble Foundation. Keith's father, Jack, initiated the time-tested relationship. Keith continued it. And now the tradition is beginning to move in the direction of the third generation with Brandon.

LEGACY OF THE LAND

Keith was 2 years old when his father, a construction worker at the time, bought a Ford dealership in Grandfield, Oklahoma, in 1960. At the same time, Jack bought a piece of farmland – the “Hoover 80” – in partnership with another man. Jack began farming, and he continued to buy land, piece by piece. With his time torn between the dealership and the farm, he eventually realized he was spending more and more time on the farm. So he decided to sell the dealership and farm full time.

In those days, the Noble Foundation served farmers in a 100-mile radius. Jack's farm west of ►

Three generations of the Varner family have participated in the Noble Foundation's agricultural consultation program.



Brandon Varner (left) and Keith Varner represent the third and second generations to work on the family farm near Grandfield, Oklahoma.

Grandfield was 99 miles away. “We were just barely in,” Keith said. But they were, and the consultants visited regularly. “I grew up with those guys,” he said. “I always looked up to them. They were smart. They were my heroes.”

As Keith grew older and more involved in the operation, he liked to ask the consultants questions and bounce ideas off of them. He enjoyed farming, but Jack

encouraged him to go to college and find an off-farm job because of the economic instability.

After graduating from Oklahoma State University with a bachelor’s degree in 1982, he moved back to Frederick, Oklahoma, just 30 miles from home, to work at the First National Bank. In 1990, married to Lori by that time, a position came open at a bank in Guymon, Oklahoma – clear out

west in the Panhandle.

“I went to work in the banks,” Keith said. “But I got tired of putting on neckties every day. And I just like doing this.” He smiles as he speaks, and his outstretched arm reveals a black-smudged hand, evidence of his morning’s work.

There were other reasons to come home, too. Keith already had partnership in his father’s operation, but 275 miles away

is a difficult distance to maintain active involvement. And, by 1992, Jack’s health was beginning to decline.

Starting out, Keith rented 700 acres from his father. His brother, Doug, moved back, and for a time the two owned a custom haying operation. They baled and sent alfalfa hay all over the world. “That was my passion when we first moved here,” Keith said.

Though the brothers eventually took separate paths, Keith and Lori continued expanding their operation to 3,000 acres, most of which they now own. They grew alfalfa in the summer, and they grew winter wheat and raised stocker cattle in the winter. They’ve grown sudan grass, cotton and milo, and they’ve tried sesame and corn.

Brandon was about Cade’s age when he started helping his dad on the farm. Just like Keith, Brandon grew up around the Noble Foundation consultants. While he was in college at OSU studying agricultural economics, he interned at the Noble Foundation under James Locke, looking at ways to manage greenbrier. Brandon and Audra, who married during Brandon’s freshman year at OSU in December 2006, even rented a house from Chuck Coffey, a consultant at the time.

When Keith and Lori moved back to southern Oklahoma after two years in the Panhandle, Brandon was about 4 years old. No one could have known then that 19 years later Brandon and his family would also spend two years out west.

After graduating from OSU with a master’s degree in agricultural economics in 2011, the young Varner family moved to southeast Colorado. Brandon worked across the state line and time zone in Big Bow, Kansas, as an agronomy manager for a cooperative there.

Like his father, Brandon had farm ties that pulled him back home. He was a partner in Keith’s cow herd, as well as in his maternal grandfather’s.

“I was just so far away,” Brandon said. “Things were going on here that I was part of but wasn’t really around for. I wanted to be around.”

By August 2013, Brandon moved his family back to Oklahoma, where he works as an assistant manager for a cotton gin owned by Tillman Producers Co-op in Frederick. He also farms 300 acres, and

“Working with the Noble Foundation has meant a lot to me There’s been some times when I just needed someone to hold my hand.”

– Keith Varner

Keith’s goal is to bring him in closer to the family operation and to continue growing it. “My dad helped me get started,” Keith said. “I rented 700 acres from him, and now we’re at 3,000 acres. If Brandon can take 3,000 and triple that, it’d be pretty neat. And it might take that much to support a family these days.”

NOBLE ENCOURAGEMENT

As father helps son through the generations, one tool they’ve passed down has been the “wealth of help” from the Noble Foundation.

“Working with the Noble Foundation has meant a lot to me,” Keith said. “There’s been some times when I just needed someone to hold my hand.”

Keith values understanding the land he works with, so he regularly sends the Noble Foundation soil, hay and water samples to test. The Noble Foundation consultants have also helped the Varners develop their pasture rotation system and supplemental feed rations, as well as provided recommendations for soil fertilization.

The past three years of drought have affected the Varners’ operation. While

they were a typical stocker cattle and wheat enterprise, they also planted and depended on alfalfa. Three years ago, it became too dry for alfalfa. Noble helped provide counsel, and they soldiered forward. Today, Keith sees some hope in the damp ground below him. “If the weather allows us, I don’t see why we can’t go back.”

Brandon likes the idea of returning to alfalfa but knows they need to watch the weather and markets. Looking toward the future, father and son have also been adopting technologies like auto-steer for their tractors. They’ve adopted no-till practices, too, and the Noble Foundation has used the GreenSeeker, an optical measuring device that detects plant nitrogen requirements, across their wheat fields to help them better understand their soil’s nutrient needs.

Through it all, the Noble Foundation has been there to visit, answer questions or just provide encouragement. “A lot of times, they come out and tell us we’re doing what we need to be doing,” Brandon said.

“And that’s OK,” Keith added. “You think you’re doing the right thing. You hope you’re doing the right thing. But we really value what they say. It’s reassuring.”

Though two, now three, generations of Varners’ hands have been “held” in some small way by the Noble Foundation, it’s their hands that have worked this land. Cared for it. And passed it down. Remembering the past, living in the present and thinking toward the future.

Lori holds Brinley’s hand as they walk down the gentle slope. Brinley stops, her white cotton dress sways in the breeze as she bends down to the grass trying to capture the bugs and butterflies hiding within. She giggles as she twirls when a grasshopper jumps away, her short curls bouncing. Later, Brandon whirls her into the air, her smile and laughter exploding again. Her brother, Cade, fearlessly climbs the tractor wheel, his eyes full of energy and playfulness. Kylie quietly nestled next to Audra, who watches her children and husband play.

“It’s nice to have them back,” Lori said. The sky has lightened now. Keith, watching beside her, grins. His eyes emanate what looks like laughter, joy and pride in the next generations of Varners. ■

Blastoff

Noble Academy and the Dallas Arboretum forge a new collaboration to bring agricultural education to tens of thousands of students

by Robyn Peterson

Frank Hardin, Ph.D., stood in front of 15 excited teachers at the Dallas Arboretum, preparing to conduct an experiment, and made a bold statement: “You eat nails for breakfast.”

Hardin, the Noble Academy educational outreach manager, usually receives befuddled stares or snickers from students, but these educators beamed with anticipation. Soon they’ll be making the same claim.

Over the next few hours, Hardin walked the Dallas Arboretum teachers, who all have degrees and educational experience, through four experiments, including the ever-popular Nails for Breakfast (see sidebar for complete explanation).

They observe, scribble notes and ask probing questions in preparation for leading the experiments themselves. These four experiments represent the initial steps of a new collaboration between the Dallas Arboretum and Noble Academy, one in which Hardin is able to teach teachers about agriculture and send them out as advocates.

The collaboration also represents a milestone in the evolution of Noble Academy.

In the fall of 2012, the Noble Foundation centralized its outreach and educational activities toward delivering agriculture- and science-based education for all students, from elementary through college, by creating Noble Academy.

“We want to demonstrate the importance of agriculture to society and the need for research to advance the industry,” Hardin said. “We also strive to communicate the wide range of career opportunities in agriculture to students.”

Noble Academy began working with Oklahoma teachers and education-related associations to expand its efforts to provide key lessons to students through in-class demonstrations. These

demonstrations are designed to fit into a teacher’s lesson plans and are a simple but effective way to bring science and agricultural education together to the classroom.

“We’ve had such great results with our Oklahoma partners and schools that we wanted to expand our reach into Texas,” Hardin said. “The Noble Foundation’s agricultural consultants work with landowners in Texas, so why couldn’t we work with Texas teachers and educational associations?”

Before Hardin could make the first move, Texas called him in the form of the Dallas Arboretum.

A volunteer at the Arboretum had learned about Noble Academy and explained the program to Maria Conroy, vice president of education and research at the Dallas Arboretum. “He suggested I contact the Noble Foundation, and I’m certainly glad I did,” Conroy said. “Our missions and goals align perfectly with each other. We knew this was an opportunity we couldn’t pass up.”

The Dallas Arboretum offers a wide variety of children’s educational programs to meet students’ and teachers’ needs, such as field trip programs and school outreach programs. The Arboretum reaches about 125,000 students each year with only 23 teachers. These teachers, however, are in constant need of fresh projects and activities.

“The Noble Academy hands-on lab experiments and lessons make a great addition to the outreach programs we have available for area schools,” Conroy said. “The lessons can be easily adapted to any age and grade, which is important for us because we work with all ages from pre-kindergarten to high school.”

As Hardin wrapped up his final demonstration with the teachers, he stood back and surveyed them eagerly chatting about their lessons. He smiled broadly, knowing the impact they would have.

“Today’s youth is going to be in charge of tomorrow’s world. You can never pass up an opportunity to educate them about the importance of agriculture and science,” Hardin said. “Because of this collaboration, we’ll be able to reach students we never imagined reaching. It’s like holding onto a rocket as it blasts off. It’s that exciting.” ■

NAILS FOR BREAKFAST EXPERIMENT

If you ate iron-fortified cereal this morning, you had nails for breakfast because iron is a key ingredient in many common cereals. The following experiment reveals the actual iron in the cereal and provides a platform for teachers to discuss how iron is absorbed by the human body and why this element is so important.

1. Put on a lab coat, gloves and protective glasses.
2. Find a magnet strong enough to reset a cell phone.
3. Fill a 1-quart Ziploc bag with Total cereal and warm water.
4. Gently mash up the cereal to break down the flakes into a soupy paste.
5. Lay the bag flat on top of the magnet in the palm of your hand and swirl.
6. Turn the bag over so the magnet is now on top, and squeeze the bag lightly to raise the magnet above the soupy paste.
7. Tiny, black specks begin to rise inside the bag toward the magnet as it moves around the top of the bag. These specks don’t look appetizing, but that is the iron in your cereal.

A group of teachers learn hands-on experiments from Noble Academy in a training session at the Dallas Arboretum.

MARIA MONTEROS, PH.D.

Plant Breeder and Geneticist

JAMES ROGERS, PH.D.

Agronomist

JACKIE CUNNINGHAM, JR.

Oklahoma Rancher



YUAN WANG, PH.D.

Molecular Geneticist



MALAY SAHA, PH.D.

Molecular Plant Breeder



FIELDS OF GREEN

Noble Foundation researchers tackle the year-round grazing challenge, hoping to unlock its economic potential and improve sustainability

by Laura Beil



Senior Research Associate Myoung-Hwan Chi, Ph.D., examines plant tissue samples for the presence of a fungus that may benefit plant growth.

Cody Goodnight comes from four generations of Tillman County ranchers who have learned from decades of raising cattle how to keep hay costs under control. His herd grazes on native grasses that have adapted to the uncertain rainfall of the southwest Oklahoma plains. He moves his animals to a new pasture every few days or at most two weeks, allowing fields time to rest and revive. He puts up hay most summers and plants winter wheat to tide him through the winter months.

The system takes planning, water resources and miles of fencing, but it works. It is how Goodnight manages his 300-400 heifers. It is how most ranchers operate.

A new initiative from The Samuel Roberts Noble Foundation hopes one day soon to take this idea further than most managers now can, enabling ranchers to raise their herds with little or no need even to cut hay, much less buy it. Called Forage365, the initiative hopes to create ranches where the grass is always green (or at least greener), with cool-season crops that persist through winter and heat-resistant species able to withstand the scorching summer sun.

"Many producers can make hay. All producers can buy hay," said Billy Cook, director of the Agricultural Division at the Noble Foundation. "In many situations, it's not the most cost-effective practice. We envision a forage system where cattle can

graze year-round and the need for hay is reduced or even eliminated."

In some parts of the country, ranchers rely on hay for up to 150 days of the year, Cook explained. "We want to do a better job of managing existing species," he said. "We now have more technology for management than we've ever had."

A FOUNDATION-WIDE EFFORT

The effort brings together different parts of the Noble Foundation campus - from those who investigate the secrets of particular genes, to experts on plant breeding and management, to researchers in applied agricultural practice.

Noble scientists and researchers will identify and work with external scientists ►



Postdoctoral Fellow Ana Paez Garcia, Ph.D., samples field-grown wheat to study root architecture.



Wheat plants are colonized with a beneficial fungus in an artificial growth medium.

and researchers around the region and nation to expedite the process.

“The Noble Foundation has the combination of expertise and resources, along with the necessary relationships within the research community, to successfully develop and execute this program,” said Michael Udvardi, Ph.D., director of the Plant Biology Division. “We needed to collaborate to tackle and solve bigger problems.”

And feeding during lean times falls into the category of “big”: the expense of hay is one of the major costs of raising livestock.

Noble isn’t a newcomer to the idea of sustainable grazing. When Ann Wells, DVM, who operates Ozark Pasture Beef near Fayetteville, Arkansas, established her ranch in the late 1990s, she and her business partner were using information they obtained from Noble even then to reduce the need for outside hay. She has learned the value of letting fields rest and replenish themselves. Today, she rarely lets her cattle and sheep stay on any given pasture for more than a day or two.

“It requires planning and thinking,” Wells said. “We start at least a season before, if not six months. We keep records, noticing how the pastures change and figuring out what we’re going to need. What do these pastures look like now, and how can we get them to grow?”

Still, they don’t grow year-round.

THE FOUR PILLARS

Given their expertise in the area, Noble scientists settled on a goal of endless forage for two main reasons: first, it stands to have a major impact on the production of beef cattle, the largest agricultural endeavor in the region and the country. (And a focus for Lloyd Noble himself in the 1940s.) Also, scientists are confident they have the scientific knowledge and resources to make a difference. Select outcomes will be available as early as 2018; however, several of the projects are intended to provide building blocks for scientists and

breeders to provide improvements over the next decade.

Noble personnel, along with select collaborators, will be working on the four crops that make up the core of Forage365 (see side bar).

“All of these species are available now to farmers and ranchers,” Udvardi said, “but the reality is that even if you plant all of those crops, there are some periods of time when they are not growing.”

One of the Noble scientists’ first goals is to coax the plants into longer growing seasons, while making them tougher in the face of drought or cold. This won’t just come from experimenting with different breeds. The Noble Foundation’s Forage Improvement Division, directed by Zengyu Wang, Ph.D., is examining the mechanisms for survival at a molecular level – pinpointing genes that protect a plant from harsh conditions.

All told, Forage365 includes a strategic set of nine interconnecting projects that will improve forage system productivity and the profitability of livestock production, examine management practices and economic systems, and demonstrate how the system can improve sustainability.

“As a whole, Forage365 focuses on the improvement and management of the four pillar species in a unified system, as well as advances the use of cover crops,” Wang said. “This whole-system approach enhances the sustainability of grazing lands, taking quality practices by agricultural producers to the next level.”

Not only will the project benefit livestock management today, it stands to better prepare the next generation of ranchers. Even crops that grow well today will need to better withstand the ever-changing weather patterns. “It’s predicted there will be a wider range of temperatures and rainfall,” Udvardi says. “I think it’s prudent that we prepare for more challenging conditions for plants in the future. This project assists us today, but it’s also going to revolutionize the future of forages.” ■

Forage365 will focus on four pillar species. These are:

- **BERMUDAGRASS.** This forage is popular because it is fast growing and tough (it originates in Africa, not Bermuda), but it goes brown and dormant in the winter.
- **TALL FESCUE.** This is a cool-season grass with the potential resilience to survive hot summers. That’s one reason why it is popular in “transition zone” states, like Oklahoma. “There are not a lot of productive cool-season perennials in this part of the world,” Cook said.
- **ALFALFA.** Known as the “queen of forages” for its impressive nutritional value, alfalfa’s use in livestock dates back to antiquity. A legume, not a grass, it is commonly cut for hay. Though a perennial, it falls dormant when the weather turns cold.
- **WINTER WHEAT.** Wheat pasture has been grown in Oklahoma and Texas for grazing or dual purpose. It’s an annual, usually planted in the fall, which produces until the first big freeze, then comes back again in early spring. Winter wheat is also an important commercial crop in the United States, where it is made into flour.



Under the (Plastic) Dome

Hoop houses may look like simple plastic structures, but they offer great advantages for a variety of agricultural industries

by Laura Beil

To those who are not true hoop house aficionados, these semicircles of plastic and piping might not seem like impressive structures. Looking something like giant white caterpillars, they are low-tech artifacts in a high-tech world.

And yet, for all their quiet simplicity, hoop houses are the leading edge of a farming revolution. One by one, especially for farmers with small- and mid-sized operations, hoop houses are transforming agriculture in the United States. By offering easy-to-provide shelter from cold, rain and pests, the structures allow crops to thrive in conditions that might otherwise spell certain failure. Safely protected, plants can sprout early, bear late and be less susceptible to disease.

"They've worked for us, and they're working for our growers," said Steve Upson, a soils and crops consultant with the Noble Foundation, who has been working with hoop houses for 19 years and authored a book about their construction. "I don't need to proclaim the good news anymore. The gospel is out there."

Even the United States Department of Agriculture (USDA) has joined in the hoop house hoopla, offering cost-sharing incentives for construction. So far, more than 6,000 hoop houses (which are also called high tunnels) have been funded through the USDA's Natural Resources Conservation Service. In 2010, a cluster of hoop houses were installed in the garden on the grounds of the White House.

The idea for hoop houses was inspired

by traditional greenhouses, which have provided tender plants with a climate-controlled perfect day, every day for likely hundreds of years. The problem with greenhouses is that they are made of glass. Glass is expensive. Plastic is cheap.

Beginning in the 1950s, plant researchers began to experiment with making a variation on a greenhouse from plastic. "It had limited use early on," Upson said. "In the vegetable industry, they were used to grow transplants for field production." Along the way, someone got the idea of covering transplanted crops with hoop houses, offering a simple shelter over the soil that would help nurse plants along for the entire season.

To support the structure, engineers used arches of metal or plastic piping ►

Steve Upson, soils and crops consultant, has been promoting the benefits of hoop house gardening for nearly 20 years.



University students construct a hoop house based on a Noble Foundation design.

anchored in the ground. The result was something that looked much like the old wartime Quonset huts. The name hoop house is a reference to their shape. Not only was a hoop house economical, a couple of motivated guys could put one up over a weekend.

With hoop houses, spring and fall stretch out longer. Winter crops can become viable year-round. The weather outside might be frightful, but underneath a dome of visqueen, plants can remain frost-free.

While the idea has been around for a half century, Upson said hoop houses have gotten newfound appreciation from two

new consumer trends in agriculture: local and organic. With a hoop house, plants that might be out of season come the end of fall can be grown locally, Upson said. Or they can be started early.

"It's changing how we think about local foods," Upson said. Crops like cucumbers, tomatoes and peppers can start early and stay late. Cool-season crops like spinach and other greens might be grown throughout the year if temperatures don't take too much of a plunge. In the northern United States, a locally grown tomato in October or fresh spinach in December might not be possible were it not for a hoop house.

"Generally speaking, a hoop house placed over a field can extend growing by two weeks to a month on either end," said Joe Buford, a resource conservation specialist with the USDA's office in Stillwater, Oklahoma. Come early spring, the climate under a hoop house in Oklahoma suddenly becomes as balmy as San Antonio, Texas. "In a competitive market, if you can have your product ready two weeks before the next person, you can market your product so much easier," he said. And crops that arrive in times of high demand and low supply can command higher prices.

But Upson said the benefits of hoop



Hoop houses are useful for greatly extending the growing season.

houses go beyond season extension. They offer protection from piercing winds and up to nickel-sized hail, he said, making them especially useful for crops like cut flowers where marketability is solely dependent on a flawless appearance.

Given the low-cost benefits of hoop houses, researchers at Noble are experimenting with ways to make the most of these plastic prizes by changing the shape slightly to allow more shoulder or head room, and adding shade cloth and vents that can keep temperatures down in summer months and shield against sunburn.

The USDA cost-sharing program

stipulates that they must be used under natural conditions. Buford said that still leaves a lot of latitude. Some growers are boring open pipes deep into the earth to provide geothermal heating.

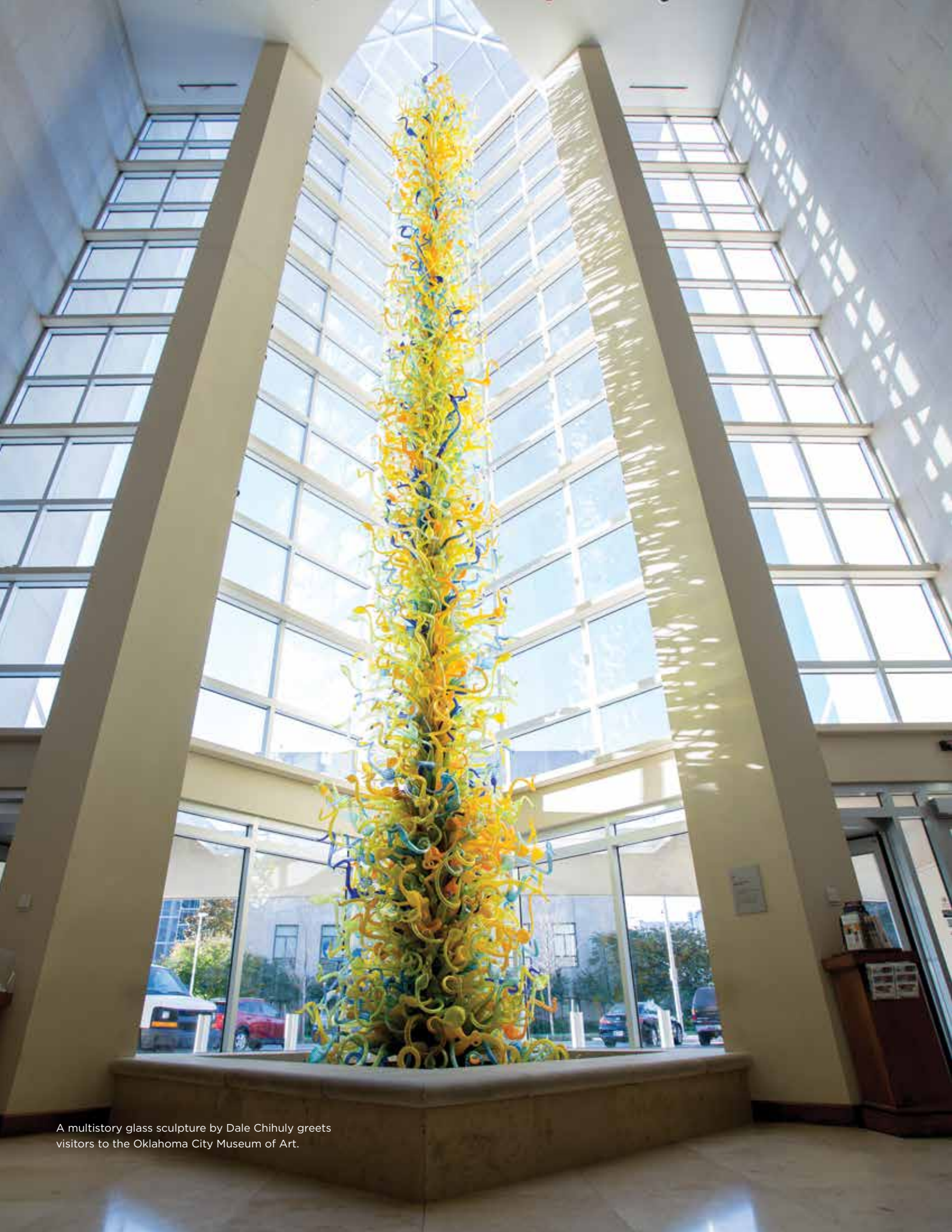
Since hoop houses make the most of nature, the structures are popular with organic farmers as a chemical-free means of pest and disease control, Upson explained. While the plastic won't keep out small bugs like aphids that can easily creep underneath, hoop houses can form a natural barrier against larger pests like grasshoppers and beetles. Rot and mold are less of a problem because the tunnel can keep plants dry during excessive rain.

Upson expects to see more farmers hooping it up as word spreads. "It's an exploding industry," he said. "The systems work. You have an element of control that's affordable." ■



To learn more about hoop houses, Steve Upson has a series of YouTube videos that discuss advantages and construction.

<http://bit.ly/hoop-house-construction>



A multistory glass sculpture by Dale Chihuly greets visitors to the Oklahoma City Museum of Art.

Art *for* Everyone

Noble Foundation grants aid the Oklahoma City Museum of Art as it enriches lives through its cinema program, film festival

by Jessica Willingham

E. Mike Whittington leans in to get a better look at an intricate and aging sketch, inhales and then whispers a barely audible “Wow.” Around him, temperature-controlled crates flown in from Paris are being carefully unpacked, larger-than-life portraits are being installed, and art curators wheel paintings to their designated locations as assistants arrange sculptures.

Whittington, president of the Oklahoma City Museum of Art (OKCMOA), is admiring a sketch created by 15th century Italian architect and painter Raphael Sanzio da Urbino. Urbino’s work and the work of some of history’s most celebrated artists is set to be featured in a new exhibit at the Oklahoma City Museum of Art – the first stop on the collection’s American tour.

Like Urbino’s sketch, some art comes to visit and some is here to stay. The museum’s permanent collection has 3,000 works that represent more than 400 years of European and American art from the 19th and 20th centuries. The story of the museum’s journey to this place in time is as rich, complex and diverse as the pieces it holds.

One might say the museum’s journey began at the movies.

AT THE MOVIES

Its home once near the Oklahoma City Fairgrounds, the museum relocated to downtown Oklahoma City, Oklahoma, in the 1990s. The OKCMOA’s new home was a long-abandoned 1940s movie palace, the Center Theater. Even after extensive internal and external renovations, and additions to the building, the Art Deco vibe of the old palace still shines through the architecture. The Center Theater’s original box office still stands near the museum’s main entrance. It’s a reminder that even when America’s “greatest generation” was steeped in war, there was still one beloved place of escape – the movies.

“Understanding the building itself is to understand a great deal about what this museum means to this city and for Oklahomans,” Whittington said. “The museum’s relocation downtown, saving this building and repurposing it was a catalyst for downtown development. And it gave the museum the opportunity to create a film program.”

Through a series of grants totaling \$2.6 million, the Noble Foundation assisted the OKCMOA in building and maintaining one of the most advanced digital theaters and the only art house cinema in the state – which has been

named The Samuel Roberts Noble Theater in honor of its support. Using the existing architecture, the OKCMOA rebuilt the theater and brought the magic of movies back to life.

Before the new building and support from organizations like the Noble Foundation, the museum’s film program consisted of poor-quality screenings, folding lawn chairs, and a small but dedicated following of independent, foreign, and classical film fans, said Bryon Chambers, assistant curator of education at the OKCMOA. “It was kind of a struggle,”

Chambers said. Today, the 250-seat Noble Theater hosts 335 screenings and 25,000 visitors a year.

With funding from the Noble Foundation, the theater began its first phase of theater Projection Perfection. Since the Noble Theater’s initial construction in the early 2000s, cinema has changed from hard-copy film to a completely digital format. The Projection Perfection campaign will enable the theater to stay within the current trends of the industry and remain a destination for independent film distributors and the next generation of filmmakers. The improvements will bring state-of-the-art ►



Students learn about contemporary art in the museum's galleries.



Noble Foundation grants helped to fund construction of a 250-seat theater within the Oklahoma City Museum of Art.

digital, visual and audio technology paired with new, plush seating to transform the theater experience for filmgoers and producers alike.

With the creation and advancement of the Noble Theater, future generations of filmmakers no longer have to escape to the Coasts for opportunities and careers in the industry, according to Chambers. The OKCMOA is cultivating the next generation of artists right in the heart of America. University of Oklahoma film students come to the Noble Theater to learn about film narrative, history and production. Every June, the Noble Theater is home to the deadCENTER film festival, the largest film festival in Oklahoma.

"The film program has been an integral part of our maturity, a wonderful symbol of how we celebrate art," Chambers said. "With the help of the Noble Foundation, we are truly a visual arts center."

Yes, Whittington certainly admires the age-old sketch, but he appreciates the tremendous growth - up almost 29 percent last year - associated with the variety in programming.

"Our audience is getting younger and becoming more diverse," Whittington said. "We're pleased our audience is beginning

to reflect the diversity of this community in every sense."

BEYOND MUSEUM WALLS

Every day at the OKCMOA is as uniquely individual as the museum's signature sculpture: a 76-foot tower of 2,100 pieces of blown glass by Dale Chihuly. Classes, workshops and seasonal camps are hosted throughout the year, and every Thursday night brings the community to the museum's rooftop for drinks and live music.

"The communities formed around art, agriculture and education are essential to improving life and culture in Oklahoma," said Mary Kate Wilson, Noble Foundation's director of philanthropy, engagement and project management. "Our trustees appreciate being part of fostering those connections and supporting cultural growth in our state."

Those connections are taking place both inside and outside the museum. The OKCMOA fosters community outreach programs for families, adults and children in the surrounding communities.

The museum also partners with organizations throughout the Oklahoma City area to help citizens in need heal

through the arts. Children with hearing or vision impairments attend museum-hosted summer camps. OKCMOA works to connect with members of the community who may not be able to visit the museum for medical or health reasons. Enabling all people to experience art within and beyond museum walls is central to the museum's mission: to enrich lives through the arts.

While the latest exhibition wraps up installment on one floor of the OKCMOA, the deadCENTER film festival is just beginning its preparations for another season. Somewhere in the middle, an entire class of preschoolers holds hands to form a long line, slowly but noisily snaking their way from gallery to gallery.

For each individual who visits, the museum offers something a little bit different - a unique opportunity, a quiet escape, a whimsical adventure. From exquisite French paintings to the excitement of the silver screen, everything at the OKCMOA brings art alive for the thousands of Oklahomans who visit each year.

And Whittington doesn't take a bit of it for granted, saying "Without the help of the Noble Foundation and organizations like them, none of this would be possible." ■



N Is for Noble

An afternoon playing bingo with local veterans leaves Noble employees humbled and proud

by J. Adam Calaway

Kaustav Bandyopadhyay just knew the next number was going to be I-22. He just *knew* it.

The postdoctoral fellow from India peered over the shoulder of an elderly gentleman sitting at a small round table and wearing a hat emblazoned with a Navy destroyer. They made eye contact, smiled at each other and Kaustav whispered: "We're just one number away. That's all we need."

The bingo announcer took another ball from the hopper. "N-36," he said. "N. Three. Six."

Kaustav threw up his hands in disgust and said, "Ah, man. We are so close!" The room filled with military veterans and Noble employees chuckled at the mock outburst but quickly quieted for the next number.

It's the day before Veterans Day. As chairs are arranged outside around the flagpole for tomorrow's memorial, a volunteer team from the Noble Foundation has joined the men of the Ardmore Veterans Center for an afternoon of bingo and birthday cake.

The outing is part of "Noble in the Community," the organization's volunteer effort that draws together employees from across the organization to support various community causes. From manning the soup kitchen to cleaning up the local lake,

the Noble faithful arrive like a swarm - all wearing their green "Team Noble" t-shirts - ready to serve.

"Of all our volunteer activities, this is my favorite," Kaustav said. "The first time I came, I talked for an hour with one guy who was in World War II. He was losing his memory. When I left, I was sad and almost decided I would not come back, but when the opportunity came up, I wanted to come again. I feel attached to these guys. It's hard to explain. It's just a feeling."

It's true. For many Noble employees, interacting with these soldiers, seeing their faded tattoos and hearing their faded memories, that *feeling* was difficult to draw out and fit with words. Awe. Sadness. Respect.

The Ardmore Veterans Center houses men from each of the United States' major conflicts (dating back to World War II) who still proudly wear their service hats and vests; reminders of wars they can never forget. Their hands tremble, and their bodies are broken. The proud strides of their youth have been replaced with shuffling steps. War is won by the young, but the cost is not fully realized until much later.

Noble's Landscape/Environmental Services Manager Terry Martin stood to the side, observing the entire scene before uttering just one word, "Humbling."

The Noble employees came to simply show kindness, but many left receiving more than they could ever possibly give.

R.A. Lindsay sat in his wheelchair grinning like a man with a million dollar secret, soaking in the revelry and laughing with newfound friends. The 91-year-old veteran of World War II toured the South Pacific as a young man. His ship was the second one to hit the beach during the reclamation of the Philippines from Japan.

He regaled a small audience with his personal slice of history, narrating the operation with calm words, teaching his pupils about events they have only viewed through glamorized Hollywood recreations.

Listening nearby was Dr. Elison Blancaflor, a Noble Foundation principal investigator who is originally from the Philippines. After Lindsay concluded, Blancaflor leaned over and - in a whisper - said, "Thank you."

Separated by generations. Sometimes hailing from cultures that were once bitter enemies. These two groups, whose lives would have never intersected otherwise, shared stories, found common ground and became friends.

"I'm so proud of what all these guys have done for this country," Kaustav said. "It doesn't matter that it's not my country. What they did, their sacrifice, is universal." ■

Noble Foundation employees visit with residents of the Ardmore Veterans Center as part of a Noble in the Community volunteer event.

From Noble. To Our Heroes.

by J. Adam Calaway



A quick Google search will reveal that the major shipping companies move about 25 million packages a day. That's 6.5 billion a year.

So it should come as no surprise that the 18 boxes that left the Noble Foundation early this fall caught absolutely no one's attention. They were brown. They were cubes. They were typical in every way.

Even their content was fairly unremarkable. No top secret weaponry. No ill-gotten antiquities. No live animals. Just snacks, toiletries and other amusements mixed with enough packing peanuts to feed a herd of Styrofoam elephants.

No, what made these boxes remarkable were the recipients. They are heroes, and they are homesick.

This fall, members of the Noble Foundation's Employee Team (ET) spent weeks gathering items to assemble care packages for the 158th Field Artillery Regiment of the Oklahoma Army National Guard, stationed in Afghanistan.

Decorated drop-boxes popped up in every building across campus, and employees donated items that would ultimately end up around the world.

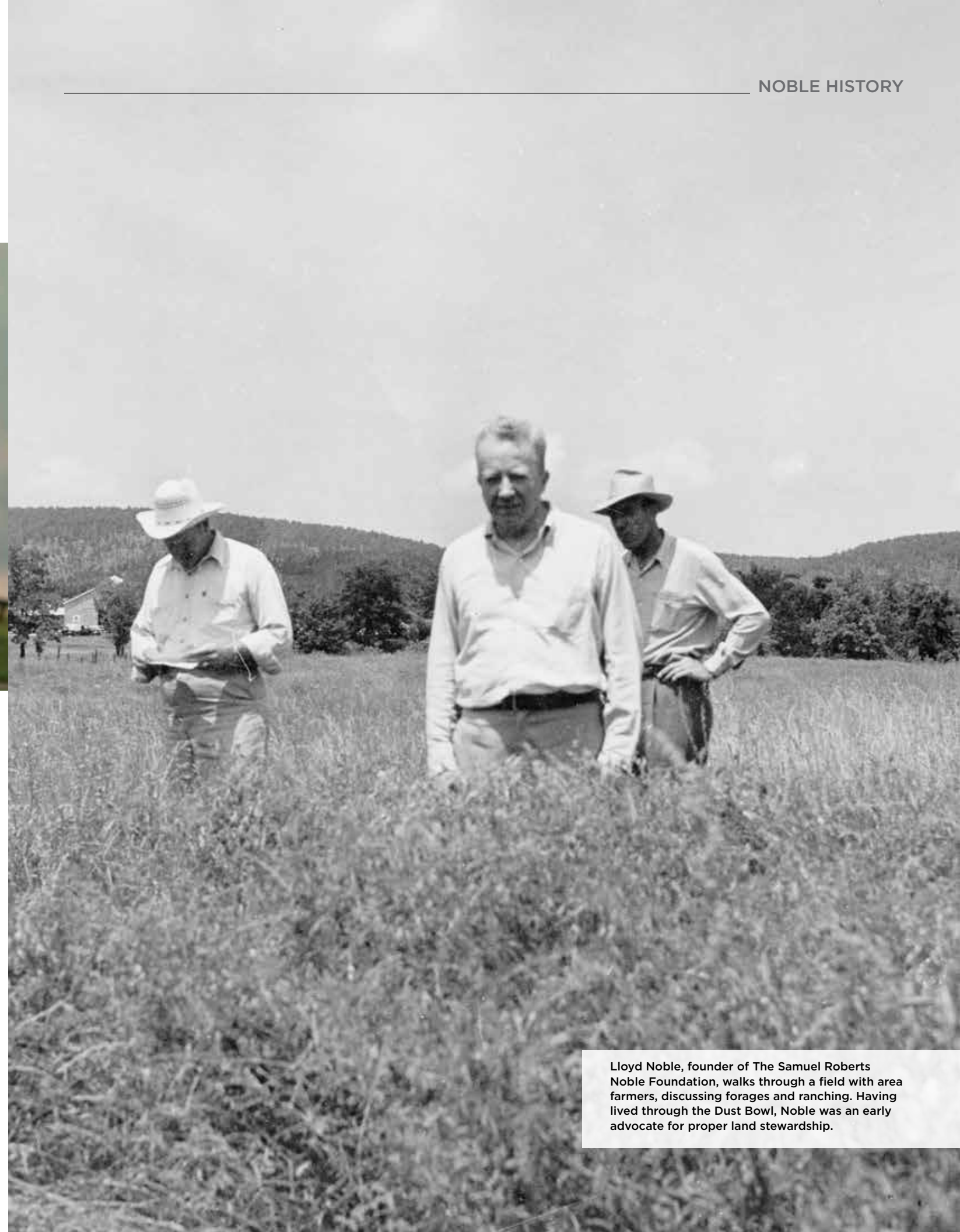
Administrative Assistant Dorthie Kelley and Purchasing Agent Dee Mackey spearheaded the project, which represents the fifth time Noble employees have adopted a unit. "It's such a small thing," Mackey said. "It's just a way to say 'thank you'. We

want to let them know that people in their home state appreciate them and that we are thinking of them."

Indeed, the ET tried to think of everything the soldiers might need or want. Kelley and Mackey ran through the list that included personal care items (deodorant, razors, shaving cream), snacks (beef jerky, crackers and cookies), entertainment (books and movies) and toys to pass out to village children. "I don't think it's what we send," Kelley said. "It's just acknowledging them and showing that we appreciate what they do. They need to know that home is still here, and we're still thinking about them."

Greg Spencer recalled the impact these cardboard treasure chests have on a unit. The former staff sergeant and current Noble Foundation greenhouse assistant spent 17 years in the Army and National Guard, including tours in both Iraq and Afghanistan. "Those care packages mean everything," he said. "They mean people are supporting you. It helps keep you going. They are a lifeline to the real world."

Months will pass before all the packages arrive; but the 18 unremarkable boxes bearing small tokens of gratitude will land at a country we can barely imagine soon enough. We pray it provides a small taste of the familiar and reminds these soldiers that we have not forgotten their sacrifice; we have not forgotten our heroes. ■



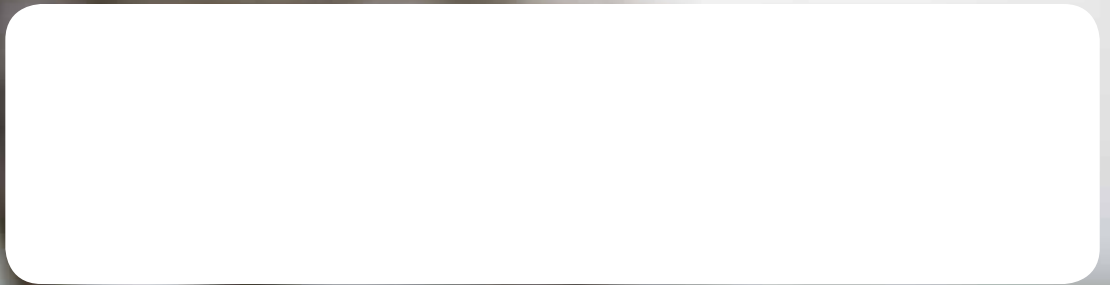
Lloyd Noble, founder of The Samuel Roberts Noble Foundation, walks through a field with area farmers, discussing forages and ranching. Having lived through the Dust Bowl, Noble was an early advocate for proper land stewardship.

THE SAMUEL ROBERTS
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Winter wheat, a target species of the Forage365 initiative (see page 16), grows on the Noble Foundation's Pasture Demonstration Farm.