

A PUBLICATION OF THE SAMUEL ROBERTS NOBLE FOUNDATION

LEGACY

FALL 2014



Join the Renaissance

www.soilrenaissance.org

Established by The Samuel Roberts Noble Foundation and the Farm Foundation, NFP, the Soil Renaissance Initiative is advancing soil health and making it the cornerstone of land use management decisions. The Soil Renaissance focuses on the role of soil health in sustainable natural resource systems, as well as the critical importance of soil and soil health in meeting the challenge of feeding 9 billion people by 2050.

No single person or organization can fully address the diverse and complex issues of soil health across the nation and the world. Advancing soil health requires a sustained effort by all stakeholders, so visit www.soilrenaissance.org to learn how you can join the renaissance.

“No civilization has outlived the usefulness of its soils. When the soil is destroyed, the nation is gone.”

- Lloyd Noble, oilman, philanthropist, founder of The Samuel Roberts Noble Foundation



Knowledge to sustain Earth's most valuable asset

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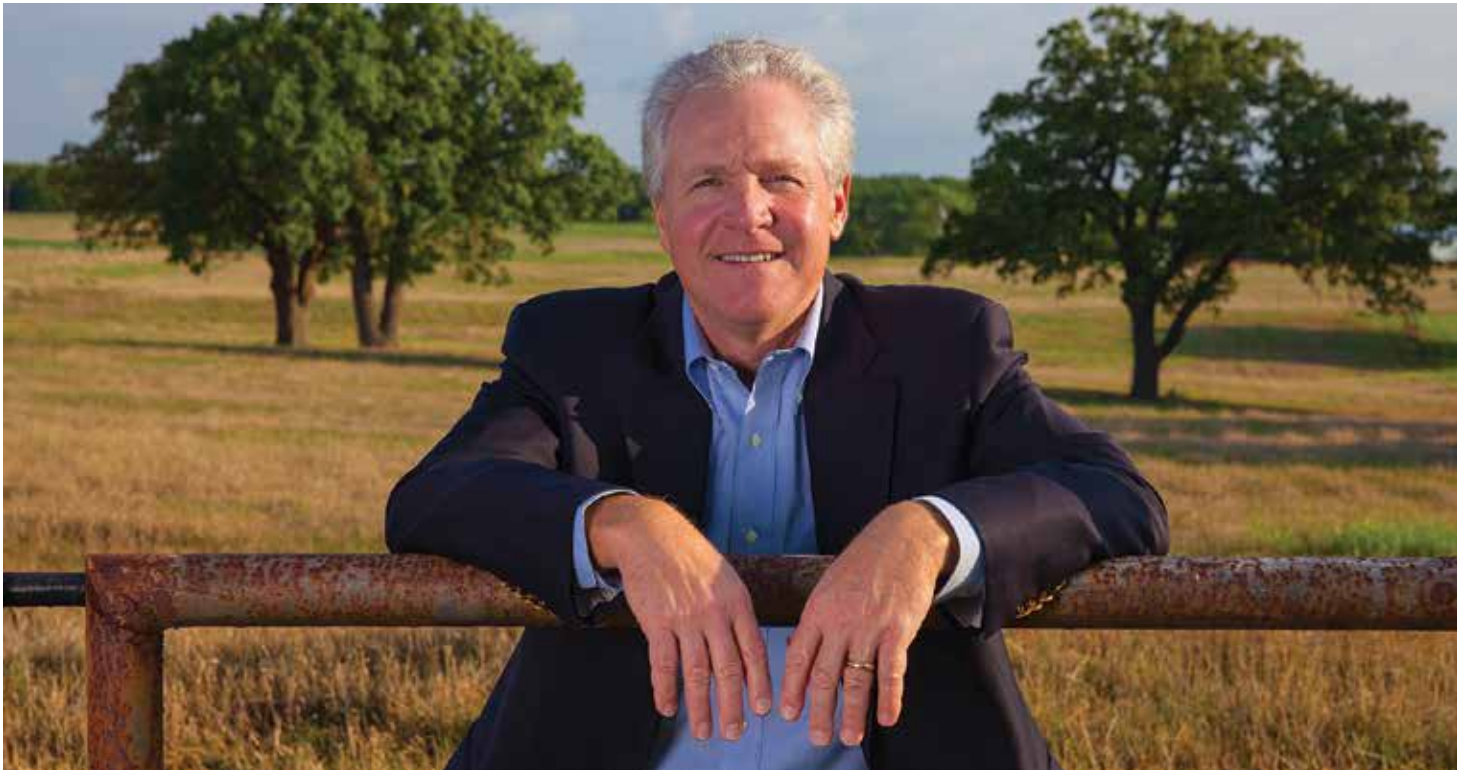


COVER STORY

16 SOIL = LIFE

Lloyd Noble established the Noble Foundation in 1945 as a way to safeguard the soil and foster land stewardship. This year, the Noble Foundation and The Farm Foundation launched the Soil Renaissance to reawaken the nation's focus on soil and soil health.

More Than Just Dirt



I've been thinking a lot about dirt lately. I know that most people give dirt – or the more accurate term, soil – about as much thought as they do mattress tags, but the subject is embedded in my brain.

Without soil, there are no plants and no livestock that consume plants. There are no people who consume plants and livestock. There is no society. Soil is the foundation. It is life, and we're running out of it.

Among the many soil facts peppered throughout this issue of *Legacy*, there are three that stand out:

- Half the topsoil on the planet has been lost in the last 150 years.
- Globally, about 40 percent of the soil used for agriculture is classified as degraded or seriously degraded.
- At current degradation rates, some experts believe the world has about 60 years of topsoil left.

If these estimations hold even a shred of accuracy (and they do), then soil is today's most pressing issue. This is not tomorrow's problem. We must act now to conserve, improve and safeguard the soil just as we would any exhaustible resource.

Both public and private soil health initiatives are springing up across the country in response to this crisis. There are many good efforts, but often they are focused on one topic or region. We need something that takes a broader


approach. We need something that completely changes the world's view of soil. We need a renaissance.

So we've started one.

This past fall, The Samuel Roberts Noble Foundation and the Farm Foundation, NFP, initiated the Soil Renaissance: *Knowledge to sustain Earth's most valuable asset.*

The Soil Renaissance's aggressive three-year goal is to make soil health a priority of farmers, researchers, foundations, nonprofits and government agencies. Within the pages of this magazine, we detail how this movement has already brought together agricultural leaders from conventional and organic farmers, researchers, policymakers, university professors, and industry professionals to form a whole-system, industry-wide effort aimed at changing our perception of soil forever.

In the following pages, you're going to read about how the Soil Renaissance came into existence, the progress it has already made and where it's headed. It's time to get our hands dirty, folks, and protect our soil. Like I said, I've been thinking about dirt a lot lately. And I think you should, too.

Sincerely,

Bill Buckner, President and Chief Executive Officer

Noble Spotlight



FOUNDER'S GREAT-GRANDCHILDREN VISIT ORGANIZATION FOR *LEGACY 4G* WEEKEND

This summer, Noble Foundation leadership and staff hosted more than a dozen of organizational founder Lloyd Noble's great-grandchildren.

These descendants represent the fourth generation (4G) of the Noble family, some of who could potentially serve on the Board of Trustees in the coming decades.

The group visited the Noble Foundation for a special weekend called *Legacy 4G: Past. Present. Future.* This "orientation" weekend was designed to provide historical context for the development of the Noble Foundation, an overview of the organization's current activities and a glimpse into the future of where Noble is headed.

JOURNAL RECORD TABS BYNUM FOR ACHIEVERS UNDER 40 HONOR

Noble Foundation Human Resources Administrator Emily Bynum was named one of 39 Oklahoma young leaders in The Journal Record's 2014 Achievers Under 40. Bynum was nominated for this award because of her contributions to the Noble Foundation and the Ardmore community.

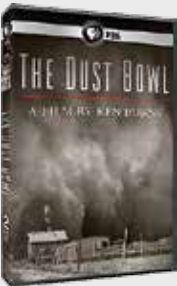


TOP PICKS: SOIL IN ENTERTAINMENT

Soil serves as the foundation of life and, in some cases, some enjoyable books, movies and websites. The *Legacy* staff corralled four of their favorite soil-related entertaining mediums.



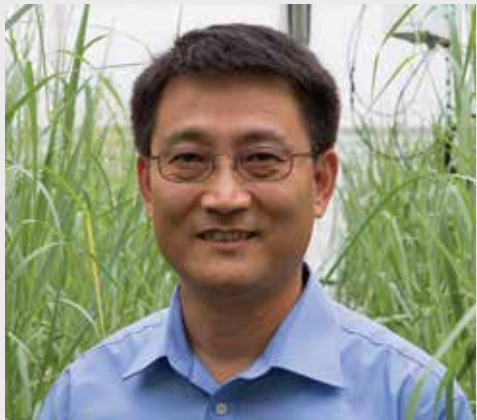
- Children's book: ***SOIL! Get the Inside Scoop*** by David Lindbo.



- Documentary: ***The Dust Bowl*** by Ken Burns.



- Educational website for students: ***soils4kids.org*** by Soil Science Society of America.



BOARD OF TRUSTEES SELECTS WANG AS NEW DIVISION DIRECTOR

This summer, the Noble Foundation Board of Trustees approved the promotion and appointment of Professor Zengyu Wang, Ph.D., to senior vice president and director of the Forage Improvement Division. He has served as interim director and been a member of the organization's Leadership Team since April 2014.

Wang joined the Noble Foundation as a principal investigator in 1998. His research focuses on improving agriculturally significant crops, specifically forages for cattle and biofuels. Wang has authored or co-authored more than 80 peer-reviewed articles and 32 book chapters, and holds 11 patents for his research.



THOMSON REUTERS NAMES UDVARDI, SCHEIBLE AMONG TOP CITED SCIENTISTS

Michael Udvardi, Ph.D., senior vice president and Plant Biology Division director, and Wolf Scheible, Ph.D., professor and principal investigator, were recognized as Thomson Reuters Highly Cited Researchers. Udvardi and Scheible are among the top 1 percent of science and social science researchers in the world, and two of only 176 plant and animal scientists honored.

Researchers were ranked by their number of highly cited papers. Those scientists in the top 1 percent (in their given field of research) from 2002 to 2012 were included in the Thomson Reuters list which comprised 3,200 researchers worldwide in 21 science and social science fields.

SOCIAL MEDIA



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youtube.com/thenoblefoundation



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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 value or principle are you a true advocate of?

I value determination. The scientific, technological and societal changes we see around us today have come from the determination of people with talent and perseverance. They overcome hurdles, working to make their vision a reality. Lloyd Noble is a great example. His determination to solve agricultural problems brought us all together from around the world to work towards his vision of sustainable agriculture.

Desalegn Serba, Ph.D.
Postdoctoral Fellow

Lloyd Noble's value of "advancing sustainable agriculture, including safeguarding the soil for future generations" is the primary principle for which I am a true advocate. I was fortunate to have been raised by a farming/ranching family in Oklahoma and have always known of the ever-changing challenges facing agricultural producers year in and year out. It is vital to support them in any and every way.

Jimmy Stein
Senior Research Associate

I advocate for plant science research. Plants are so often overlooked, but they are a critical part of our lives and the source of all our food. As a plant biology researcher, I focus on leaf development - helping plants produce more leaflets, resulting in greater yields and increased productivity. With 2 billion more people to feed by 2050, we must focus on improving plants now. We cannot wait to do this research. We cannot research in a vacuum.

Jianling Peng, Ph.D.
Senior Research Associate

Legacy

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SOIL | FACTS ABOUT SOIL

RENAISSANCE

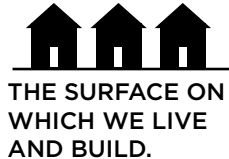
Soils are ...



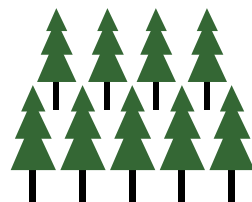
THE **DYNAMIC SKIN** OF THE EARTH, FORMED BY THE INTERACTION OF MINERALS, ORGANIC MATERIAL, ORGANISMS, WATER AND AIR.

A **NONRENEWABLE** RESOURCE. IT CAN TAKE **HUNDREDS TO THOUSANDS OF YEARS** TO CREATE 1 INCH OF TOPSOIL.

Soils provide ...



THE SURFACE ON WHICH WE LIVE AND BUILD.



FERTILITY TO GROW THE PLANTS AND FORESTS THAT NURTURE AND SHELTER HUMANS AND ANIMALS.

STORAGE FOR WATER AND CARBON. JUST **1 PERCENT** OF ORGANIC MATTER IN THE TOP 6 INCHES OF SOIL WOULD HOLD APPROXIMATELY

27,000

GALLONS OF WATER PER ACRE.



RECYCLING AND PURIFICATION FOR AIR, WATER AND NUTRIENTS. HEALTHY SOILS CAN REDUCE NUTRIENT LOADING AND SEDIMENT RUNOFF, INCREASE EFFICIENCIES, AND SUSTAIN WILDLIFE HABITAT.



HOUSING FOR A DIVERSITY OF MICROBES, ORGANISMS AND ANIMALS.

Why the need for a Soil Renaissance?



IF THE EARTH WERE AN APPLE, THE ARABLE LAND WOULD BE EQUIVALENT TO THE PEEL FROM ONE/THIRTY-SECOND OF A SLICE OF THAT APPLE.

THE WORLD'S **7 BILLION PEOPLE** TODAY ARE FED BY ARABLE LAND THAT **COMPRISES 10.6%** OF THE WORLD'S LAND AREA.

HALF

OF THE TOPSOIL ON THE PLANET HAS BEEN LOST IN THE LAST 150 YEARS.

EXPERTS FORECAST THE WORLD'S **FOOD DEMAND WILL DOUBLE BY 2050.**

POPULATION IS FORECAST TO INCREASE BY 50%, REDUCING THE RATIO OF ARABLE LAND TO PEOPLE AND PLACING MORE DEMANDS ON SOILS.

SOIL IS BEING LOST AT 10 TO 40 TIMES THE RATE AT WHICH IT CAN BE NATURALLY REPLENISHED.

THE AVERAGE RATE OF SOIL EROSION ON U.S. CROPLAND IS

7 TONS/
ACRE/YEAR.

GLOBALLY, ABOUT **40% OF THE SOIL** USED FOR AGRICULTURE IS CLASSIFIED AS DEGRADED OR SERIOUSLY DEGRADED. AT CURRENT DEGRADATION RATES, **THE WORLD HAS ABOUT 60 YEARS OF TOPSOIL LEFT.**

Why the need for a Soil Renaissance?

LOSS OF SOIL AND WATER FROM U.S. CROPLAND DECREASES PRODUCTIVITY BY ABOUT

\$37.6 BILLION

PER YEAR.

MORE THAN 90%

OF THE **FRUITS AND 78% OF THE VEGETABLES** PRODUCED IN THE U.S. ARE GROWN ON FARMS LOCATED CLOSEST TO CITIES - DIRECTLY IN THE PATH OF DEVELOPMENT.



SOIL EROSION GLOBALLY COSTS AN ESTIMATED

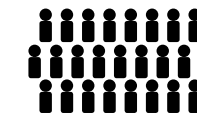
\$400 BILLION PER YEAR.

EVERY YEAR, THE U.S. **LOSES MORE THAN 1 MILLION ACRES OF LAND** IDEALLY SUITED TO GROW FOOD TO DEVELOPMENT.

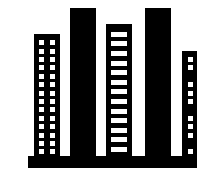
MOST **FARMERS CAN INCREASE SOIL**

ORGANIC MATTER IN **THREE TO 10 YEARS** IF MOTIVATED TO ADOPT CONSERVATION PRACTICES.

Threats to soils include ...



POPULATION GROWTH



URBAN DEVELOPMENT

KNOWLEDGE GAPS THAT IMPACT PRODUCTION PRACTICES AND PUBLIC POLICIES

SOIL EROSION



DEGRADATION AND CONTAMINATION

The Soil Renaissance will ...

- MAKE SOIL HEALTH A PRIORITY AMONG ALL STAKEHOLDERS.
- IDENTIFY A STANDARD APPROACH TO MEASURING SOIL HEALTH.
- DEVELOP TOOLS TO DEMONSTRATE THE RETURN GENERATED BY SOIL HEALTH INVESTMENTS.
- SUPPORT SOIL HEALTH EDUCATION AND OUT-REACH PROGRAMS FOR ALL STAKEHOLDERS.
- IDENTIFY KNOWLEDGE GAPS AND LAY THE GROUNDWORK FOR NEEDED RESEARCH.
- CELEBRATE THE MIRACLE OF SOILS.

How to be a part of the Renaissance ...

Neil Conklin, president, Farm Foundation, NFP, neil@farmfoundation.org

William Buckner, president, Noble Foundation, wbuckner@noble.org

Tim Brennan, Farm Foundation, NFP, tim@farmfoundation.org

“No civilization has outlived the usefulness of its soils. When the soil is destroyed, the nation is gone.”

Lloyd Noble, Nov. 18, 1949

Eddie Funderburg

by Robyn Peterson

A Louisiana State University (LSU) sign proudly welcomes all who enter Eddie Funderburg's office, as do two large bass mounts and a soils chart. It doesn't take Sherlock Holmes to deduce this Louisiana native's passions.

Growing up in Louisiana, this bayou boy loved fishing, football and a good shrimp etouffee. However, all these loves took a backseat to agriculture. During college at LSU, he followed an agriculture path which led him to the Noble Foundation where he has served as a soils and crops consultant for 14 years.

On this day, Funderburg, Ed.D., discussed the moments that shaped his life, the job that still inspires him and a few memories that might scare Kermit the Frog.

What inspired you to pursue a career in agriculture?

I grew up around agriculture – it is just what we did. It was our way of life. In college, I took a soil fertility class, and it sparked my interest in soil so I continued down that degree path. After college, I was the state extension soils professor at Mississippi State University and LSU.

How did you get to the Noble Foundation?

I came to the Foundation in November 2000. I was working at LSU but had decided I did not want my kids growing up in the Baton Rouge area, so I went looking

for a job that was equivalent to what I was doing as an extension agent.

So how is your job at the Noble Foundation similar?

I previously worked as both an extension county agent and state extension soils professor. This job seems to combine the best traits of both. I get to work with individual producers, like I did as a county agent, and get to specialize, like I did at the state level in extension. As a soils and crops consultant, I hone in on soil management and weed control.

What is your favorite part of being a consultant?

I enjoy working with the farmers and ranchers to help them achieve their goals. One great aspect of the Noble Foundation's consultation program is that we don't cost the producers a penny. It's a free service that can change their entire operation.

What do you do as a soils consultant?

I enjoy making complex things simple. I help translate the sometimes complex chemistry and physics aspects of soil so that farmers can produce better crops and ranchers can grow better forages for cattle.

What was it like growing up in northwestern Louisiana?

We lived in a small town where you knew everyone and everything. We were the smallest high school that played football in the state, and every other team played us for their homecoming. The best thing was it was just a short walk to the bayou for some duck hunting and fishing. On the weekends, my dad and I would go fishing and listen to LSU football on the radio.

What was your favorite/least favorite job?

Unfortunately, the job selection as a kid was slim. My worst job was roofing houses in the humid Louisiana heat. It really made me think about going to college. My fishing hobby did come in handy for my job of catching frogs for a seafood restaurant. I earned \$1 per frog. It was definitely the most fun and unusual job I had.

Why weren't you interested in fisheries as a degree and job path?

I truly enjoy fishing as a hobby. If it had become my job, I might not have enjoyed it as much. I'd rather take a trip to Belize with my oldest daughter for some offshore fishing than look at fish and water all day, every day.

What is something people would be surprised to know about you?

If I didn't have my current profession, I have always wanted to be LSU's head football coach. It's in my blood. ■

Since the earliest days of the Noble Foundation, its agricultural consultants have consistently preached the importance of getting good soil test results before beginning any soil health program. Eddie Funderburg recorded a

YouTube video explaining why a soil test is important and showing how to take a sample that will yield accurate, usable results. See Funderburg's video at www.noble.org/video/ag/soil-test/.





Deeply in debt and with his ranch on the line, Ron Stilwell sought consultation from the Noble Foundation to turn his operation around.

Straight Talk

With his ranch struggling, Ron Stilwell reached out to the Noble Foundation for assistance. Two decades later, that simple act saved his operation and reshaped his life.

by J. Adam Calaway

Ron Stilwell never minces words. Ask *any* question, and he'll serve up unfiltered truth like an ace pitcher whipping high and tight fastballs at social etiquette.

On a particularly bright spring morning, Ron Stilwell stood in his kitchen, hot mug of joe in hand, delivering a bevy of colorful anecdotes too blue to print as he chronicled a life story with his hallmark brand of blunt-force humor.

Decorum might dictate personal subjects remain unspoken, but the 58-year-old, who embodies a real-life Rooster Cogburn, right down to dusty black cowboy hat, worn boots and half-cocked smile, lays his life bare for visitors.

See, at the Stilwell ranch, new acquaintances are treated as old friends, and old friends have no secrets, just straight talk and acceptance.

For two hours, he regaled his captive audience with tales of his life, always returning to the two constants – his relationship with the land and the organization that helped it prosper.

ANSWERING THE CALL

Stilwell might blame his fascination with ranching on Ben Cartwright. At 6 years old, he fell in love with ranching through the TV Western *Bonanza*. “Yeah, I was riding around on a stick horse and shooting my toy gun,” he said. “I wanted to own cows. The only happy people I saw had cattle and land.”

Flash forward a dozen years and Stilwell graduated from Durant High School the year Nixon took office for his second

term. He initially pursued higher education, then opted for a career with Central Sales Promotions in Oklahoma City, where he rose through the ranks to supervisor.

Life in an office was far from the rolling plains of his dreams. In 1980, he returned home to live on 35 acres in an electricity-less trailer. His estimated net worth: \$100.

That same year, he fulfilled his boyhood ambition by purchasing his first two cows. After leasing hundreds of acres and building his herd up to 80 head on “used-up land,” Stilwell purchased his current ranch along the Red River in 1993, about 2.5 miles from Kemp, Oklahoma, selling 20 cows to make the down payment. “I didn’t want to do anything but run cows,” he said. “I found this place, and everybody told me I was stupid. People kept telling me I needed to quit. I have heard that all my life, but this was my dream. This is all I ever wanted to do.”

His dream required a full-time job, however.

Stilwell worked for the Pillsbury plant in Denison, Texas, from 1988 until 2002. He was a dough maker by day and a rancher in between sleeping and work. Things were admittedly not going well.

In 1995, he sold a crop of 57 calves for \$14,000, which didn’t quite cover his land payment. He needed to buy bulls. He needed to purchase fertilizer. He had only debt. His trial-and-error method was loaded with red marks, and the ledger said his window was almost closed.

“I didn’t know a thing about selling. I didn’t know how to vaccinate cows. I didn’t

know what I needed to know,” Stilwell said. “Everyone was doubting me, and I started to believe it.”

Then Stilwell met Hugh Aljoe.

A SWEEPING CHANGE

The 1996 drought had just begun to leather the Oklahoma prairie when Stilwell embraced the Noble Foundation’s consultation team.

As part of its mission, the organization provides farmers, ranchers and other land managers with no-cost consultation services and educational programs. The service helps agricultural producers achieve production, financial and quality-of-life goals, while fostering good land stewardship.

His decision to work with the Noble Foundation coincided with the arrival of the consultation team’s newest member. Aljoe had just arrived from managing a private ranch, and the pair quickly found common ground. Aljoe liked Stilwell’s dogged determination. Stilwell appreciated Aljoe’s seemingly endless wealth of knowledge. It was a match.

“The day I met Hugh, I was screwed like a cooked turkey,” Stilwell said. “I was \$150,000 in debt. I said to him, ‘Hugh, I’m in bad trouble. I can do the work. I just need to know what to do.’”

Stilwell outlined his simple vision: He wanted healthy, heavier calves and to raise his own cows – enough to make a living without a second job. Aljoe, along with other members of the Noble team, formulated a plan.

The first step was to get the pastures ►



Rancher Ron Stilwell, right, discusses operational strategy with Noble Foundation Consultation Program Manager Hugh Aljoe.

producing again. Aljoe had Stilwell focus on soil testing and fertilize according to those numbers. This simple step doubled production on grazing pastures and quadrupled hay production.

Aljoe then showed Stilwell how to use EPDs (Expected Progeny Differences) in the bull selection process instead of just visual evaluations. They focused selection on low birth weights, calving ease and high weaning weights. The end result: Stilwell raised weaning weights from the low 400-pound range to the mid-500s. Today it is more than 600 pounds. Aljoe even accompanied Stilwell to bull sales and showed him proper methods for bull selection. “I wanted more than a college education. I wanted to know everything these guys did,” Stilwell said. “Every problem I

had, I called Hugh and the Noble Foundation. If I hadn’t had him and the other Noble guys, I would have quit.”

More Noble Foundation consultants began to lend expertise.

Steve Swigert, economics consultant, convinced Stilwell to market calves in Oklahoma City as opposed to local sale barns. The trip up I-35 increased sale revenues more than 15 percent.

Soils consultant Jim Johnson helped Stilwell solve a problem with a new pasture that refused to yield any life. Johnson dug a few holes and found what he suspected – hardpan about 12-14 inches below the surface, caused by years of tillage before Stilwell purchased the land. Johnson recommended deep tillage to the pasture. Stilwell obliged, and the pasture sprang

back to life. Once barren ground soon became an emerald sea of thriving bermudagrass.

Director of the Agricultural Division Billy Cook, Ph.D., then a livestock consultant, helped him select a Brangus bull to be the foundation sire of his replacement breeding program. He then provided a live demonstration of how to synchronize and artificially inseminate (AI) cows. “I couldn’t AI a rabbit. Billy comes down and helps. He taught me right there and right then,” Stilwell said. “Who would do that for you? Who?”

Stilwell now has one of the best commercial Brangus herds in southeast Oklahoma and a more uniform set of market calves. “Just to be able to pick up the phone and have that kind of



After implementing advice from the Noble Foundation, Stilwell’s Brangus herd became one of the best in southeastern Oklahoma.

knowledge on the other end – what is that worth?” he asked. “You can’t put a value on that.” As Stilwell talked, Aljoe sat in the corner of the kitchen, sipping a soda and smiling as he listened to his friend retell their almost two decades of improvement. “This is what the Noble Foundation was created to do – advance agriculture,” Aljoe said. “We do that in so many ways, from national programs right down to the individual producer. This is our mission, and the outcomes of that mission can be seen right outside.”

A LITTLE MORE STRAIGHT TALK

As the morning sun began its march west, Stilwell left his perch in the kitchen to tour his sprawling 1,200-acre ranch, complete with two “guard” bulls dozing by the front

gate. Today, the Stilwell ranch owns more than 220 cows, and Stilwell has not a single penny of debt. One of his proudest moments came in 2001 when he purchased neighboring land and paid the balance in six months.

“If it wasn’t for the Noble Foundation, I would have kept on the way I was going, and I know I’d be out of business,” he said. “They’ve made all the difference in my land and my life.”

He wheeled his grey pickup through the fields, pointing out an eagle’s nest and fencing construction with equal excitement. Every tour stop elicited another conversation with Aljoe as Stilwell constantly picked his friend’s brain for the latest morsel of knowledge.

With the fundamentals far behind him,

Stilwell has moved into advanced operations. Swigert and Aljoe are currently helping him manage his annual net profits through wise investments into his cattle operation, including ranch and herd expansion.

As he wrapped up the tour at a field brimming with healthy, fat, black Brangus cows, he recounted one last personal tale. In 2002, Stilwell was laid off from his job at the Pillsbury plant, a seemingly significant setback.

“It’s the best thing that ever happened. That’s when I became a full-time rancher. No more jobs, just cows,” he said. “Cows have always been good to me; so have the Noble guys. I’ve never had anyone put up with me like them. It’s pretty simple. They’re the reason I’m still here.”

And that’s some straight talk. ■



Construction Specialist Tony Ballard replaces a wall panel on the Dickson High School greenhouse.

Regrowing Dickson's Greenhouse

Fallen into disrepair, a local school's educational greenhouse receives a new start with a little help from the Noble Foundation

by Courtney Leeper

The sun beat down on Thurman Householder, Noble Foundation construction services supervisor, and his crew one July morning as they began to clothe a bare greenhouse frame with translucent paneling.

Up they'd hoist a sheet to cover one section of one side of the Quonset structure. One man peeking out from the top, standing on a rolling scaffold; two men at the bottom, bracing their knees against the paneling to smooth its surface against the frame.

"We need to go up and over," the man up top called to those down below. The trio maneuvered up, down and around the paneling to line it up straight with the opposite side's panel. In tune with one another and their task, they called out measurements and adjusted their positions to prevent buckling before securing the panels.

Soon all the panels will be in place, and Dickson Public School's agriculture department will have a refurbished greenhouse. "It's sure going to be a nice facility," Householder said. "It just needed a facelift."

Originally built in the 1980s, the Dickson greenhouse was an extension of the agriculture classroom used to teach students how to grow and sell flowers. But the building's condition deteriorated over time.

By the time Zack Gadberry came to teach agriculture at Dickson in July 2013, the greenhouse had not been used to its full capacity for at least three years. His goal was to make the space fully functional again for his students.

The greenhouse foundation and framing were in sound condition, but its shell, cracked and yellowed with

age, needed replaced. The Dickson FFA Chapter bought new panels, but Gadberry soon realized the labor to put the panels up would cost more than the panels themselves.

At a Noble Foundation-sponsored agriscience workshop in 2013, Gadberry met Frank Hardin, Ph.D., the Noble Foundation's educational outreach manager who leads Noble Academy. Gadberry, who'd never managed a greenhouse previously, explained the project and wanted to see if the Noble Foundation could offer assistance once he started teaching. "I just wanted to use the Noble Foundation as a resource after we rebuilt the greenhouse," Gadberry said. "But Hardin said, 'I think we may be able to do better than that.'"

That's when Householder and his crew got involved.

Years of rain pounding against the hillside had displaced soil up against the side of the greenhouse. Before the old paneling could be peeled off the frame, the construction crew needed to push the dirt away.

All Gadberry was hoping for was help replacing the shell, he said, but the Noble Foundation team went much further. Members of the facilities and maintenance department built retaining walls around the greenhouse to improve water drainage and prevent future dirt buildup, ensured plumbing was in working order, and replaced the lighting. "We want this place in full operation when we leave," Householder said. "It'll be more user-friendly and more pleasing to the eye."

Most importantly, students stepping through its threshold this fall are able to use the fully functional facility to learn about plant science and gain hands-on horticulture experience, something that's

been a challenge the past few years.

Last year, Gadberry's horticulture class germinated some seeds in the greenhouse, but the lesson's setting was less than ideal since the building couldn't keep pests out or hold desired temperatures. This year, the prospect of a renovated greenhouse enticed some of those students to take the class again. This year, they're able to work in the greenhouse more frequently and more effectively.

Gadberry doesn't plan to focus on flowers as in the past; rather, the focus will shift to vegetable plant production. Students will grow vegetable plants from seed and sell them when they're big enough to transplant. For students who already have produce-related, supervised, agricultural experience projects, the greenhouse provides space for them to start their own plants.

Animal science students may also utilize the space for growing grasses to compare and determine which make better forages for grazing animals. Looking far down the road, animal science students could get more involved if they were to implement a hydroponics system, where horticulture students and animal science students would work together to grow lettuce and raise tilapia.

Once it's up and running, Gadberry plans to continue using the Noble Foundation as a resource to provide students with the best learning experiences possible. But for now, he said, he's blessed to have the Noble Foundation as a community partner.

"If it wasn't for the Noble Foundation, I don't know if we'd get this done," Gadberry said. "I'm extremely grateful. Because of Noble, I'm going to be able to provide a better education for my students." ■



Soil Renaissance movement reawakens focus on soil health

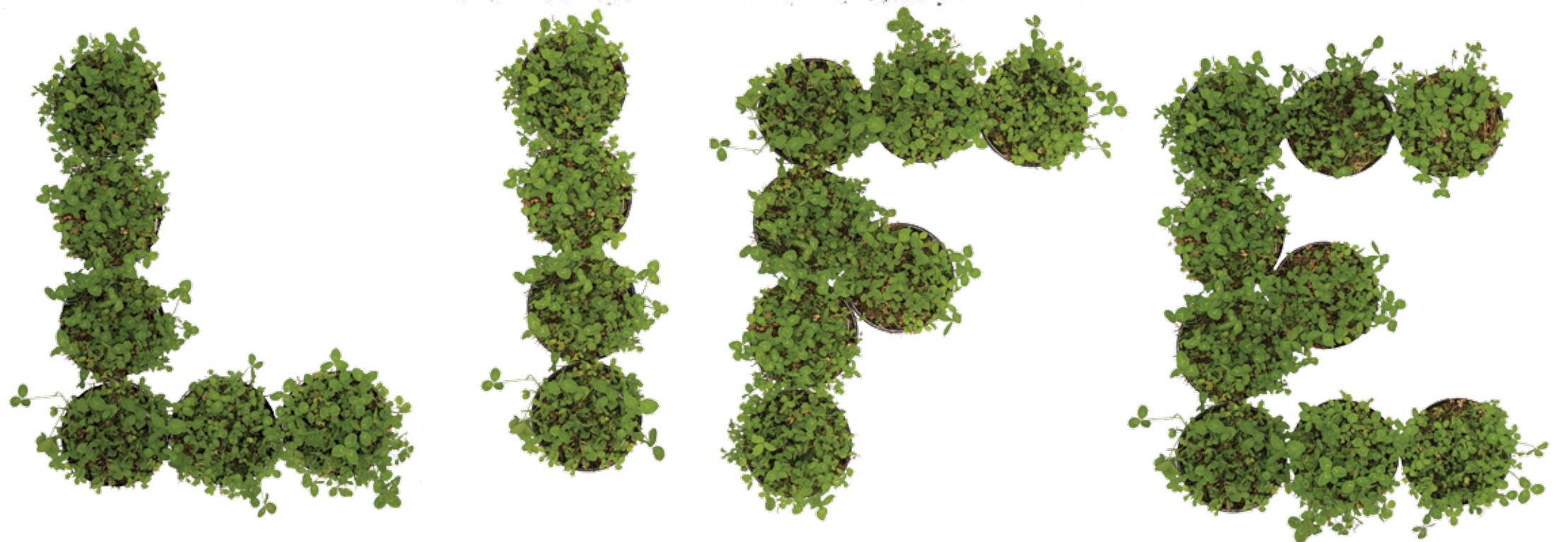
by J. Adam Calaway

To see the most precious resource on the planet, walk outside and look down.

Soil is the foundation of life. The top 6 to 8 inches of rich organic matter that cover a small fraction of Earth's surface serve as the genesis for food, which drives the world's economy and, in turn, gives rise to modern society.

Yet so often, soil is treated like dirt.

It's no wonder really. Environmental anxieties clog the public consciousness, stacking in interconnected blocks like an oversized game of Armageddon Jenga. Overpopulation drives urban sprawl and increases resource consumption. Demand for goods ramps up production, impacting pollution, air quality and water concerns. Dead zones, desertification and deforestation ensue. Pull on one issue too much and the whole stack ►





Jim Johnson (right), Noble Foundation soils and crops consultant, discusses seed planting with consultation client Lee Wayne Stepp.

threatens to topple over.

And there at the bottom of the pile – under all the headlines and public fear – is soil.

As vital to the life cycle as sunshine and water, soil remains undervalued and overlooked.

Most never imagine that healthy soil could disappear, but this exhaustible resource requires active management to remain productive. This isn't the first time in history that soil health has required immediate attention.

The Southern Great Plains witnessed firsthand the life-altering impact of soil health. In the early 1900s, generations of farmers unknowingly taxed the soil with poor land stewardship. These practices combined with 10 years of drought to produce the great Dust Bowl of the 1930s.

If soil equated to life, then Oklahoma was dead.

Oilman and philanthropist Lloyd Noble had a unique perspective on the Dust Bowl's devastation. Noble pioneered the use of personal aviation as a means of travel between his drilling rigs across North America. From the air, he saw his home state lying in ruin. He became an advocate

for protecting the soil and safeguarding the land for future generations. "No civilization has outlived the usefulness of its soils," Noble said. "When the soil is destroyed, the nation is gone."

Noble endowed The Samuel Roberts Noble Foundation as a means to prevent another Dust Bowl by raising awareness about proper soil management and providing agricultural producers with land stewardship education.

Seven decades later, significant concerns surrounding soil health have become evident but on a global scale. The organization Noble established is once again reaching out to fulfill its mission. This time, though, it will take a renaissance.

A FUNNY THING HAPPENED AT THE FORUM

Maybe it was chance. Maybe it was fate. Maybe it was a friendly president making small talk, but a national movement in soil health began with an unlikely conversation between Bill Buckner, Noble Foundation's president and CEO, and an organic farmer from New York.

Every year, the Farm Foundation – a non-advocacy public charity focused

on agriculture – hosts a series of public forums that engage the full range of stakeholders about food, agricultural issues and rural policies. In the spring of 2013, Buckner joined 130 other invested individuals for a discussion about the future needs of research within the industry.

Buckner led wide-ranging discussions on the role of science and technology in agriculture and the food system at the forum. During a break, Buckner and the farmer – two men with radically different backgrounds – delved deeper into soil health issues, finding common ground and agreement on its importance. The pair brought the conversation to the larger group, which determined this issue needed immediate action.

"Soil health is a key factor in any agricultural production system, whether conventional or organic, yet soil is too often ignored or overshadowed by other factors," Buckner said. "It is critical that producers – the people working directly with the land – be in close communication with researchers and policymakers to ensure that their challenges are recognized and our soils are protected and sustained for future generations." ►



Soils and Crops Consultant James Locke takes a soil sample from a pasture.



Natalie Kirkwyland, Noble summer research scholar, tests soil in the laboratory.

By fall, the conversation had advanced into action. Twenty-five leaders representing conventional and organic agriculture, science and research, land managers, and policymakers convened at the Noble Foundation's campus in Ardmore, Oklahoma, to develop a road map.

A mere 72 hours later and the Soil Renaissance was born, designed to bring recognition to the central role of soil in productive agricultural systems.

"In many cases, the people in that room have little in common," said Farm Foundation President Neil Conklin. "They have different backgrounds, unique perspectives and differing opinions, but the unifying factor was the common belief that action must be taken to conserve and build up our soil profile."

The first challenge facing the group was building a consensus on a definition of "soil health" – a seemingly innocuous but necessary step to bring continuity to all future work. This was completed by December 2013 (see sidebar), and, by

spring, a strategic plan had been authored around four key areas: education, economics, research and measurement.

The latter of these – as it turns out – is both the impediment and the catalyst for the rest of the Soil Renaissance.

MORE THAN JUST CAR PARTS

To conduct research, to educate the masses, to understand the economics of soil, researchers must first agree on how to measure its health. It's the starting point, the baseline from which everything else will spring.

This is not a simple task, however. Dr. Rick Haney, Ph.D., has spent two decades as a soil scientist at USDA's (United States Department of Agriculture) Agricultural Research Service and advocates for a true measurement that is practical and can be adopted around the world, independent of soil type.

"Soils are different, yes, but the fundamentals are the same," he explained. "Microbes break down matter and release

nutrients. We need a standardized set of measurements that compares apples to apples."

To be clear, there are no technological gizmos capable of taking a tablespoon of soil and evaluating its content, a la *Men in Black*. In fact, the technology is not even the issue. The focus of the tests, based on antiquated approaches, has had lasting implications for today's researchers.

"Think about a car. If you want to know how a car works, you take it apart and look at the pieces. We have treated soil like it was a car," Haney said. "We took it apart and picked the most important items to use, primarily the inorganic nutrients like nitrogen, potassium and phosphorus (NPK). We measured them and then added more to increase yield. By doing it this way, you ignore the biology, and we can't forget that soil is a living thing."

Haney's soil health test, which is nationally recognized as one of the leading methods, avoids the pitfalls of traditional tests that only examine the inorganic

matter. The Haney test instead focuses on a robust screening that examines the natural mechanisms happening within the soil, such as how a plant produces natural acids to solubilize the nutrients around it. This knowledge, in turn, gives a better understanding of what is actually happening to the nutrients (NPK), which are the biggest input costs for producers.

"If you ignore the natural systems, you are adding NPK on poor analysis," he said. "We get reliable, more realistic measurement of NPK so you don't have to apply as much. Sometimes it can have a dramatic impact on outcome."

The Haney test takes three days instead of a few hours and costs about \$50 (compared to \$10), but the results are wildly more accurate and ultimately producers are more efficient. They save more money by using less nutrients and limit the environmental impact, all at the same time.

"The test tells them a story that they've never seen before," Haney explained. "They can see that field A is better than field B, but they don't know why. Now they have the numbers. We've got to get farmers to thinking about the soil again; thinking about what their soil is trying to tell them."

A second soil health test has been developed by researchers at Cornell University. While the Haney test focuses on the biological factors that drive NPK, Cornell University folds in other elements of physical and chemical drivers.

“What’s soil got to do, got to do with it? Everything.”

– Wayne Honeycutt, Ph.D.

In December, Soil Renaissance leaders will reconvene and hammer out the guidelines that can be adopted as the soil measurement test. "We're dragging soil testing into the 21st century," Haney said. "Most testing methods were developed in

the 1950s and '60s. What technology do you still use from that era? We have to remember, however, we are at the tip of the iceberg in understanding soil health. We must continually adapt. We can't cling to the old ways."

Of course, some classic Tina Turner never hurt.

WHAT'S SOIL GOT TO DO, GOT TO DO WITH IT?

On an unusually mild July morning in Washington D.C., Wayne Honeycutt, Ph.D., took the podium at a Farm Foundation Forum less than a year after the birth of the Soil Renaissance, a movement he now advocated.

The deputy chief for science and technology at the USDA-Natural Resources Conservation Service (USDA-NRCS) summarized the case for soil health.

He presented the stark challenges facing agriculture, including the increase of global population from 7 to 9.5 billion in the next 50 years; loss of 23 million acres of active agriculture land from 1982 to 2006; and the present danger to pollinators, on which 30 percent of the United States food crop depend.

Then Honeycutt surprised his audience by warbling his way through a revised version of Turner's *What's love got to do with it?*, replacing the key word "love" with "soil."

"What's soil got to do, got to do with it?" he sang, before emphatically adding: "Everything."

Honeycutt then detailed how soil health impacts crop resiliency, water quality and quantity, environmental issues, plant health, and the necessity of coordinated research. "Fundamental research is very much needed," he explained. "When I was a researcher, I remember doing a literature review, and I found that only half of organic phosphorus had even been identified. How can you understand, much less manage, something if it hasn't even been identified? There is so much of that basic research that has to be done."

With the measurement piece soon in place, that research will have a baseline. Soil Renaissance scientists then will identify research objectives and collaborate with USDA agencies to integrate soil health priorities into the President's FY2016 Budget proposal. Individual researchers and institutions will be able

The Soil Renaissance

THE MISSION:

The Soil Renaissance awakens the public to the importance of soil health for enhancing healthy, profitable and sustainable natural resource systems.

THE VISION:

Improving soil health is the cornerstone of land use management decisions.

DEFINITION OF SOIL HEALTH:

The continued capacity of the soil to function as a vital living ecosystem that sustains plants, animals and humans.

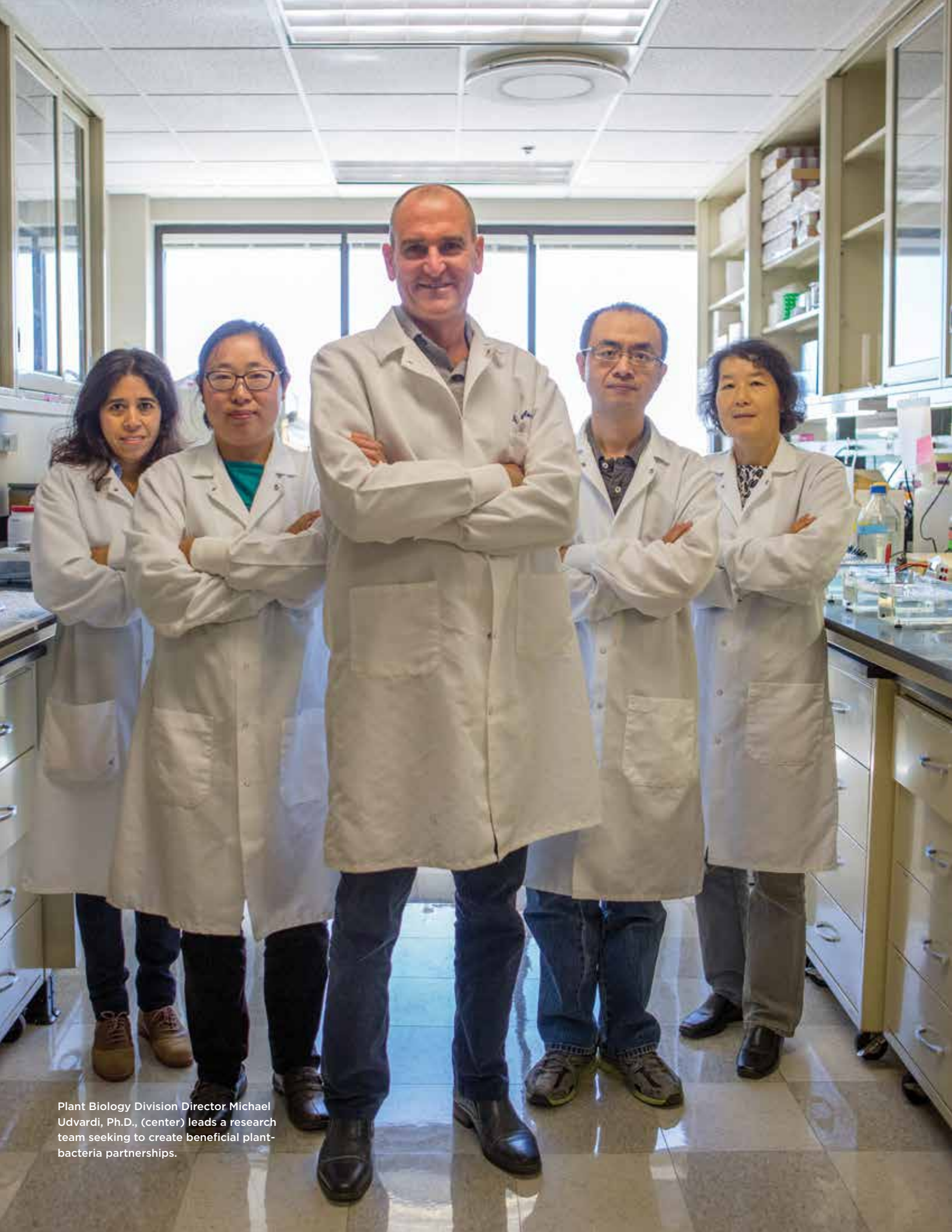
to provide support through collaborative projects, but funding on the national and international levels will be pivotal for success. "It is difficult to get funding for soil research," Haney said. "It's not sexy. It's not hot. But it's critical."

Running parallel to the research efforts will be an education program for consumers and policymakers about the critical role of soil, as well as detailing the underlying economics of soil health.

Soil health advocates know the adoption of standards hinges on showing the underlying financial impact and the economic benefit of investing in soil health, as well as how it mitigates long-term risk.

"There are layers upon layers of issues to address surrounding soil health," Buckner said. "Soil Renaissance addresses them all with an interconnected strategy. Unlike other soil efforts, we will have no financial gain. We are doing this because this is our responsibility. This is our moment in history to make a change before we can no longer salvage the vitality of soil. We must act now."

Because soil is life. ■



Plant Biology Division Director Michael Udvardi, Ph.D., (center) leads a research team seeking to create beneficial plant-bacteria partnerships.

Revolutionary Rhizobia

Noble Foundation scientists attempt to decipher the complex relationship between plants and bacteria in a bold new approach that could affect nitrogen use challenges

by Laura Beil

Plants would die without nitrogen. The nutrient is necessary for healthy growth and is a key ingredient in the manufacture of molecules the plants need, including chlorophyll (and is why nitrogen-starved plants turn yellow). Yet despite the fact that plants live in an invisible cloud of nitrogen gas – it makes up 78 percent of the Earth's atmosphere – the element in the air is inaccessible to most of them.

Throughout most of human history, farmers have had to nourish their crops with other forms of nitrogen, like that deposited into the soil from weathered rocks or tilled into fields with plant and animal waste. Only legumes, through the aid of microbes that work their way into the cells of a plant's roots, are able to turn nitrogen from the air into compounds a plant can use, a process known as nitrogen fixation.

In 1909, German chemist Fritz Haber revolutionized agriculture by pioneering a process that converts nitrogen from the air (which exists in a form called di-nitrogen, because two nitrogen atoms are chemically stuck together) into ammonia that can be applied as fertilizer. Over the next century, crop yields skyrocketed as farmers harvested from nitrogen-enriched soil to

meet the needs of rising world population. Problem is, this abundance has come at a cost. Experts predict that by 2015, farmers will be adding 190 million tons of nitrogen into the world's soils. But crops only use about half of it. The excess runs off into lakes and rivers, and eventually into the ocean.

Nitrogen washed into the sea fuels the growth of algae that suck oxygen and other nutrients from the water. Each year, a "dead zone" at the mouth of the Mississippi River forms in the Gulf of Mexico, a semi-lifeless pool where the oxygen levels are so poor that little marine life can survive. Unused nitrogen also escapes back into the atmosphere as nitrous oxide, a so-called "greenhouse gas." And, as the recent explosion in West, Texas, tragically showed, fertilizer manufacture produces compounds that are hazardous to store.

A NOVEL APPROACH

Scientists at The Samuel Roberts Noble Foundation are working to solve these problems by coming up with ways to make nitrogen available to plants without the need to add so much extra to the soil. If more plants could use the tricks of legumes and fix nitrogen themselves, the world might reduce its dependency on

industrial fertilizer. The secret is creating new bacteria-plant partnerships.

"We're trying to learn from nature by looking at the nitrogen fixation process in legumes," said Michael Udvardi, Ph.D., director of Noble's Plant Biology Division. "We want to apply it to non-legumes."

If successful, the development of new nitrogen-fixing bacteria and plant-microbe partnerships could also help farmers in countries where fertilizer is too expensive to buy. In poorer nations, Udvardi said, crop yields are a fraction of those in the United States.

One of the first steps has been to figure out the secrets of rhizobia, the soil bacteria that fix nitrogen naturally in legumes. The relationship between rhizobia and legumes has become so synchronized over millions of years that both plant and bacteria thrive best when they have each other. (In fact, the name rhizobia itself is a combination of the Greek words for "root" and "life.")

Rhizobia live naturally in soil. When a legume is planted into the ground, the root sends out chemical signals that attract the bacteria. Through a back-and-forth chemical conversation between microbe and plant, the root develops special structures called nodules where the bacteria "infect" ►



Senior Research Associate Ivone Torres-Jerez prepares a laboratory test as Udvardi observes.

the plant's cells and begin to multiply.

The relationship is mutually beneficial. The plant supplies the bacteria with carbon and other nutrients that it uses for its own metabolism. The bacteria supply nitrogen (in the form of ammonia) the plant needs to make molecules necessary for its growth and survival.

By figuring out which plant and bacterial genes are important for symbiotic nitrogen fixation by rhizobia in legumes, researchers might be able to recreate a nitrogen-fixation system for crops like wheat or corn, which is the greatest consumer of nitrogen fertilizer. "We hope to engineer nitrogen-fixation genes into bacteria that form relationships with plants naturally," Udvardi said.

THE ROAD FORWARD

A \$2.5 million grant from the National Science Foundation and the Biotechnology and Biological Sciences Research Council in the United Kingdom allows Udvardi and his collaborators to explore this. (The project is split among researchers at the Noble Foundation, Montana State University, the University of Wisconsin-Madison

“We’re trying to learn from nature by looking at the nitrogen fixation process in legumes”

– Michael Udvardi, Ph.D.

and the Massachusetts Institute of Technology in the U.S., and the John Innes Center and Oxford University in the UK.)

One approach would be to genetically alter a form of rhizobia to allow the same chemical crosstalk that takes place in legumes to happen in another species. Another possibility is enabling other bacteria to work like rhizobia.

"There's a suite of microorganisms

that will colonize plants, but they aren't really supplying nitrogen," said John Peters of Montana State University, who is also working on the project. "Typically they're not feeding the plant with significant amounts of fixed nitrogen. What we're trying to do is strengthen these associations."

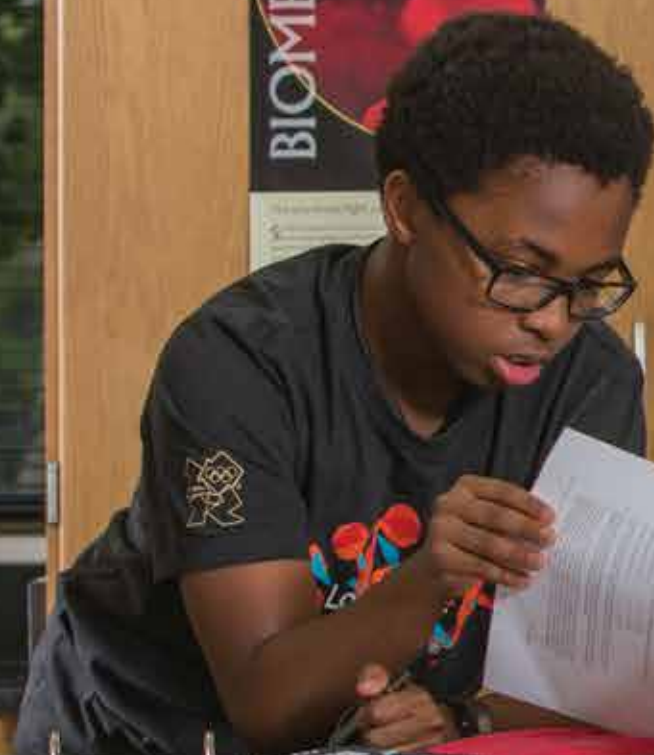
But first the genetic instructions involved in the nitrogen fixation process have to be identified. Then the researchers must figure out how active these genes need to be and in what metabolic systems of the bacterial cell. For example, if the bacteria produce ammonia, scientists want to be sure that it is ferried on to the plant and not used by the microbe itself.

"This is the first time a group of scientists have come together to try to manipulate both the plant and the bacteria," Udvardi said. "If we can work out the rules of engagement – the ways microbes and plants can live together – we can develop novel nitrogen-fixing systems to reduce the amount of nitrogen fertilizer used in agriculture, which will be a win-win situation for agriculture and the environment." ■



Green millet (*Setaria viridis*) will be used as a model plant in the Udvardi laboratory's rhizobia research.

Multiplier Effect



An Oklahoma School of Science and Math teacher listens as students solve an equation.

Noble Foundation philanthropy helps fuel Oklahoma School of Science and Mathematics to educate, empower the next generation

by Jessica Willingham



At the heart of the Oklahoma School of Science and Mathematics is the cafeteria – much like any other high school.

But unlike any other high school, lunchtime at OSSM is characterized by the quiet hum of small conversations between groups of students and their teachers.

When it's time to resume the day, students simply come and go on their own; a bell never rings to signal the beginning or end of the meal. It is a small but noticeable variation in the high school template.

Spend a day at OSSM and the differences become more pronounced. Cell phones do not dominate student attention spans. Challenging coursework is not only expected but appreciated. A general collegial atmosphere replaces any juvenile antics. The entire rhythm of this high school is different, and different is good.

LIFE AT OSSM

OSSM is a public, two-year, residential high school for students with exceptional ability in science and mathematics. There are only 16 similar schools in the country.

Funded by the state legislature, the school first opened its classrooms to students in 1990.

Today, 144 high school juniors and seniors from across Oklahoma attend and live at the Oklahoma City campus at no cost. The admission process for Oklahoma students is based on academic achievement, interest in science and math, and the ability to handle residency. Students live in dorms on campus, entering a university-like setting two years before most of their peers.

"It's like college before it counts," said Gracie Mitchell, senior.

OSSM seems like college because that's how it was designed. Students choose courses to fit their preferred areas of study, much like a university student selects a degree program. The average high school student in a traditional public school can take up to three courses in biology. At OSSM, students can take up to 12 biology courses with options ranging from general biology to endocrinology, microbiology and genetics.

In addition to science and math, students take art and physical education courses, like multimedia creation, yoga and rowing. Outside of the classroom and labs, students engage with mentors and participate in developing, presenting and

“We recognize that the future of agriculture depends on young Oklahomans and their passionate pursuit of science and mathematics.”

– Mary Kate Wilson

even publishing research alongside industry leaders, alumni and faculty.

Collectively, the campus and classroom environment complements the intensive course load and content. "To quote our founding president, Dr. Edna McDuffie Manning, 'Everything in this environment supports academics,'" said Pam Felactu, OSSM director of development. "Students live together; they study together. And the faculty are constantly available to help them keep up and keep moving forward to attack that college-level curriculum."

BUT THERE'S THE PROBLEM

Two-thirds of the OSSM faculty hold doctoral degrees, and they hail from elite universities like Columbia, Georgetown and the Massachusetts Institute of Technology.

Within the last five years, the school has lost a third of their staff due to state budget cuts. The remaining staff salaries are supplemented through stipends, and still, some teachers are working full-time, schedules on part-time paychecks.

"This school is still operating at the same world-class level it has since day one because of the dedication of our faculty and staff," Felactu said. "For our teachers, it's not just a job. It's a way of life."

The Noble Foundation, with 110 doctoral-level scientists from more than 25 different countries, knows all about bringing the brightest minds from around the world together. As an organization dedicated to advancing modern agriculture through technology, supporting science and mathematics education

is critical. Since the school's inception, the Noble Foundation has awarded the school \$670,000 in grants, most of which support OSSM faculty and help supplement salaries during one of the most trying eras of educational funding in the history of Oklahoma.

"We recognize that the future of agriculture depends on young Oklahomans and their passionate pursuit of science and mathematics," said Mary Kate Wilson, Noble Foundation director of granting. "We also recognize the need for committed and compensated faculty to educate the next generation of innovators in medicine, technology and agriculture."

Through the relentless dedication of OSSM staff and the donations of private foundations like the Noble Foundation, the future of science and math in Oklahoma remains hopeful. The school hopes to continue to achieve successful faculty retention and encourage graduates to return to serve the school and state that gave them so much.

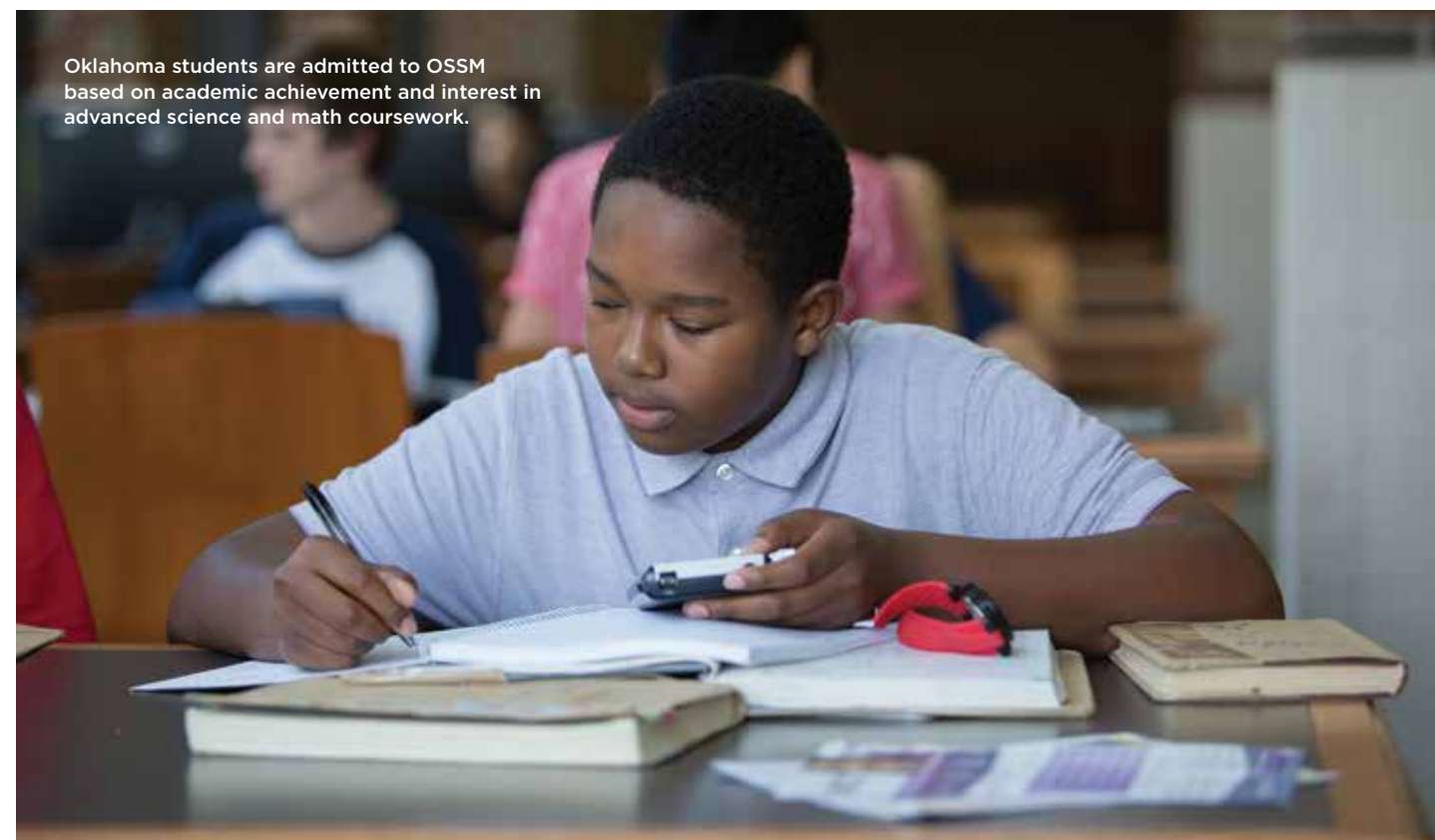
Chris Shrock, Ph.D., graduated from OSSM in 2000 and is now the dean of students. Like so many graduates, Shrock has returned to serve his alma mater. Alumni often return to teach, tutor, present to students or assist OSSM by living in and maintaining the dormitories. "I feel a great sense of gratitude for the OSSM experience," Shrock said. "I'm proud to give back to the school that launched my career."

He's not the only one.

EXPANDING IMPACT

To date, the school has produced 1,407 graduates, many of whom have gone on to impact Oklahoma. A recent independent economic impact study showed OSSM and its alumni generate some \$40 million in economic activity in Oklahoma each year, and that number is growing with every graduating class.

"OSSM is a strong contributor to the local economy," Felactu said. "Our students feel a connection to their home state. While they may go out of state to further their education, they often come back to Oklahoma to begin careers. The state is working so hard to get high tech and scientific business to come to Oklahoma. A key piece of that is having a trained and educated workforce in those areas. OSSM contributes directly to that effort, and we couldn't do any of it without organizations like the Noble Foundation." ■



Oklahoma students are admitted to OSSM based on academic achievement and interest in advanced science and math coursework.

In addition to its campus in Oklahoma City, OSSM supports eight regional centers in rural areas of Oklahoma in partnership with career technology centers. These centers provide advanced science and math curricula to high school seniors, allowing qualified students to take advanced physics and calculus courses while still attending their home high schools for other classes and activities.

"My goal is to broaden OSSM's reach and impact through our residential center where students are immersed in an intensive academic environment, through our regional centers and through our newly created virtual regional center where we deliver instruction via interactive video conferencing," said OSSM President Frank Wang, Ph.D. "We also hope to expand our middle school outreach and teacher training programs so that as many students and educators in the state as possible can benefit from OSSM. We want to be a bright beacon of academic excellence statewide."





Mike Proctor, Noble Foundation research associate, helped save a poisoning victim through his plant identification skills.

It Wasn't Wild Onion

A Noble Foundation research associate's proficiency in plant identification helps ailing patient

by Courtney Leeper

When Mike Proctor woke up on a typical Wednesday morning in mid-May, he had no idea his keen eye would help save a life that day. The agricultural field plot operations research associate typically spends his time at the Noble Foundation's Oswalt Road Ranch collecting data. But this particular day was filled with meetings that kept him on the main campus in Ardmore, Oklahoma, and away from his usual plant-tending routine.

Then Lea Brown called. As Mercy Hospital's emergency room manager, Brown had a puzzling case on her hands and needed help.

About an hour earlier, an oil pipeline crew working near Gene Autry brought one of their coworkers to the emergency room. He said he'd eaten what he thought was a wild onion and was now terribly ill. What the patient thought was a simple snack turned out to be the beginning of a nightmare.

The man was unstable, and the nurses immediately began treating his symptoms, knowing they were likely dealing with some type of poison. "We had no idea what we were dealing with," Brown said. "I'd never seen a plant do that to a person, and I've been in the medical field 20-plus years."

All they knew was they needed the plant identified. Until then, they would be in the dark. So they sent the crew back to their worksite to dig up the plant and bring it to them.

Meanwhile, Brown attempted to figure out how they could get the plant identified once they had it in their hands. On this day, having the largest private agricultural and plant science research institution less than 4 miles away was going to be a lifesaver. "I thought if anyone could help, the Noble Foundation would be it," Brown said.

Brown called the Noble Foundation, and Darla Warren, administrative assistant for agricultural research and operations services, began searching for the right person to help. While the nurses continued treating the man's symptoms at the hospital and waited for the puzzling plant to arrive, a phone chase began at the Noble Foundation. Warren eventually tracked Proctor down by cell phone. Proctor, who has a master's degree in biology, is known for his ability to identify plants.

As soon as he got the call, Proctor headed to the Ag Division Building to wait for Brown. In his head, he began a process of elimination. The clues surfaced – he knew the plant was most likely toxic, which eliminated about 95 percent of his options, and he knew he was limited by location and time of year.

Proctor typically likes to see the plant's flower and fruit when identifying plants. He looks through books, checks the Internet, puts individual parts under a microscope and, ideally, compares the mystery plant to identified plants.

"It takes time to identify a plant," Proctor said, "But when the ER doctors and nurses are literally waiting for your identification, you don't have time. Then it comes down to an in-depth familiarity with the vegetation of the area."

Brown arrived at the Ag Division Building, leaves and a small bulb in hand. Proctor was at the front desk waiting. He already had a pretty good idea of what the plant might be when Brown walked up. To make sure he hadn't missed anything, Proctor sat down at the computer and started going through a list of plants to compare his clues against their characteristics.

Within 15 minutes, he had the culprit – *Zigadenus nuttallii* – one of several toxic species commonly known as Nuttall's

deathcamas, which is poisonous when consumed because of a toxic alkaloid called zygacine.

A member of the lily family, Nuttall's deathcamas is a perennial herb native to areas in the Southern Great Plains and east. It has long, narrow leaves near the bottom of the plant, and its stem rises from a bulb. The poisonous plant typically grows unnoticed. It's only recognizable while in bloom, a relatively short period of time.

Those unfamiliar with the plant may look at its bulb and mistake it for wild onion, although its bulb does not have the same onion odor as a wild onion. Deathcamas poisoning may cause stomach pain, nausea, muscle spasticity, slowed heart rate, low blood pressure, difficulty breathing, coma and even death.

Fortunately, Proctor's speedy and correct identification enabled Brown to help the nurses back at the emergency room. A few minutes after Proctor identified the plant, Brown was in her car calling the emergency room to give them the name. They then immediately called poison control, which was able to advise them on treatment. The patient was admitted to the hospital, but he eventually recovered and was released.

"I'm grateful they were so giving of their time," Brown said. "In a situation like this, he helped save a life."

Proctor was happy to help but said a person in an emergency goes to the person with the right information. On that particular day, he just happened to be the right guy. "This may be the first time my background was useful to something besides our cows," Proctor said. "It's nice to have helped someone in a bad situation, and it makes you feel good about your local hospital to see them go to such great lengths to help a patient." ■

Ten Pin Revelations

by J. Adam Calaway



If you ever meet Natalie Kirkwyland, you’re going to feel better about life. Natalie’s a living Roman candle, a pop of iridescent hope in an often bleak world.

Natalie came to the Noble Foundation from the State University of New York-Cobleskill as one of this year’s Noble Research Scholars. Every summer, our organization offers a dozen of the best and brightest minds the rare opportunity to become either a Noble Research Scholar or a Lloyd Noble Scholar in Agriculture.

These two internship programs – one focused on laboratory research; the other focused on applied research and agricultural consultation – bring together college students for three months of redefining experiences. They work. They bond. They return home forever changed. So, often, they leave their coworkers with a renewed sense of confidence in the coming generation. Natalie certainly did that for anyone who crossed her path. She skipped into Noble radiating a mix of childlike joy and mature eagerness.

She was always happy. Always. No matter the challenge dumped at her feet. Huge research project. She’d just giggle, put her nose down and crush it. Scary social situation. No worries. She’d be the first to stick her hand out and introduce herself.

It wouldn’t matter if you’d just been audited, Natalie could make you smile by just being Natalie. She was a plucky little ray of sunshine – even when she was dominating you at bowling.

On a nondescript Wednesday night, the research scholars, along with my communications intern, instituted a tradition

of competing against their mentors in a few friendly frames of bowling. We gathered at the local lanes, slipped on some recently fumigated shoes and looked for a ball that least resembled the surface of the moon.

For the record, I never enter any athletic competition expecting victory. But my Y chromosome leads to the inevitable assumption that I should best a 21-year-old with a bobbed haircut. Teams were selected, and it quickly became clear that these Millennials were going to dominate. I was amazed at Natalie’s ability to bowl while laughing. Giggle. Giggle. Strike. Giggle. Giggle. Spare. Giggle. Giggle. Crush my ego.

With my self-esteem rolling down the gutter, I stepped back from the microcosm of this “friendly team competition” and looked at the whole picture. Our baker’s dozen of bowlers included multiple generations, ethnicities and points of view.

Little moments like this always sneak up on me. Moments when I find myself struck by the simple joy of people enjoying people. No masks. No titles. Just humans with no obvious common bonds finding mutual admiration.

And then there were the scholars. They stood out even in this eclectic group. So young and capable. So different from the zombie youth marching lockstep into nothingness. These intelligent, sweet-spirited young people defy generational labels. They possess a remarkable desire to contribute. They are the future, and that should make us all happy.

Even if they kick your butt at bowling. ■



Charles Parker takes a soil sample in the 1940s for testing. Since its inception, the Noble Foundation has been dedicated to soil health.

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A blanket of stars wraps the sky over center pivot
irrigation equipment on the Noble Foundation's
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