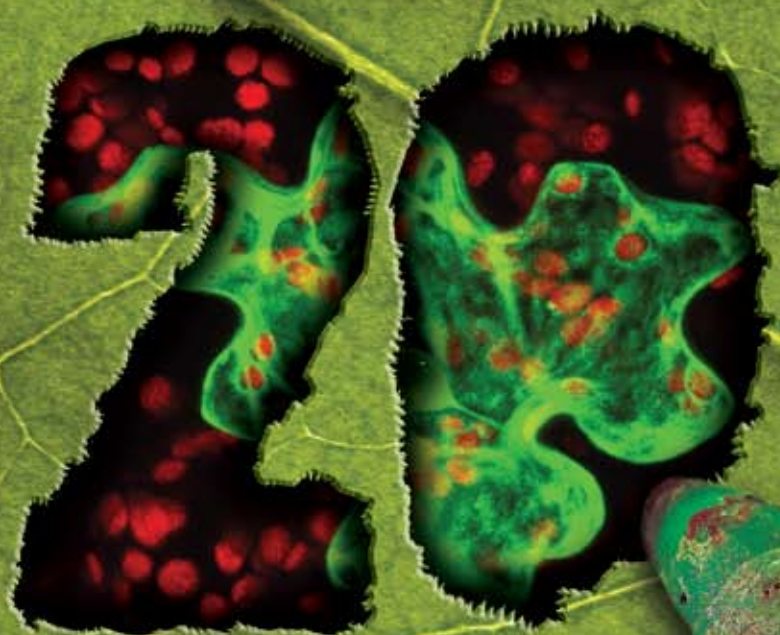


# Legacy

Fall 2008

A publication of  
The Samuel Roberts  
Noble Foundation

Volume 2, Issue 2



**20  
YEARS OF  
PLANT  
BIOLOGY**



Plus: The Seeds of Progress \_\_ Special Postdoc Section \_\_ A Legacy of Success





## 8 Launching Scientific Careers

Postdoctoral fellows (known as “postdocs”) are the backbone of science. At the Noble Foundation, quality mentors combine with cutting-edge resources to provide postdocs an unparalleled experience.

A Noble Foundation postdoc works in the lab.

Photograph \_ Broderick Stearns

## Cover story

# ONLY THE BEGINNING

For more than two decades, the Noble Foundation's Plant Biology Division has performed the highest quality basic biochemical, genetic and genomic plant research for the purpose of improving characteristics within crops, such as disease resistance, drought tolerance and forage quality.

Inside is a look back at the people, the events and the vision that established one of the premier plant research institutions in the world.

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A Noble Foundation researcher is working with scientists at Mount Sinai to see if chemicals in grape seed extract could unlock a cure for Alzheimer's disease.

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For more than 50 years, the Noble Foundation's agricultural consultants have been helping farmers and ranchers prosper.

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## On the Cover

In celebration of the Plant Biology Division's 20th Anniversary, the Fall 2008 cover of *Legacy* brings together a few common elements used in fundamental plant science including a tobacco hornworm and a tobacco leaf. The photograph seen in the space behind the “20” is of cellular structures and illustrates the basic biochemical, genetic and genomic plant research performed by the division.

Illustration \_ Doug McAbee and Broderick Stearns



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*Legacy* is published by the Office of Public Relations and the Office of Publications and Visual Media at The Samuel Roberts Noble Foundation. Headquartered in Ardmore, Okla., the Noble Foundation is an independent, nonprofit institute conducting plant science research and agricultural programs to enhance agricultural productivity. *Legacy* offers detailed insight into the outstanding scientists and agricultural specialists, and their programs and research, which collectively serve to pursue the vision of Lloyd Noble, the founder of the Noble Foundation, to better mankind.

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ISSN: 1939-5035



# The Real Answer

“What does the Noble Foundation do?”

It is a question I’m asked daily as president of the Noble Foundation. It’s an understandable query, of course. The Noble Foundation is unlike most private foundations, which exist solely to distribute grants.

We do provide more than \$12 million in grants to charitable organizations each year, but our focus remains dedicated to developing one of the most comprehensive agriculture and plant science research institutions in the world with the sole purpose of benefiting farmers and ranchers.

Our unique mission was set forth by Lloyd Noble, who established this organization in 1945 as a way to help solve one of our region’s most pressing problems. Poor farming practices and drought devastated the Oklahoma landscape in the early to mid 1900s, and he decided a charitable foundation could be a touchstone of change.

The Noble Foundation began with a “soils” group, which tested a farmer or rancher’s soil and told them what nutrients need to be returned to the land to keep it viable. It was an invaluable service and laid the groundwork for our efforts which continue more than six decades later.



The soils group is now the Agricultural Division, and the services they provide stretch far beyond soil testing. Today they provide consultation to more than 1,600 farmers and ranchers, helping them achieve their financial, production, stewardship and quality-of-life goals.

Four teams of consultants – each complete with a wildlife, soils, pasture and range, and livestock consultant as well as an agronomist – assess each producer’s needs and tailor recommendations to fit

his/her unique circumstances. This service is offered at no financial cost to the producers.

To further its mission, the Noble Foundation expanded into fundamental plant science research (Plant Biology Division) and forage breeding and translational plant science (Forage Improvement Division) during the past 20 years. Along with the Agricultural Division’s research group, these scientists and researchers provide invaluable insight into forage crops, such as grasses and legumes, as well as produce new varieties for use by producers. These groups have already established themselves as international leaders in their fields.

While “agricultural programs and scientific research” are the easy response to what the Noble Foundation “does” – I really learned about what we do at a local high school football game some 15 years ago.

On a perfect fall evening, the Ardmore Tigers were facing their weekly gridiron foe, and I found myself waiting in line at the concession stand when a farmer approached me with a blustery greeting: “Cawley!” I heard as a barrel-chested man stepped forward.

His overalls were worn and his John Deere ball cap was faded from countless days working under the Oklahoma sun. He reached out, shook my hand, and asked: “You work out at the Noble Foundation, don’t you?” I said, “Yes, sir, I do.” As we talked, he explained that he was one of the many farmers and ranchers who received consultation services from our Agricultural Division, and how our consultants had turned his struggling operation into a successful endeavor and then he said, “I just wanted you to know if it wasn’t for the Noble Foundation, I would not have been able to put my children through college.”

An appreciative tear welled in his eyes. He patted me on the shoulder and with that, he turned and left.

I had been president for almost two years and I could talk with great authority about this organization, but it wasn’t until that moment that I really understood what the Noble Foundation “does.”

We change lives. We open doors. We explore new worlds. We ask questions. We find answers. We help. That is what we do. That is the real answer.

Sincerely,

*Michael A. Cawley*

Michael A. Cawley  
President and Chief Executive Officer

## Your Health

# Grape expectations

Alzheimer’s disease afflicts more than 24 million people worldwide. Richard Dixon’s mother was one of them.

Dixon, D.Phil., serves as Senior Vice President and Director of the Plant Biology Division at The Samuel Roberts Noble Foundation, and he’s watched firsthand the debilitating power of Alzheimer’s, a disease that claimed his mother’s independence, erased a lifetime of memories and eventually ended her life.

“It was an extraordinarily difficult time,” Dixon said. “Within a matter of a few years, she went from being totally independent – able to successfully navigate international travel – to a woman who was unable to find her way around the town she had lived in for decades.”

More than five years removed from his mother’s death, Dixon was asked to collaborate on a National Center for Complementary and Alternative Medicine (NCCAM) project at Mount Sinai Medical Center in New York to investigate if chemical compounds from grape seed extract could provide protection against a disease which has been deemed “the long goodbye.”

Mount Sinai researcher Giulio Pasinetti, Ph.D., obtained evidence suggesting that chemicals in grape seed extract called polyphenols, which are already believed to possess cardio-protective qualities, might also help guard against Alzheimer’s. A particular class of polyphenol, called condensed tannins, was thought to be likely candidates for the anti-Alzheimer’s effect.

Dixon is internationally renowned for his research on condensed tannins. Recently, he received a three-year, \$320,000 grant from the National Institutes of Health (NIH) as part of his efforts with the consortium, which also includes scientists from Purdue University, Rutgers University and the University of California at Los Angeles (UCLA).

As part of the NCCAM consortium, Dixon’s laboratory works to fractionate grape seed extract, which is a complex mixture of many different chemicals, several of which are polyphenols. They look for the specific compound or group of compounds responsible for imparting human health benefits. Initial findings are already being reported back to Mount Sinai’s research group, who then follow up with detailed analyses of the effects of the isolated compounds on brain proteins in the test tube and on memory in animal models.

“This is a long-term process that requires us to answer many questions,” Dixon said. “You must identify what chemical compounds are at play within the grape seed extract and then understand how the chemical compounds impact the body. You must see if the chemicals make it to the brain or if they cause a secondary chemical reaction within the body that has the beneficial effect. We hope eventually that our research leads to the development of a plant-derived ►





agent that protects against Alzheimer’s.”

Dixon’s experience in this field comes from his research at the Noble Foundation and his efforts to understand and utilize the biosynthesis of condensed tannins to reduce the incidence of pasture bloat in ruminant animals, such as cattle. The ultimate goal is to develop bloat-safe alfalfa – alfalfa does not naturally produce condensed tannins in its leaves or stem. As with his work with the Mt. Sinai consortium, his research also holds the potential to advance human health discoveries.

“The plant science research at the Noble Foundation is focused on benefiting agriculture,” Dixon said. “However, as with many of our research projects, there are applications for humans. For many years, I had been considering how our work could move beyond agriculture to exploit the potential of tannins and related compounds for prevention of diseases such as cancer. The work with polyphenols in grape seed extract is a good example of how plant science can be applied to make inroads for human health breakthroughs.”

Awards

The Noble Foundation presented Micheal and Julie Campsey with the 2008 Leonard Wyatt Memorial Outstanding Cooperator Award during a special presentation at the Southern Plains Beef Symposium in August.

The Leonard Wyatt Memorial Outstanding Cooperator Award is given annually to one of the more than 1,600 farmers and ranchers who work with the Noble Foundation’s Agricultural Division.

Snapshot



**Photograph \_ Broderick Stearns**  
A view down the central mall of the Noble Foundation shows the buildings (from left to right) of the Agricultural Division, the Plant Biology Division and the Forage Improvement Division. The Noble Foundation recently completed a seven-year, \$100 million campus construction project that more than doubled the organization’s infrastructure. Sitting on an 800-acre campus, the Noble Foundation now has more than 500,000 square feet of research and administration space.

As part of its mission, the division provides agricultural producers – called cooperators – with consultation services and educational programs in an effort to help them achieve their financial, production, stewardship and quality-of-life goals.

In 1993, the Campseys began their ranching venture when they moved to a ranch near Jacksboro, Texas, owned by Micheal’s father. Even though they possessed little agricultural experience, they were thrust into managing the ranch a few years after Micheal’s father retired. Their local veterinarian told them about the Noble Foundation and their consultation services.

“We contacted the Noble Foundation, and our program has never been the same,” Micheal Campsey said.

The Noble Foundation consulting team brought

the Campseys a wealth of information about weaning and vaccination programs, animal uniformity and breeding practices. Noble Foundation agricultural economists further assisted in developing recordkeeping systems. The Campseys built on the foundation of knowledge and support provided by the Noble Foundation. A decade later, the Campsey ranch is not only thriving, but providing the couple a means to give back to the community around them.

“Our team is as hands-on as we want them to be, and they are always accessible,” Julie Campsey said. “We will always want to have them as part of our management plan.”

Research

Noble Foundation researchers and agronomists are studying the possibility of using legumes to offset the need for

costly fertilizers. The research could provide a financial savings to farmers and ranchers.

Nitrogen, once only 25¢ per pound, is now 65¢ per pound (or more), an increase of more than 150 percent in the last few years. As these prices increase, the Noble Foundation is taking a second look at winter and summer legumes, such as alfalfa, clovers, medics, vetch and other similar crops, and their ability to add nitrogen back into the soil.

Legumes are known for the significant role they play in agriculture for being high in protein, but they also have an innate ability to fix nitrogen from the air. Their root system, accommodating bacteria called “rhizobia,” converts atmospheric nitrogen to ammonia creating a source of fertilizer that could help stem production costs.

“We’ve hit a critical period

in agriculture,” said James Rogers, Ph.D., pasture and range consultant and team manager. “The way we used fertilizers is gone and may be forever. It’s vital we discover alternatives to the issue of fertilization, and legumes look to be a positive alternative.”

Noble Foundation agronomists with the Forage Improvement and Agricultural divisions, Twain Butler, Ph.D., and John Guretzky, Ph.D., are currently testing several field trials, one of which is a legume-bermudagrass grazing trial on 42 acres. The trial’s objective is to discover how legumes impact bermudagrass that is being grazed.

“More than 2.5 million head of cattle are within a 100-mile radius of the Noble Foundation,” Guretzky said. “Cattle are the predominant agricultural business in the

region so it’s important that we find how legumes and grasses can work together to better support the cattle industry.”

While legumes are a positive alternative to high fertilizer costs, they do not freely give their nitrogen production away. The primary source of nitrogen transfer comes from decomposition of dead legume plant material to the following grass crop or by recycling urine and dung via grazing to the companion crop.

“To make a legume-grass system work, management must be focused on the legume,” Rogers said. “Pastures will look different than they have. It will look uneven and may have more weeds, but that’s OK.”

Because legumes are less persistent than grasses, pastures comprised of grasses and legumes require a higher degree of management than nitrogen-fertilized pastures. Legume-grass systems also complement the growth of grasses and extend the production of forage into spring growth periods, when forage from grasses in the southern Plains is unavailable. 🌱



Bettering our community

Robert Wells opened the box and peered inside to see almost 200 phone cards neatly stacked and sealed in cellophane.

“Wow,” said Wells, Ph.D., smiling. “I can’t believe how fast this all happened. We just started this program a few months ago, and now we’re already sending cards overseas. I couldn’t be more excited.”

Wells, a livestock consultant with the Noble Foundation Agricultural Division, facilitated the Noble Foundation’s effort to become an official drop-off point for Cell Phones for Soldiers, a nonprofit organization which recycles donated cell phones and uses the proceeds to purchase calling cards. Each donated cell phone equates to an hour of international talk time for American soldiers serving in Iraq and Afghanistan.

“There has been an amazing outpouring of support,” Wells said. “We’ll send this group of cards over, and our collection box is almost full again, so we’ll be able to send more.”

Communication between soldiers in Iraq and their families is difficult. While some soldiers attempt to call home using cell phones – resulting in astronomical phone bills – and others try to use the sporadic Internet service, the best way for troops to contact home is through land lines with international calling cards.

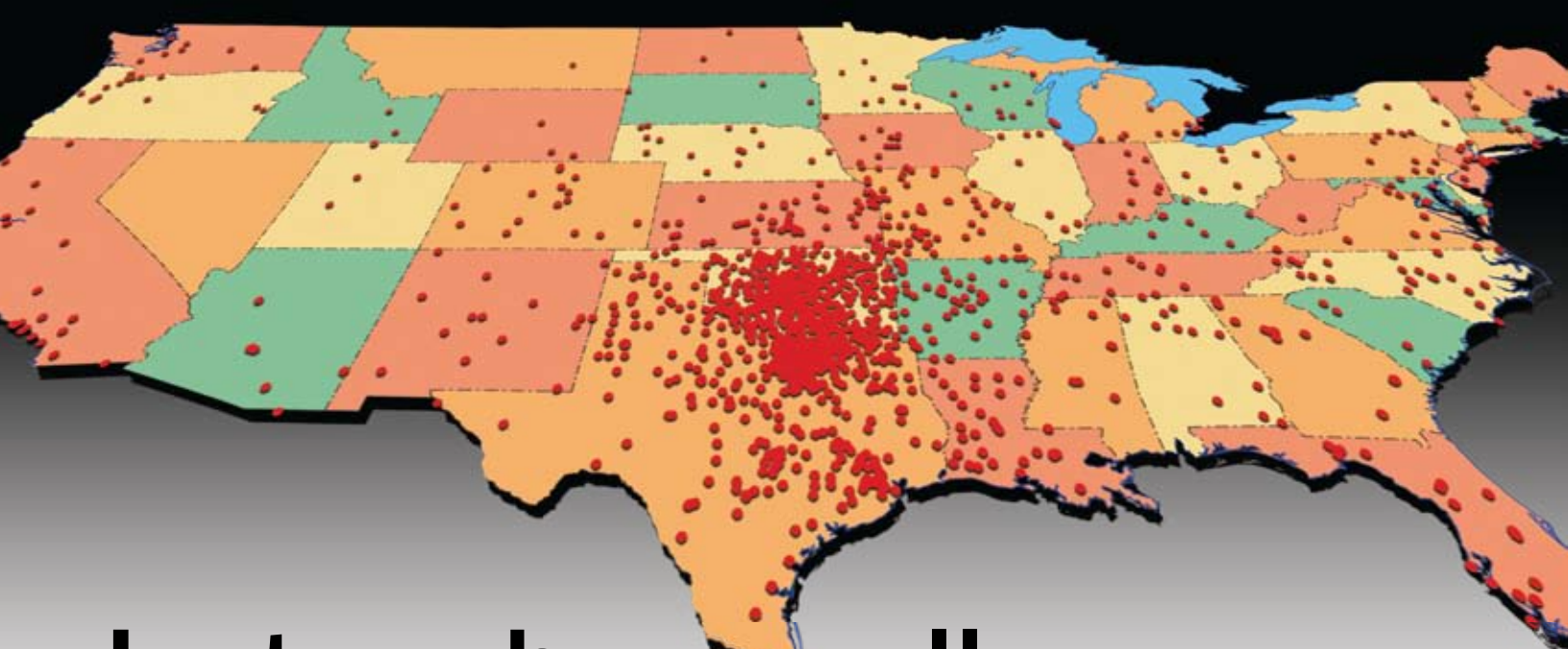
Wells knows firsthand the importance of communicating with a loved one overseas. Wells’ wife, Danielle, currently serves in Iraq with the 1120th Ordinance Company out of Ada, an attachment of the 45th Infantry Combat Division.

This summer, Danielle Wells received 15 days of leave, so she returned to Oklahoma. During her 20-hour return trip to the Middle East, Wells’ group stopped in Europe to refuel. She placed a quick call to her husband. Their 11-minute conversation cost the couple almost \$75.

“It was worth every penny to know she had made it that far safely. I would have paid anything,” Robert Wells said. “But transcontinental communication comes at a high price for those in the military. Each of these calling cards is a lifeline between the soldiers and their families.”

For individuals who want to donate a used cell phone, the Noble Foundation drop box is located in the Agricultural Division’s lobby. All cell phones – functioning or not – may be donated with or without their batteries. The charger may be donated as well.





# Just a phone call away

## Helpline provides farmers, ranchers with invaluable resource

In the world of agriculture, landowners and producers have many questions. For instance, “What is the best way to determine the carrying capacity of my pastures?”; “How do I lease land I’ve inherited?”; or even, “Are armadillos edible?”

For those who have agriculture-related questions, no matter how unique, the Noble Foundation’s Agricultural Division created the Ag Helpline.

The Helpline is a free call-in service offered through the Agricultural Division to give assistance to anyone, even those landowners and producers outside of the local region. The Helpline gives callers access to the division’s consultants, who specialize in each of the primary facets of farming and ranching: livestock, soils and crops, horticulture, pasture and range, wildlife and fisheries, and agricultural economics. Individuals involved in agriculture – from established cattlemen to novice producers – may utilize this service.

For many regional landowners and producers, the Helpline has served as a gateway to a long-term relationship with the Noble Foundation and its consultants.

After many years spent working to enrich young minds in the Texas public school system, Bud and Linda Helm retired. They relocated to land they inherited from Linda’s father, nestled comfortably between the towns of Lindsay and Maysville, which sits in the Agricultural Division’s service area.

Bud Helm said he enjoyed his time as

a high school teacher and, in later years, a vocational counselor, but said he always wanted something more. “I have loved cattle my whole life,” Helm said. “If I had had the money, I would have worked with cattle all day.”

Returning to their roots was an exciting experience for the Helms; they finally found the chance to relax, enjoy their free time and, of course, work. Having been away from the cattle industry for so long, Bud and Linda wanted the latest information and research to help them run their cow-calf operation.

“After being out of the business for so long, I felt green,” Helm said. “I knew there were a lot of developments in farming and ranching, and wanted to do it right.”

The Helms began reintroducing themselves into the agricultural world by attending Noble Foundation seminars and calling the Helpline. Helm used the Helpline for assistance in addressing almost every aspect of his operation.

“I called and talked to just about all of the consultants,” Helm said. “I called about everything from marketing and planting grass to questions about fish for our pond.”

In 2007, Annie Coble, then Noble’s Helpline operator, assisted 1,500 individuals, answering questions and putting them in contact with consultants. Coble added that the Helpline has been contacted by individuals from 47 states

since its inception in 2001. She said one of the most important roles the Helpline plays is introducing producers in the area – especially those new to agriculture and who are working with only a few acres – to the Noble Foundation and familiarizing them with the consultation program.

“The Helpline service is a vital tool, allowing us to reach out to the community and increase awareness of the Noble Foundation and the work it does,” Coble said.

The Helms, who live within the Noble Foundation’s consulting service area, decided to take the next step and join the consultation program. The members of their consulting team came to survey the Helms operation. During the visit, the team sat down with the Helms and assisted them in establishing goals for their operation and creating a plan of action to meet those goals.

“I really appreciated the way the team took time to ask about the goals we had for our operation,” Helm said. “They took a ‘what do you want to do?’ approach and helped us plan how to get there.”

Bud and Linda both spread the word about the Noble Foundation and the Helpline to anyone who might need assistance with farming and ranching. “I’m a true believer in the Noble Foundation,” Bud said. “They can’t know how much they’ve helped us.”

Story \_ Callie Turney

# The Seeds of Progress

## Oklahoma Bioenergy Center plants world’s largest site of switchgrass

This summer, Noble Foundation researchers and agricultural specialists planted 1,000 acres of switchgrass near Guymon in the Oklahoma Panhandle on behalf of the Oklahoma Bioenergy Center (OBC).

These production-scale demonstration fields are the world’s largest site of switchgrass devoted to cellulosic ethanol production.

“Rising food costs recently resulted in a pushback against renewable fuels. However, cellulosic ethanol from sources such as switchgrass is non-competitive with food sources for animals and humans, and remove cellulosic ethanol from this discussion,” said Oklahoma Secretary of Energy David Fleischaker. “More importantly, this dedicated land will allow us to demonstrate the advantages of switchgrass.”

Switchgrass is a different type of energy crop. It has a higher relative energy output than corn and does not compete with human or animal food sources. It is a perennial grass that is naturally drought resistant and grows on marginal cropland.

The OBC demonstration fields will provide academia and industry a unique “living laboratory” to understand the production and long-term impact of bioenergy crops, as well as experiment with new production techniques and critical harvest, collection and transport methods. The fields also will serve as a “living classroom” where agricultural producers, policymakers and the general public can see and experience these crops which will play a key role in the United States’ energy future.

“These fields are vital for the continued development and understanding of dedicated energy crops,” said Michael A. Cawley, President and Chief Executive Officer of the Noble Foundation. “This is more than just a research project that ends in the field. It has a market endpoint.”

A cellulosic biorefinery currently being constructed by Abengoa Bioenergy in Hugoton, Kan., will be less than 35 miles from the Panhandle switchgrass fields. The parties are developing a contract to enable a future supply of the material to the biorefinery. The Abengoa Bioenergy facility is expected to be operational in 2010.

“The value of the Oklahoma Bioenergy Center to the cellulosic ethanol industry cannot be overstated,” said Gerson Santos-Leon, Executive Vice President, Abengoa Bioenergy New Technologies.

“The early and aggressive establishment of 1,000 acres of switchgrass will provide researchers, scientists, agricultural producers and industry – not only in Oklahoma, but across the nation – with important information that will help establish the emerging cellulosic ethanol industry.”

Revenues received from the sale of biomass will be reinvested in the OBC for additional bioenergy and biofuel research.

The 1,000 acres of switchgrass leverages the extensive agricultural infrastructure and farming expertise located in Oklahoma’s Panhandle. This undertaking is made

possible through a lease arrangement with Hitch Enterprises, Inc., one of the region’s most renowned agriculture operations.

A family-owned and managed agricultural company, Hitch Enterprises has conducted extensive cattle feeding, cattle production, pork production and agricultural operations near Guymon for more than 110 years.

The participation of Hitch Enterprises enables the concentrated establishment of the 1,000 acres in one geographic location, which will enable critical research in the areas of harvest, collection and transportation that challenge the emerging biofuels industry.

Agricultural researchers for the Noble Foundation will manage the 1,000-acre fields as part of Noble’s OBC-related activities.

### Who is in OBC?

A state initiative championed by Gov. Brad Henry, the Oklahoma Bioenergy Center brings together Oklahoma’s comprehensive higher education institutions – the University of Oklahoma (OU) and Oklahoma State University (OSU) – with the world-class plant and agricultural research of The Samuel Roberts Noble Foundation to initiate a biofuels industry within the state.



# Launching Scientific Careers



Just after a 3-inch rain, Francis Kirigwi, Ph.D., a postdoctoral fellow in the Forage Improvement Division of The Samuel Roberts Noble Foundation, visited the plot where he assesses the performance of potential new fescue varieties bred to exhibit tolerance during drought conditions. Unfortunately, the recent spring deluge could adversely affect his research results, but Kirigwi shrugged and noted, “It’s not good for me, but it’s good for the farmers.”

Perhaps Kirigwi remains connected to local farmers because he is a farmer in Kenya, as is his family. Yet his philosophy is not unique; it is the original mission of Lloyd Noble, who established the Noble Foundation in 1945 to assist agricultural producers. It is a belief echoed by Rick Nelson, Ph.D., professor and principal investigator in the Plant Biology Division: “My goal is to help humankind; this is always in the back of my mind.” To reach this ultimate goal, the Noble Foundation provides an unprecedented research culture for postdoctoral fellows, otherwise known as “postdocs,” recognizing

them as indispensable gears in the complex machinery of modern research. “Without postdocs,” Nelson comments, “science would grind to a halt.”

Phillip Harries, Ph.D., a postdoc on Dr. Nelson’s team, adds “I appreciate that I am valued by both my mentor and the Foundation. That’s why I chose to come to the Noble Foundation. My relationship with my mentors here determines my future as a scientist.”

After earning a Ph.D., postdocs become a part of research laboratories at the Noble Foundation where senior scientists – known as “principal investigators” or “PIs” – provide mentorship. Comparable to the medical doctor’s residency, postdocs need further training in a laboratory setting conducting additional research. During a traditional postdoctoral fellowship, postdocs do not take classes or teach – the status quo while a graduate student – which allows them to concentrate on research for a three- to four-year paid term.

But the Noble Foundation goes further. ►

“Without postdocs science would grind to a halt.”

Rick Nelson, Ph.D.  
Professor



The organization helps launch careers by ensuring that the postdoc experience, whether through constructive mentorship or ready access to research infrastructure, includes a fast track to scientific results and conclusions.

#### No hassle research

Noble postdocs – perhaps more than their colleagues at other institutions – can dig in deep for research results with little angst over future funding because the Noble Foundation's endowment provides stable backing for projects.



Postdoc Yongzhen Pang looks at cultures.

At other institutions, much time could be spent preparing no-guarantee grants to keep a project alive and to fund salaries. As Nelson noted, "Grant writing for external funding remains part of our postdocs' lives, but the Noble Foundation does what it takes to conduct good science. I might spend 25 percent of my time on proposals and management of grants. I think it would be much higher elsewhere."

Though the Noble Foundation continues to receive more of its annual operating funds from federal and state agencies each year, its stable source of base funding provides freedom from the anxiety that one project will be cut so that another may continue. This environment contributes to a creative and nurturing culture as well as camaraderie among the scientists who take educated and creative risks. Because of the myriad of freedoms the Noble Foundation affords, postdocs can more quickly evolve from workers stooped over the laboratory bench or knee deep in red soil – though that will always be a part of their lives – to the mavericks of cutting-edge science.

Faster results lead to faster publication in the "publish or perish" world of scientists. Kirigwi explains the unique importance of publications to postdocs: "Because publications are the only record of our work, postdocs at the Noble Foundation have an advantage over the field because we can concentrate on research results, not on the mundane." These publications open other doors to national and international partnerships, colleagues and, best of all, future employers.



Rick Nelson, Ph.D., mentors young scientists in his laboratory.

More so, turning trailblazing results in the laboratory or field into a long-term solution for farmers will ultimately make instrumental and meaningful change within this lifetime. In the case of Kirigwi, someday farmers might receive drought-tolerant plants, which will positively affect the security of related food supplies.

#### The best environment for the best science

The Noble Foundation greenhouse facilities demonstrate some of the amenities which its researchers enjoy. Greenhouse staff provides hands-on plant care, ensuring plant maintenance every hour of every day. The 47,000-square-foot greenhouse is the largest research greenhouse in the United States, which includes a 10,000-square-foot portion that is fully climate controlled. A computer system monitors watering and lighting, temperature and humidity control, and any other necessary

parameter requested by the scientist.

In addition, each division at the Noble Foundation employs plant specialists who prepare made-to-order plots or plants for Noble researchers. Harries both trusts and appreciates the plant specialists: "I can tell them what I need planted. Anywhere else, I would be doing that work myself. They save me time and that equates to faster results." Harries notes that the greenhouse support staff comes in on weekends, another worry erased; the plants, the experiment, the controls, the data, the results are in trained, qualified hands. Forage Improvement postdocs enjoy similar support, such as tillage and irrigation in preparation for and maintenance of experiments. Nelson summarizes: "There is nothing holding the scientists back here at the Noble Foundation."

Nelson's comment percolates to the surface of many a conversation with Noble Foundation's

"Postdocs at the Noble Foundation have an advantage over the field because we can concentrate on research results and not the mundane."

Francis Kirigwi, Ph.D.  
Postdoctoral Fellow

## Noble Foundation ranks in the Top 10 best places to work for postdocs

Internationally renowned for its plant science discoveries and agricultural programs, The Samuel Roberts Noble Foundation added another distinction in March 2008.

*The Scientist* magazine released its annual Best Places to Work for Post Doctoral Fellows (postdocs) survey, and the Noble Foundation was ranked No. 8. More than 80 institutions nationwide participated in the magazine's sixth annual survey.

This year marks the first time the Noble Foundation

participated in the magazine's postdoc survey. The Noble Foundation also ranked as the highest plant science research institute on the list.

"The Noble Foundation is widely regarded as a source of excellence in the scientific and agricultural communities," said Michael A. Cawley, President and Chief Executive Officer of the Noble Foundation. "The results of this national survey reaffirm that the Noble Foundation is dedicated to performing world-class research and providing abun-

dant opportunities for those who conduct that research. We have the best postdocs from around the world and, as an organization, we strive to provide them the means to succeed during and after their time here."

The Noble Foundation employs 57 postdocs from more than 20 different countries to conduct research in the Foundation's world-class facilities in Ardmore, Okla. Postdocs are typically defined as nontenured scientists with a doctoral degree, many of

who have recently graduated. Postdocs typically spend three years at a research institution after graduation.

Noble Foundation scientists provide training and mentorship to help postdocs establish their careers and become independent scientific investigators or university faculty.

"The Noble Foundation competes with countless national and international research organizations to recruit the best postdocs from around the world," said Richard

Dixon, Senior Vice President and Plant Biology Division Director. "This survey shows the Noble Foundation is among the very elite in providing an environment that helps launch these young scientists into their careers."

*The Scientist's* Web-based survey ran from Oct. 1 to Dec. 2, 2007, gathering almost 3,100 responses from postdocs at 82 research facilities in the United States. Participants were asked to rate their institutions on 44 criteria in 11 different areas. The Noble

Foundation ranked as one of the highest paying institutions for postdocs and received its top scores for generous funding of postdoc research; the quality of the infrastructure; excellent internal communication with postdocs; and networking opportunities for postdocs.

"There is no doubt the Noble Foundation has planted its flag as an international center for plant science research," Dixon said. "Postdocs come from around the world to southern Oklahoma for an

opportunity to learn and grow as scientists.

This recognition shows we're doing a very good job at preparing them for their lives as scientists."

The Noble Foundation topped such recognized research organizations as the Mayo Clinic, the National Cancer Institute, the National Institute of Environmental Health Sciences, as well as dozens of universities, including the University of Texas Southwestern Medical Center and Duke University.

TheScientist

BEST  
PLACES  
TO WORK  
2008  
POSTDOCS



“We are privileged at the Noble Foundation to be able to try our own ideas with minimal limitations.”

Ranamalie Amarasinghe, Ph.D.  
Postdoctoral Fellow

postdocs. Ranamalie Amarasinghe, Ph.D., requested a second computer monitor because her data spread across several screens. “At a university,” she said, “I would never have asked for a second screen. The Noble Foundation is more resourceful, and the tools here make the difference.” Amarasinghe completed two other postdoctoral fellowships at other institutions before arriving in southern Oklahoma, where she immediately recognized her new scientific home as prestigious and where she felt part of a team. She also chose the Noble Foundation because she “enjoys the freedom to attempt new research projects,” which would be difficult if she were at a university or working in industry. “We are privileged at the Noble Foundation to be able to try our own ideas with minimal limitations,” Amarasinghe said.

Of course, the research climate and resources are not the only consideration – even for new researchers. It is important to know that there is support from all groups, including administration and the governing board of an institution. In addition to assistance with navigating the sometimes confusing waters of work visas for international employees, the Human Resources Department provides new employees with guidance in getting settled in Ardmore and navigating the inevitable challenges of any new community.

Human Resources also took an active role in 2008 to obtain additional benefits for Noble’s postdocs. While the Noble Foundation continues to provide competitive compensation to its employees, in response to an internal survey, it was determined that the institution could improve its retirement benefits for postdocs. In prompt response,

the Noble Foundation Board of Trustees implemented a retirement thrift plan to provide Noble postdocs an opportunity to save for their future. Most importantly, the cost of living in Ardmore allows many postdocs to buy their first home.

“The Noble Foundation has always been committed to providing compensation and benefits that equal – and oftentimes exceed – that of our peer institutions,” said Michael A. Cawley, President and Chief Executive Officer. “We are fortunate to have a Board that is open to new ideas and remains vigilant to continually improving the benefits offered to the employees.”

#### The means for success

The Noble Foundation provides the means for its people to succeed, and then some. Kirigwi, along with any other Noble Foundation postdoc who wishes, can plant a personal garden on the campus. Kirigwi grows sweet peppers, okra, capsicum and cow peas, a favorite from Kenya. The drought-resistant legume – prized in India and Africa – will survive the Oklahoma sun. Later Kirigwi will harvest the green leaves, fry or boil them, and serve them with beef or goat meat.

Those cow peas are a small, comforting piece of a faraway home. Its roots spread into the soil securing a base to support the leafy abundance of hard work. The Noble Foundation understands the metaphor of the stable, nutrient-rich soil. From mentors to administrative support, postdocs feel secure in their scientific home at the Noble Foundation and the role it will play in their careers. 🌱

Story \_ Amy Thorne

Photographs \_ Broderick Stearns



Bharat Joshi examines a film as part of his work as a postdoc at the Noble Foundation.

# Home Sweet Home

## Former postdoc recalls finding his second home at the Noble Foundation

Deyu Xie, Ph.D., is a man who hails from two hometowns.

His first hometown – his birthplace – is a village in Chen Xi County in the Hunan Province of China. Chen Xi is a place of mountains, water buffalo, bamboo, waterfalls, rice and mountain crabs. It’s a place where your laugh will echo back to you as it rolls through the mountainous terrain. It’s Xie’s home, a place of peace and family.

Halfway around the globe is a town that would become as meaningful to Xie as that mountain village in China.

In January 2001, Xie left China to become a postdoctoral fellow at The Samuel Roberts Noble Foundation. By August 2005, when he left the Noble Foundation, Ardmore, Okla., had become his second hometown.

#### The ABCs of Xie

Xie attended Hunan Jishou University and Hunan Normal University and earned a bachelor of science degree in biology. He went on to Beijing Normal University, where he obtained his master’s degree in cytogenetics, and then to the Institute of Botany, Chinese Academy of Sciences, where he earned his Ph.D. in plant physiology. After completing his education, he worked for three and a half years at the National University of Singapore on tropical cash tree biotechnology.

When Xie arrived in Ardmore in 2001, he didn’t find mountain waterfalls or the

echoing laughter of his boyhood home, but he found much to value, including research experience that established and defined his scientific career and bonds of friendship that will last a lifetime.

After first starting in Dr. Nancy Paiva’s laboratory at the Noble Foundation, he researched the biosynthesis and metabolic engineering of condensed tannins (proanthocyanidins) under the direction of Richard Dixon, D. Phil., Senior Vice President and Plant Biology Division Director.

“Condensed tannins had been studied for nearly a century, and their biosynthetic pathway had been investigated for nearly 50 years,” Xie said. “However, many questions remained unknown.”

The answers Xie searched for included the nature of the precursors of condensed tannins; the metabolic relationships between anthocyanin pigment and condensed tannins; the mechanisms whereby tannins are condensed into long chains; how the molecular shapes of tannins are controlled; and how tannins can be engineered into crops to improve forage quality.

Xie quickly became immersed in his work at the Noble Foundation, routinely working late into the night with his wife, Guoli Liu, bringing his dinner to the laboratory office. His work progressed well, and in 2002 he began to work on a project to characterize the activity of an enzyme encoded by the so-called *BANYULS* (*BAN*) gene. His research was successful, but he achieved unexpected results. He showed that *BAN* encodes a novel anthocyanidin reductase that made a chemical called epicatechin, a building block for the condensed tannins. When Dixon first saw ►





“I told my students and any audience attending my seminars that I am from Ardmore, Okla. I consider it my second hometown.”

Deyu Xie, Ph.D.  
Former Postdoctoral Fellow

Xie's results, he was skeptical and asked Xie to repeat the experiment.

“I was a little scared because the results were different from previous hypotheses and from textbook dogma,” Xie said. “When we sent the results to a leading chemical expert on condensed tannins, his first response was ‘Impossible.’ But my data convinced him, too.” This work resulted in an important paper published in *Science* in 2003, where Xie served as the primary author.

Condensed tannins in forages for ruminant animals, such as cattle, can provide protection against pasture bloat by reducing methane gas production in rumen during fermentation and can improve animal nitrogen nutrition. The study of condensed tannins may also lead to new treatments for Alzheimer's, cardiovascular diseases, urinary tract infections, high blood pressure and several types of cancer.

“Dr. Xie's research added greatly to the Noble Foundation's overall efforts to explore the potential within condensed tannins,” Dixon said. “He's a skilled scientist, and we're proud of his accomplishments at the Noble Foundation and beyond.”

#### Outside the laboratory

Xie says his time at the Noble Foundation was momentous both for his career and his personal life.

“It was wonderful,” Xie said. “I spent my most fruitful time of academic research at the



Deyu Xie, Ph.D., works in laboratory during his time as a postdoc at the Noble Foundation.

Foundation. My research accomplishment established my research career in the U.S., and it was an honor to work for my mentors.” He was close to many scientists and members of the Foundation staff.

“I was glad to work with laboratory manager Dr. Xianzhi He,” Xie said. “He is one of the best friends in my life. He taught me how to drive. Dr. Fang Chen, one of the scientists in our laboratory, is also a close friend. I was lucky to work with such helpful laboratory technicians and other postdoctoral fellows. They are all like my brothers and sisters.” On June 13, 2005, Xie and his wife were blessed with the birth of their first child. “I created his English name that is (a blending) of Noble Foundation, Ardmore and Oklahoma,” Xie said. “My son's name is Charnold Jing-Xiang Xie. Charnold means: ‘A Chinese boy is born in ARdmore, Noble Foundation, Oklahoma and the LD is part of Arnold which is an ancient German name meaning ‘Brave Eagle.’ He just turned three. I am so proud of him.”

#### The next chapter

In 2005, his time at the Noble Foundation drew to a close, and he accepted a tenure-track faculty position as an assistant professor of phytochemistry and metabolic engineering in the plant biology department at North Carolina State University (NCSU).

“After I left Noble, I told my students and any audience attending my seminars that I am from Ardmore, Okla., which is the first place I came to in the U.S., and I consider it as my second hometown,” Xie said. Today, he splits his time equally between teaching and research. “I love teaching,” he said. “Teaching is one of the best and most sacred jobs in the world, but I also want to do more research so I can generate new knowledge for my students.” He credits the Noble Foundation with propelling his scientific career.

“As a young scientist, the most important thing is to introduce ourselves (by being) published in high impact, peer-reviewed journals – like *Science*, *Nature*, *PNAS*, *Cell*, *Plant Cell*, etc.,” Xie said. “I am sure that there was nobody in the academic community in the U.S. who knew me before my work at the Noble Foundation. How can I have convinced NCSU to hire me without my previous experiences?”

And to remember that important time, all Xie has to do is look into the face of his son, Charnold, the Chinese boy who was born in his father's second hometown. 🌱

Story \_ Danaline Bryant

‘Billbeau’ and ‘Poppy’ may not be able to recognize mutualistic viruses or run a state-of-the-art research laboratory, but Marilyn Roossinck, Ph. D., can. In fact, she's been a Noble Foundation principal investigator for the last 17 years, and the aforementioned personas are extensions of the virologist. They are two of the three clown characters that Roossinck has created to bring humor to hospital patients and as educational tools to teach children science. In a personal interview, the Comstock Park, Mich., native talks about her work, her life outside the laboratory and her alter egos.

#### On her worst job

Right out of high school, I worked for one of those loan shark places, where they lend a small amount of money for huge amounts of interest. I hated it. They would try to get me to call people and find out information from a relative so that they could track delinquent accounts. I never was a good liar, so that didn't work out too well.

#### On how she became a scientist

Around the second grade, I told my mother I was going to be a biologist when I grew up, and she said there was no such job as a biologist.

#### On her work with viruses

We are forging new paradigms in the field of virology and changing the way people think about viruses. They are more our friends than our enemies. I was first introduced to plants as hosts of viruses during my postdoctoral fellowship. Before that, I worked on human viruses. I find plants a better host for experiments. It is hard to do experiments on humans or even other animals, but plants are great. You can have a whole greenhouse full of genetically identical plants, something you can never do with animals, and no one ever minds when we put plants in the blender.

#### On the path not traveled

If I were not a scientist, I would be a novelist. It has always been a passion of mine to write for the popular press. I am currently writing a novel, but I rarely have enough time to make much progress on it.

#### On Billbeau and Poppy

Billbeau and Poppy are two of my clown characters. Billbeau came first, and Poppy just popped out one day when I was trying out different makeup styles. Poppy is Billbeau's little sister. They also have an aunt, Dr. Quackemup, or Aunt Quackie as they call her. The clowns all have different personalities. Billbeau is very calm and sweet, and completely nonjudgmental. Poppy is a little more sassy and flirtatious. Dr. Quackemup likes to do weird science for kids. I clown at Mercy Memorial Hospital in Ardmore and at various area events. When I am “in clown,” I am a completely different person than Marilyn. Most people don't recognize me unless they already know about my clown characters. It gives me a sense of freedom to be someone different than the serious scientist. 🌱

Story \_ Andrea Perry



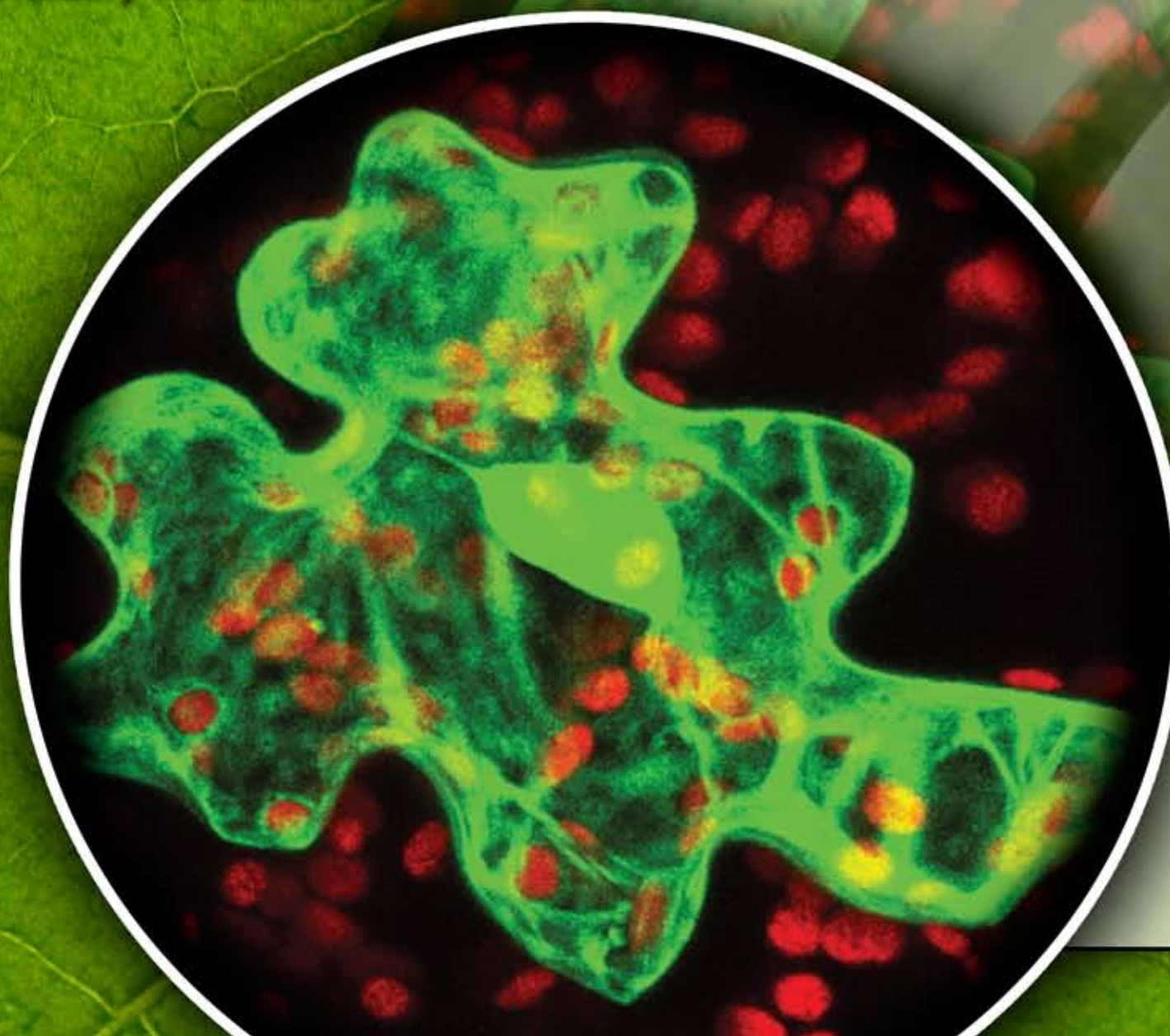


# ONLY THE BEGINNING

The Noble Foundation's Plant Biology Division celebrates its 20<sup>th</sup> anniversary with a look at the past two decades

Story \_ J. Adam Calaway

Photograph \_ Broderick Stearns



The afternoon has all but faded into evening when Drs. Richard Dixon and Chris Lamb reach the last hurdle in a tightly scheduled day of seminars at the Noble Foundation.

The setting sun casts a warm glow through the western window of Dixon's office as the colleagues (and friends) of 30 years each claim a chair at a small table for an interview that some might find historically appropriate.

Here, within a few feet of each other, sit two of plant science's most accomplished researchers: Dixon, the Senior Vice President and Director of the Plant Biology Division at the Noble Foundation and Lamb, the Director of the John Innes Centre in the United Kingdom. Two decades ago, their careers stood at pivotal intersections. Their thoughtful conversations resulted in decisions that defined their lives and played a supporting role in the Noble Foundation's development of a plant biology division. It is fitting then, as the division celebrates its 20<sup>th</sup> anniversary in 2008, that these two men gather once again to peer into the past and remember how it shaped the present. On this night, the pair laugh and talk and remember as though

they were home in their native England, hoisting a pint at their favorite pub. They swap stories about their joint research, which has produced more than 100 published papers; reminisce about defining successes and enlightening failures; and sprinkle in anecdotes about their journeys from beginning scientists to leaders in their field.

Most of all, they add their plot line to an intriguing story of how the Noble Foundation and Salk Institute helped foster each other's plant biology programs. It's a story that includes famed scientists, two institution presidents and a board of trustees who reshaped the future of the Noble Foundation—as well as plant science research in this country—by taking a bold step into the unknown. ►



# THROUGH THE YEARS

For two decades, the Noble Foundation's Plant Biology Division has explored plant science for the benefit of production agriculture. This timeline recaps some of the division's greatest accomplishments and landmark events. **Timeline** \_ Andrea Perry

## A seed is planted

The Salk Institute, founded by Jonas Salk, M.D., developer of the polio vaccine, began biomedical research in the early 1960s on its research campus near San Diego, Calif.

In December 1975, the Noble Foundation made a \$9,000 grant to support a visiting scientist at Salk. It was this unassuming gift that served as the genesis of a relationship between the two organizations.

"I do not think anyone at that time could have guessed how this small grant would impact the future of either organization," said Michael A. Cawley, President and Chief Executive Officer of the Noble Foundation. "Clearly, it was like planting a seed."

Less than two years later, the Noble Foundation made a pair of significant investments in the La Jolla, Calif.-based Salk.

First, a \$600,000 grant established the Noble Professorship Chair in Health Sciences which was held by Dr. Salk, and then a \$500,000 Noble grant initiated a joint program in molecular/cellular biology.

"That initial scientific collaboration redirected both organizations," Cawley said. "It set the stage for the Noble Foundation to shift its scientific focus from human health research to fundamental plant science, and it placed the Salk Institute on the edge of developing a full plant biology division."

Another significant step in the Noble-Salk relationship took place across the Atlantic Ocean the summer of 1976, though nobody at either organization knew it yet.

Dixon and Lamb found themselves sharing bench space in the same laboratory at the University of Oxford's School of Botany. Dixon was finalizing his doctoral

degree work, while Lamb entered the laboratory on his first postdoctoral fellowship after graduating from the University of Cambridge. Dixon and Lamb met because they happened to study the same molecular pathways, and their joint scientific interests provided fertile ground for collaboration and friendship.

"I think there was an instant respect between us," said Dixon, Lamb nodding his head in agreement. "We were like-minded in our lives and our careers."

The two scientists provided feedback for each other's research through the remainder of the decade and into the 1980s. They continued their joint projects when Dixon moved to the University of Cambridge to pursue postdoctoral studies in late 1976 before taking his first faculty position at the University of London, and Lamb left the United Kingdom for a new adventure in the United States, a move that eventually impacted them both.

## Salk takes its first steps

Four years of productive collaboration between the Noble Foundation and Salk Institute culminated in 1981 with a \$1 million grant for the establishment of a cellular biology and plant science program at Salk.

Fred de Hoffman, Ph.D., then President of the Salk Institute, tabbed a young Englishman from Oxford named Chris Lamb to guide the fledgling program.

Lamb quickly found the Noble Foundation's support to be invaluable and credits a secondary, \$770,000 grant for a joint plant science tissue culture project in

1983 as the genesis of the Salk Institute's plant biology laboratory.

"As a scientist, I was very appreciative of how the Noble Foundation provided significant assistance," Lamb said. "From that, it was obvious the Noble Foundation had a clear vision that plant science research ultimately fulfilled its mission of helping agricultural producers."

In 1985, de Hoffman flew to the Great Plains to petition the Noble Foundation Board of Trustees for additional grants, but the car ride from the Dallas-Fort Worth airport to the organization's Ardmore campus proved eye-opening.

As he drove north, the vast prairie grasslands unfolded before him. He saw family farms and herds of cattle. He witnessed a way of life directly impacted by the outcomes of plant science research. And he changed his mind about his trip's purpose.

"He stood before the Board of Trustees and said, 'I might get fired for what I'm getting ready to say, but I don't want any more money. I want you to start your own plant biology division,'" Cawley said. "Those were powerful words from a powerful man and it sparked the Board to action. They had vision to see how this aligned with our mission and complemented the agricultural programs already in place."

## A division is born

The Noble Foundation Board of Trustees pursued the possibility of expansion with vigor. They traveled to

California to review the plant biology program at the Salk Institute, consulted with outside organizations and individuals, and, in the end, decided to move forward.

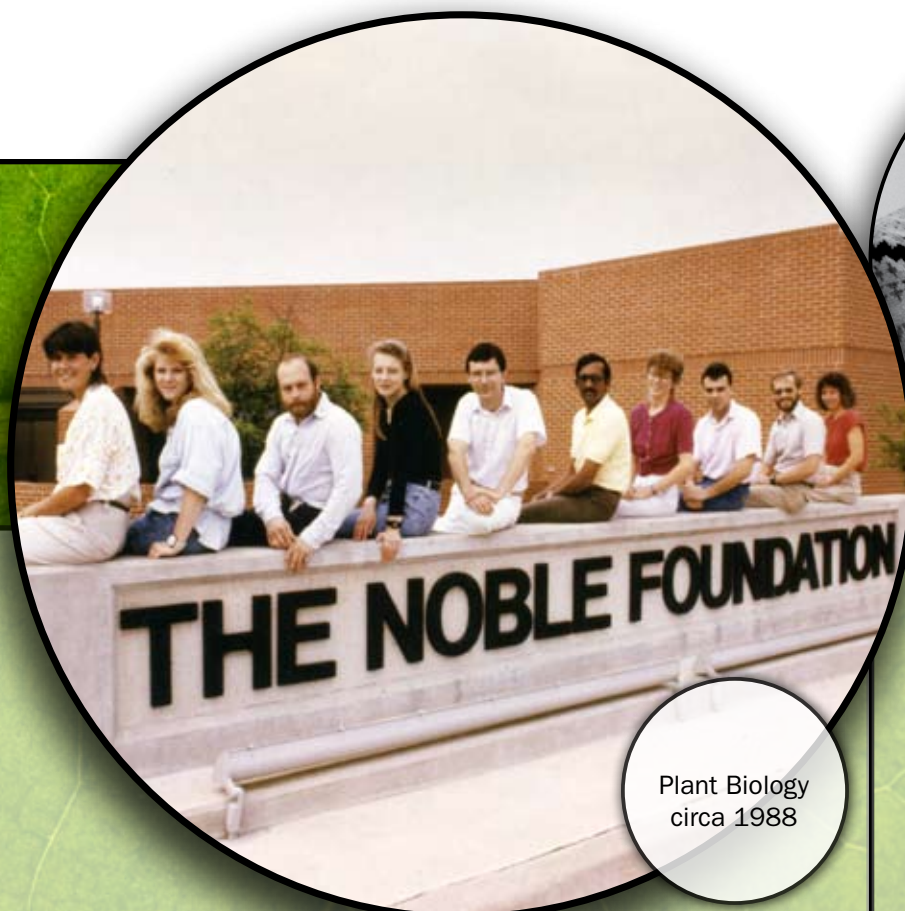
The Board took measures to launch the Noble Foundation division in 1987. Finding a capable and respected scientist to build the division's programs stood as the critical first step in the process. The Board assembled a hiring committee that included, among others, Lamb.

In that same year, Dixon traveled to the Salk Institute for a sabbatical with his longtime colleague – a temporary reprieve from the mounting frustrations of university life. Dixon's dissatisfaction with the university's fluctuating funding and constant reorganizations brought him to the cusp of change. Lamb saw the potential to match an accomplished scientist with a premier agricultural organization.

"I'll never forget the conversation," Dixon said. "We were walking with our wives in San Diego's Old Town, and Chris said, 'Although it is not yet on the map, the Noble Foundation has the opportunity to become one of the best plant science institutions in the world because of its stable funding.' I had never thought of being ►

## What does a Plant Biology Division do?

The Noble Foundation Plant Biology Division conducts basic biochemical, genetic and genomic research for crop improvement, enhancement of human and animal health, and production of novel products in crops.



Plant Biology circa 1988



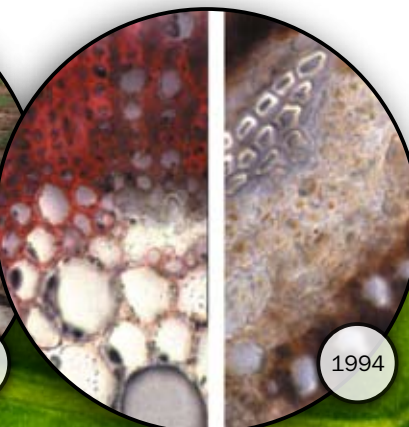
1988



1988



1993



1994

**1988.** The Plant Biology Division is founded. In January, new Division Director Richard Dixon, D. Phil., and the first postdoctoral fellows arrive in Ardmore. Due to limited laboratory space, several researchers start their projects at the Salk Institute in San Diego. The Noble Foundation and the Salk Institute hosted a joint postdoctoral fellows program during the early stages of the Plant Biology Division.

**1988-91.** Principal Investigators Rick Nelson and Marilyn Roossinck are hired, establishing the division's plant virology program.

**1993.** Researchers perform the first transgenic plant field trial in Oklahoma.

**1994.** The first successful genetic modification of lignin in plants is reported.

**1995.** Plant Biology Division researchers discover the first fungal phosphate transporter associated with phosphate uptake by mycorrhizal fungi. This discovery provided basic knowledge for engineering improved phosphate uptake efficiency in plants.

**1998.** AgriBioTech, Inc., acquires the rights to the Noble Foundation's technology for lignin

manipulation in alfalfa and enters an agreement to sponsor further Noble Foundation research in this field. These rights and sponsored research relationship are later transferred to Forage Genetics International, a subsidiary of Land O'Lakes. In subsequent years, Forage Genetics performs advance field trials of the lignin-modified alfalfa in multiple states.



director of a large science initiative. It wasn't my ambition at the time. I was just beginning to consider the next stage in my career, but the last thing I thought I'd do was take a job in Oklahoma. I don't think I even knew exactly where Oklahoma was."

Dixon not only found Oklahoma, but found himself in then Noble Foundation President John Snodgrass's office the next week. The interviews with the hiring committee went seamlessly, and Dixon became the desired candidate. Snodgrass sent Dixon away with a mandate: Think about what it will take to be successful, and then fax me your proposal.

"I remember thinking we'd have to negotiate all the parameters like you would do at a university so I started high," Dixon said. "I asked for 40 people and a new building. I thought he might (politely, of course) tell me where to go."

Dixon received Snodgrass's response quickly: No problem. Come see the Board next week. The Board of Trustees finalized Dixon's hiring, outlined a budget and began drawing up plans for a new building shortly thereafter.

"It was an honor to start such an endeavor," Dixon said, "but I felt somewhat overwhelmed because of the immense responsibility of delivering on the Board's investment."

#### The early years

Dixon's challenge was clear. The Noble Foundation

had essentially provided him with all the tools to be successful. Now he had to deliver.

Sitting in his office two decades later, Dixon remembers his first years by saying, "It was tough, very tough, recruiting from ground zero. It was tough for eight or 10 years, but we were successful because we set high standards, and we submitted to external review to police those standards."

Dixon set out to hire principal investigators that could meet his lofty expectations, and he found a handful early on.

"In the first three years, we were fortunate enough to hire Drs. Rick Nelson and Marilyn Roossinck," Dixon said. "They are two quality scientists with keen insight and great vision."

Nelson and Roossinck are still pillars of the division today. Roossinck is considered one of the world's leading experts on plant and fungal virus evolution and ecology. Her work on mutualistic relationships between a virus, fungus and host plant has received international recognition.

"The Noble Foundation is unique," Roossinck said. "Its dedicated funding for science provides stability in the research and results in highly productive laboratories. It would have been difficult to get funding for plant virus evolution research when I began. If not for the Noble Foundation, I probably would be working in a field of research that I cared less about."

Nelson, who is another virologist with a world-class

portfolio of publications, is now perfecting the use of a virus to allow scientists around the world to rapidly evaluate a transgene's function within grasses.

As one of the original scientific faculty, Nelson reflected on the organization's continued commitment to the division.

"We didn't grow capriciously," he said. "We grew in measured steps based on our merit and perceived needs. The Board of Trustees provided a steady stream of support through personnel and well-equipped facilities, and we worked to earn it."

All the support did not overcome one detrimental factor – the lack of name recognition. A problem eased – ironically – by another institution's plant biology program, one created in part by the Noble Foundation.

#### The Salk effect

While many national and international scientists recognized Dixon as a proven colleague, recruiting valued postdoctoral fellows (postdocs) might have been impossible without the backing of the Salk Institute.

The Noble Foundation and Salk offered joint postdoc positions through the Dixon-Lamb laboratories. Postdocs spent a year and a half in both La Jolla and Ardmore to complete their three-year training cycle.

"The Salk Institute helped us actively form relationships in the scientific community," Dixon said. "The Salk Institute and Chris were very generous.

We were fortunate to have the backing of an excellent organization."

For Cawley, the sequence of events is poetic.

"It's simply astounding how all the pieces fell into place," he said. "The Noble Foundation and the Salk Institute each played a significant role in the development of the other organization's plant biology program. That's a successful collaboration that defies expectation and imagination."

#### Twenty years later

The Noble Foundation's Plant Biology Division can celebrate a variety of successes during its 20<sup>th</sup> anniversary.

What began with a few dozen people has grown to more than 120 individuals, including 46 postdocs, who now come from more than 25 countries around the world to work together at the Noble Foundation.

The division has undergone two significant facilities expansions, including a 48,000-square-foot, state-of-the-art addition, which opened in 2002.

"The new building is a visual sign of the confidence and commitment," Lamb said. "That's important to the continuation of excellence and to keeping the top flight scientific culture that exists here."

The growth in infrastructure and personnel brings Dixon obvious satisfaction, but it's the quality of the division's programs and the recognition they have received in the greater scientific community that provide ►



**1999.** The isoflavone synthase gene – a key reagent for engineering the production of health-protective isoflavonoids in plants – is discovered by division researchers.

**2001.** In furtherance of the research initiatives of the Plant Biology Division, the Noble Foundation Board of Trustees awards a grant of \$5 million to the University of Oklahoma to initiate

the sequencing of the *Medicago truncatula* genome. At the same time, the division establishes the "Center for *Medicago* Genomics" to coordinate *Medicago* genomics efforts in the division and nationally.

2001. Plant Biology Division researchers, in collaboration with researchers at Virginia Tech University, receive their first National Science Foundation (NSF)

Plant Genome Award for studies on the integrated functional genomics of *Medicago*, utilizing transcriptome, proteome and metabolome studies. This project leverages an extensive investment by the Noble Foundation in biological mass spectrometry.

2003. Dixon is elected a Fellow of the American Association for the Advancement of Science.

**2003.** Division researchers report the discovery of anthocyanidin reductase, a key enzyme in the biosynthesis of condensed tannins in plants.

**2004.** NSF awards an equipment grant (\$339,000) for the purchase of a single photon laser confocal microscope. It is the first NSF equipment grant in Noble Foundation history.

2004. The Noble Foundation establishes a bioinformatics program to process the data generated through its genomics and other research programs.

**2004.** Researchers in the Plant Biology and Forage Improvement divisions, in collaboration with researchers at the University of Oklahoma and Oklahoma State University, form the Consortium

for Legume Research, a state-funded initiative to understand and eradicate cotton root rot disease in alfalfa throughout the southwestern United States.

2005. Researchers, in collaboration with Oklahoma's public and private comprehensive universities, become part of a \$3,595,000 grant from the NSF's Experimental Program to Stimulate

Competitive Research (EPSCoR) for studies on plant virus diversity and ecology.

2005. Lloyd W. Sumner, Ph.D., is elected a Fellow of the American Association for the Advancement of Science.

**2005.** The first crystal structure of a plant uridine diphosphate glycosyltransferase is discovered.

This opens the door to rational engineering of novel enzymes for the stabilization and sequestration of plant natural products.

**2006.** NSF and the Department of Agriculture award \$1.1 million to the Division for a project to sequence 5,000 virus genomes.

**2007.** A fungal endophyte biology program is established.





him with the greatest sense of accomplishment.

The division operates 11 of the Noble Foundation's 18 laboratories with expertise in plant biochemistry, genomics, cell and developmental biology, metabolic engineering and plant-microbe interactions.

Through the past 20 years, the Division's research efforts have resulted in important breakthroughs in understanding plant metabolic pathways, engineering quality traits in plants, understanding the molecular mechanisms that underlie the interactions of plants with both beneficial and disease-causing microbes, and deciphering how plant viruses evolve to cause disease.

However, Dixon said the division's "flag planting" moment came when it initiated what became an international effort to sequence the genome of *Medicago truncatula* (commonly called "barrel medic"). Information generated from the *Medicago* genome will allow researchers to utilize the plant as the model species for the study of other legumes, including such agriculturally significant crops as alfalfa, soybean and peanut.

The product of the Plant Biology Division's research is no longer limited to agriculture and *just* the improvement of plants and their productivity. More recently, Plant Biology Division scientists are looking at the role of condensed tannins for improved animal health and the treatment of various human diseases, including Alzheimer's. Additionally, they are

playing a central role in developing novel technologies to drive the emerging biofuels industry by engineering dedicated bioenergy crops, such as switchgrass, to have more degradable cell walls and improved agronomic characteristics such as better nitrogen use efficiency and sustainability.

"We have made immense strides and expanded into fields I never would have imagined two decades ago," Dixon said. "I believe that the Division has now realized the potential that Chris and I saw that summer day in San Diego in 1987."

A fact that has not gone unnoticed.

In decades past, Noble scientists were not permitted to compete for external funding because the Noble Foundation's endowment provided fully for its research. However, the capabilities, facilities and personnel at the Noble Foundation have drawn interest and funding from state and federal agencies, including the National Science Foundation, Department of Energy and Department of Agriculture, who seek to leverage the institution's expertise in agricultural plant science.

The Plant Biology Division received more than \$7.1 million in new external funding last year alone, providing about 45 percent of the Division's total funding.

"We've been extremely successful in generating external funding," Dixon said. "You combine successful peer-reviewed grants with our robust publishing record, and that says to the outside world that you've arrived."

### The winds of change

Twenty years have changed Dixon. Sitting in his office, flanked by his friend and colleague, he's not afraid to admit his point of view has shifted, if ever so slightly.

With the addition of the Forage Improvement Division in 1997, the Noble Foundation now possesses the ability to move plant science discoveries from fundamental plant science through translational research and plant breeding, and out to the field for real-world trials and testing. This pipeline of discovery in a single, integrated set of programs is unique to the Noble Foundation and generates not only knowledge, but tangible outcomes.

Dixon remains a pure fundamental scientist at heart, but he says having an application endpoint now provides a major stimulus for his research.

"The fact that we have 'applied drivers' has been really positive for my thinking about basic science," Dixon said. "Basic science completed in Plant Biology might be used for any number of applications down the road. I do not have a personal interest in actually performing the translational research, but I do derive great pleasure from seeing the final product that comes out of it. My indirect involvement in applied research has also introduced me to a lot of new colleagues in fields such as plant breeding,

ruminant nutrition and agronomy, with whom I would not have previously had the opportunity to interact. This has also allowed me to preach the importance of basic, hypothesis-driven science to my applied colleagues. It's all about discovery."

With that statement, there is only one question remaining: What discoveries will shape the next two decades of the Plant Biology Division? Dixon thinks for a moment and then says, "The resources, faculty, reputation, culture are all in place to have continued success. Our work in engineered plant quality traits may be what we're best remembered for in 50 years. Or it could be something that we've not even thought about. You really don't know and that's the beauty of all this. I have a belief, though, that this is only the beginning."



2007



2007



2007



2007



2008



Plant Biology  
circa 2008

**2007.** Researchers in the Plant Biology and Forage Improvement divisions are awarded more than \$8 million by the Department of Energy for studies on switchgrass genomics and genetic manipulation as part of the \$125 million Bioenergy Sciences Center managed by the Oak Ridge National Laboratory.

2007 - Plant Biology Division

researchers discover that a three-way combination of a virus in a fungus in a plant is required for thermal tolerance of certain plants located in Yellowstone National Park. The corresponding publication was the first to document this unexpected type of mutualistic plant association.

**2007.** NSF awards \$3.8 million for the development and application of

genetic and genomic tools in the model legume *Medicago truncatula*. This leverages a significant investment by the Noble Foundation during the previous four years to establish large-scale mutant populations in *Medicago*.

**2007.** Dixon is elected to membership in the National Academy of Sciences.

**2007.** The Noble Foundation receives its first National Institutes of Health (NIH) grant for studies of the natural protective effects of grape seed extract compounds for addressing/preventing Alzheimer's disease.

**2007.** Researchers with the Noble Foundation's Plant Biology, Forage Improvement and Agricultural divisions, in collaboration with

researchers at the University of Oklahoma and Oklahoma State University, lead the effort to form the Oklahoma Bioenergy Center, a state-funded initiative to develop technologies to enable the economic production of cellulosic ethanol in the state of Oklahoma.

**2008.** The first crystal structure of a plant cytochrome P450 is determined by division scientists.

This opens up the possibility of designing novel catalysts for plant metabolic engineering.

**2008.** Division scientists publish the "Medicago Gene Expression Atlas," a database harboring genome-wide information on tissue- and development-specific patterns of gene expression in a model legume.



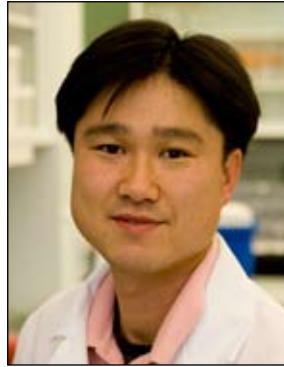
# What was your first job?

Everybody starts somewhere, and for scientists that initial foray into the work force is as varied as the research they explore. More than 140 scientists from 29 different countries call the Noble Foundation's Ardmore, Okla., campus home. No matter their native country, each experienced the harsh realities of punching the clock and the satisfaction of that first paycheck. Below, four scientists look back on the road of life to the starting line of their careers.



Maria Monteros, Ph.D.  
Assistant Professor  
Forage Improvement  
Division

"When I was 13 years old, I wrapped gifts during the holiday break at a local mall near where I grew up in Guatemala. I used the money to buy gifts for my family and friends, but I could only afford to buy something small like a piece of chocolate for most of them. It was the thought that counted."



Dong-Man Khu, Ph.D.  
Postdoctoral Fellow  
Forage Improvement  
Division

"My first job was as a gopher at a construction site in Seoul, Korea. I hauled cinder blocks and cement bags wherever they needed. It was a dirty, dangerous, hard job, but I was 19 years old, and I wanted to backpack through Europe after college, so it was worth it."



Kelly Craven, Ph.D.  
Assistant Professor  
Plant Biology Division

"I was a busboy at a Mexican restaurant in Tempe, Ariz. I was 14 years old, and, after work, I'd carouse with the bartenders. I learned more than how to bus a table there. On the plus side, I still love Mexican food."



Nikki Charlton, Ph.D.  
Postdoctoral Fellow  
Plant Biology Division

"My first job was as a dental hygiene coordinator in Edmond. I was 19 years old, and, during my first day, I fainted during an extraction. I ended up in the chair with the oxygen mask on."



## A Legacy of Success

For more than half a century, the Noble Foundation's agricultural consultants have provided farmers and ranchers with the knowledge and support to maximize their operations. Below four families tell how one organization changed their lives.

"Having people" is a phrase synonymous with having resources and information to assist you in your business. This concept is not new to the Noble Foundation. In fact, founder Lloyd Noble's primary mission was to establish an organization dedicated to assisting farmers and ranchers in Oklahoma and north Texas. For more than six decades, Noble Foundation consultants have been working with agricultural producers to achieve their financial, production, stewardship and quality-of-life goals by providing direct consultation service – at no cost

to the agricultural producer. Today there are four consultation teams, which include experts in the areas of wildlife, pasture and range, horticulture, soil and crops, agricultural economics and livestock that work with more than 1,500 producers. Lloyd Noble knew the value of "having people" long before it was popular.

Below, four producers share their experiences of working with the Noble Foundation consultants who assist their operations. ►



**Micheal and Julie Campsey  
Jacksboro, Texas**

The Campseys will be the first to tell you they started their ranching venture with an urban background, limited agricultural knowledge and a herd of cows that featured every color in the rainbow.

They moved to one part of the ranch bought by Micheal's father in 1993, and by 1997 they were managing their part of the ranch.

"The overgrazed ranch came with about 300 cows and a foreman," Julie Campsey recalls. "The herd included some of every color, and they had been selected on the criteria that they would have a calf in the fall."

Two years passed uneventfully. The Campseys were just happy to be out in the wide open spaces and believed they were making progress. In 1995, their local veterinarian told them about the Noble Foundation and its consultation services.

"We contacted the Noble Foundation, and our program has never been the same," Micheal Campsey said, adding that 90 percent of what they have learned about ranching and grasses has been from their consultation team.

The Noble Foundation consulting team taught the Campseys about herd health and vaccination programs, Beef Quality Assurance principles, how to maximize a 45-day weaning program and how to improve the "marketability" of their herd, for example, animal uniformity, timing of sale and breeding for certain market endpoints. Noble Foundation agricultural economists further assisted in developing recordkeeping systems, understanding

the production value of each cow on the ranch, and balancing feed rations and managing their grasses so that no hay is used for the cow herd.

The Campseys' herd was reduced to 200 head by 1997 because of the ongoing drought situation. In addition to destocking, they initiated a serious rotational grazing system.

"We had survived on less than desirable native pasture up to that point," Micheal Campsey said. "The Noble Foundation consultants taught us to let our grasses rest. By doing so, the native grasses became stronger, and the good grasses were able to flourish."

In addition, the Campseys changed to a spring calving herd to better utilize their grasses. They also began culling the herd and adding Angus-based females as replacements to establish uniformity. They introduced Charolais bulls to maximize growth traits and hit targets for their marketing program, which now includes a 45-day weaning system. All of these changes were suggested by the Noble Foundation consultants who assisted the Campseys with the logistical aspects.

They now have a 60-day calving season in the spring, which not only makes the calf crop uniform, but is a management and labor time saver.

The Campseys also began a wildlife management program for their enjoyment and to diversify their income. The ranch is now enrolled in the Texas Parks and Wildlife Department "level 3 managed lands program" for the deer population. "Hunting is a big part of our overall program now, and we

lease several pastures primarily to folks in the Dallas-Fort Worth metroplex and Wichita Falls, Texas, area," Micheal Campsey said. They also donate 10 hunting blinds annually to a December deer hunt for underprivileged boys held by the Northwest Texas Field and Stream Association.

"We can always count on our Noble Foundation team to help us when needed," Julie Campsey said. "Our team is as hands-on as we want them to be, and they are always accessible. We talk to them regularly. We participate in a number of their programs annually and, even though we have been with them more than 10 years, we still rely on them. We will always want to have them as part of our management plan."

**Jeffrey Reuter  
El Reno, Okla.**

The Reuter family has deep roots in the El Reno area, as previous generations homesteaded their land in

Oklahoma's historic land runs. Jeffrey Reuter represents the third generation to make his living from this property.

Their operation includes 125 mixed breed commercial cows with Charolais bulls selected by the Noble Foundation, and they run about 350 stockers year around. They also raise alfalfa and rye primarily for grazing. In addition, Reuter runs a stocker/feeder buying company.

Reuter found out about Noble's consultants by chance. He was on a farm tour in 1992, and, in the literature provided, there was an article about the Noble Foundation. He made a phone call that has resulted in a 16-year relationship.

"If I had to pick one thing that the Noble Foundation has helped me with the most, it would have to be my management skills," Reuter said. "They have greatly improved my skill level and have made me a better manager."

Reuter credits his consultation team with assisting him with feeding programs, application, analysis and usage of fertilizer, better production of improved grasses, including winter rye, developing stronger

grasses and pastures, fencing and rotational grazing systems, and controlling areas prone to erosion. They have taught him to get by with less tillage of the land, which is critical now in light of fuel prices, and how to utilize crop residues to improve fertility.

"They have a great organization, great people, and they have developed an effective way to get information to people," he said. "Their information is presented clearly, and their consultants realize that information and practices must be practical. I have found the consultants to be hands-on in teaching and making suggestions."

Noble Foundation consultants have worked with Reuter to maximize his grazing land for his stockers and have developed feeds for certain conditions that best spend his dollars allocated for protein sources. Stocking rates have also been altered to best utilize resources.

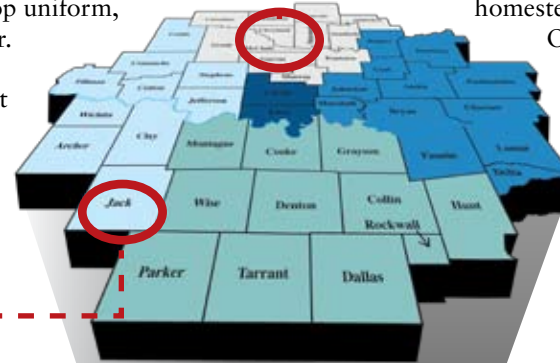
"Time management and efficiency are also areas of their expertise, and by implementing their suggestions I have become a better manager," Reuter said. "I no longer think my cattle have to be physically looked at every day. This has been a big time saver and money saver in terms of fuel and wear and tear on vehicles."

Reuter has also developed a wildlife program and gains additional income through hunting leases. "Noble has been instrumental in helping me develop leases and has provided valuable insight into how to develop a hunting clientele," he added.

Reuter's son, Cole, is involved in the family operation and represents the fourth generation for this Oklahoma family. Reuter's other son, Ryan, was also greatly influenced by the Noble Foundation team members as they made visits to the ranch while he was growing up. After serving as a livestock consultant on one of Noble's consultant teams, he returned to school and received his doctorate degree from Texas Tech University in ►



Jeffrey Reuter



Micheal and Julie Campsey





Jim Covington

“We have enjoyed working with the Noble Foundation, and our bottom line has definitely improved.”

Jim Covington  
Noble Foundation cooperator

2007. Now, he is part of the Noble Foundation Agricultural Research team.

“They have made me a better steward of my land and have put in practices that have improved my bottom line,” said Reuter, who added the consultation service is for those “who aren’t afraid to make changes.”

**Jim and Karan Covington**  
**Pottsboro, Texas**

The Covingtons are small operators, and they have found the consultation services of the Noble Foundation invaluable. Jim is an independent contractor in the defense and aeronautics fields, and maintains their cattle operation around his day job.

His family has owned land in Pottsboro, in Grayson County, Texas, since 1947. Hereford cattle have always been the breed for the family. The Covingtons have continued that tradition, but have recently diversified by adding a small stocker operation and adding Angus genetics to their herd.

The Covingtons began working with the Noble Foundation about seven years ago when they observed the team assisting a neighbor. “I consider the team a part of my ranch. It’s like having them as part of my staff,” said Jim Covington, adding that there is no way he could put a dollar figure on the assistance provided by the Noble Foundation.

One of the first things the consultants helped the Covingtons do was soil test, then use the information from the tests to guide their fertilizer program.

“They taught me that when it came to fertilizing, three things could happen – I could use too little, too much or, with soil testing, use just

the right amount,” he explained. The impact of the soil testing equated to significant financial savings.

Other practices that the Noble Foundation consultants helped the Covingtons put into place include cell grazing, establishing and managing a budget, and diversifying the operation with crossbreeding. On the advice of their consultants, the Covingtons have started a small stocker operation of about 70 calves.

“The Noble Foundation has walked us through every step of the stocker operation,” Covington said. “We work together on everything. We jointly consider the options and when and where to sell the calves.”

The couple handles almost all the work themselves and are joined on many weekends by their daughter, Amy, who resides in the Dallas-Fort Worth metroplex.

“We have thoroughly enjoyed our seven years working with the Noble Foundation, and our bottom line has definitely improved,” Covington said. “We probably visit with our team members at least six times a year in person, and we can call or e-mail them for their input on various practices at any time. Our program has benefited greatly from having them as an integral part of our operation.”

**Jack and Jackie Cunningham**  
**Ardmore, Okla.**

The Cunningham family first contacted the Noble Foundation in 1982, and the relationship has continued for 26 years.

Jack Cunningham moved to the Ardmore area from southwest Texas and soon learned that the land, climate, crops and cattle programs were completely different than what he had experienced. Today, he is joined by son Jackie as they run their operation.

“The Noble Foundation consultants are knowledgeable in every aspect, and they are the greatest consultants you could ever have. The service they offer is unprecedented,” describes Jackie, with Jack adding that he talks to his team members on a weekly basis and they are always willing and ready to talk through a situation.

The Cunningham operation started as a purebred Brahman herd, but by 1989 they had changed to a stocker operation.

In addition, they grow pecans and raise wheat.

“They have taught us so much about each part of our operation,” Jack Cunningham said. “Some of the areas that

stand out in my mind over the 26 years include soil fertility, health of the stockers, crop issues and now even crop rotation as we are considering adding milo and soybeans.”

The Cunninghams have learned to evaluate charts provided by the Noble Foundation that document trends in the stocker industry and to make business decisions based on information.

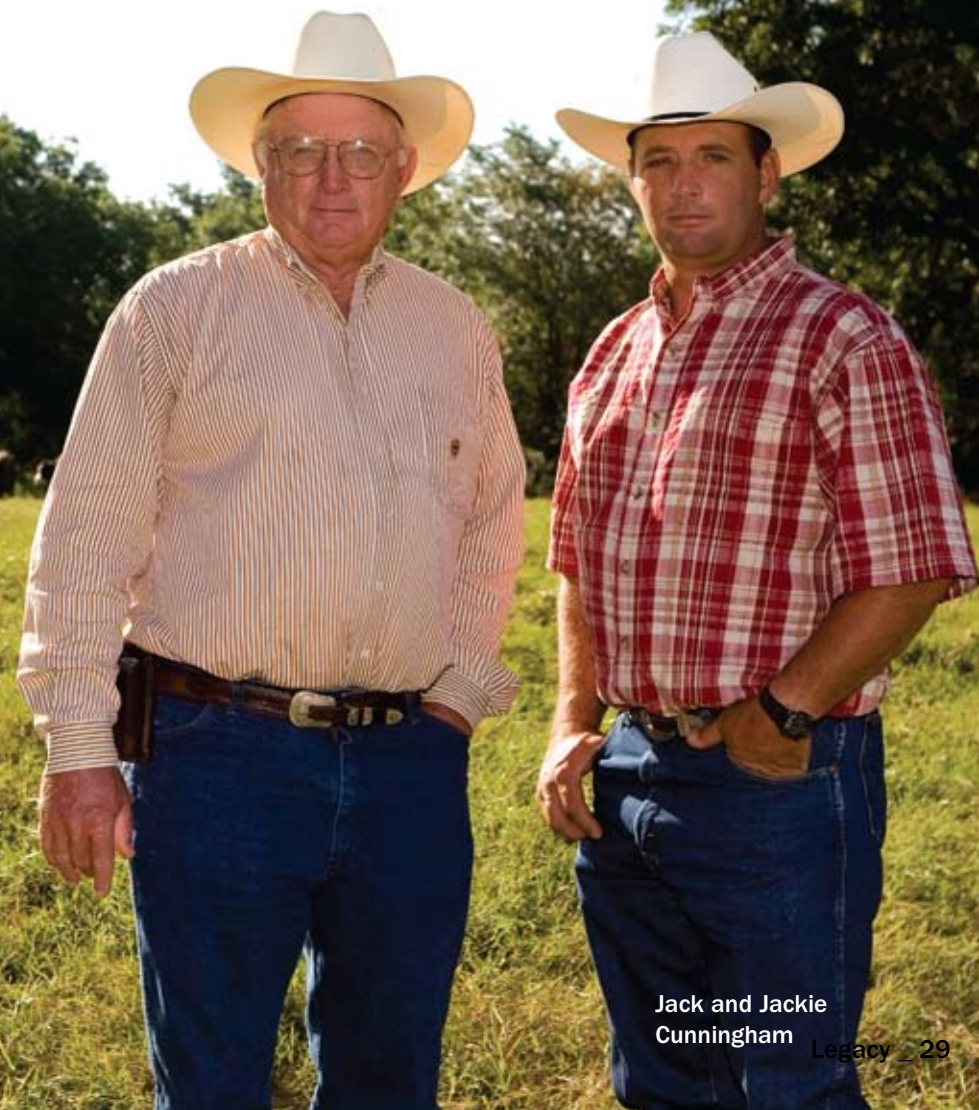
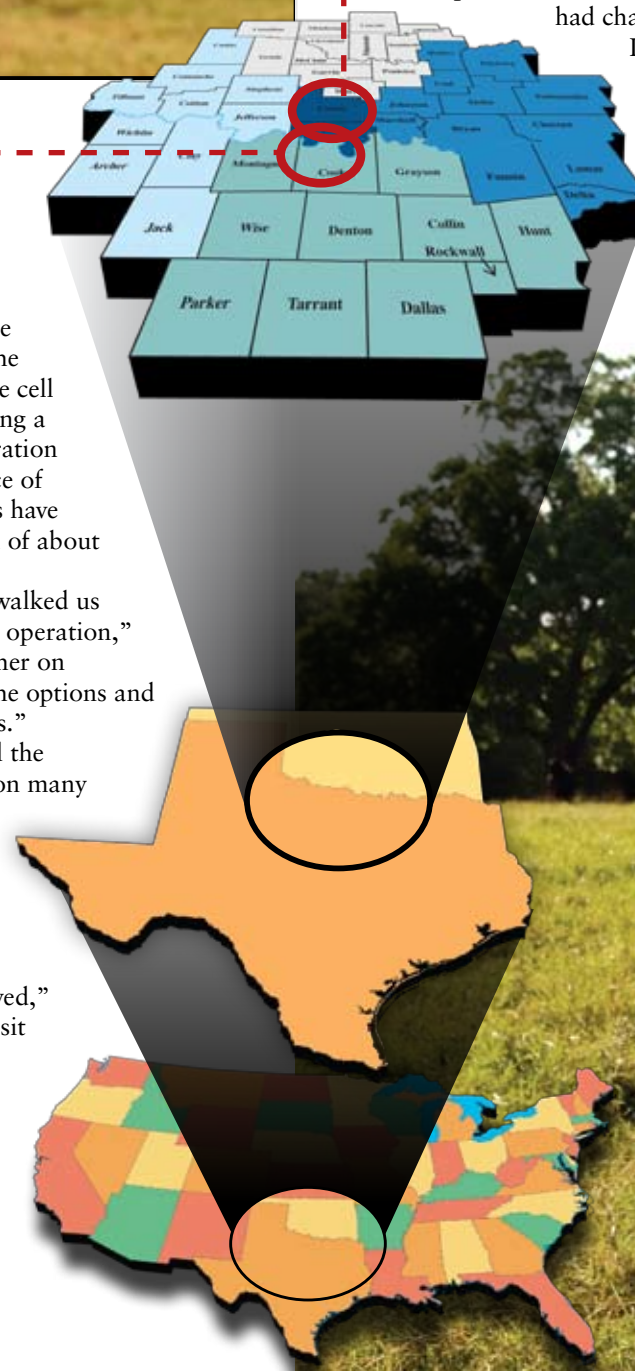
Jackie Cunningham also adds that in the pecan segment of their operation, the Noble Foundation has provided tremendous assistance with insect management and fertility.

“One point I would like to make is that they have always been at the top of their game,” Jack Cunningham said. “Noble has been part of our management team for more than 25 years, and their information is always current. They are always looking to the future.”

Jackie Cunningham agrees wholeheartedly.

“No two places, no two operations, no two sets of land are the same,” he said. “Everyone has a different caliber of management and resources, yet Noble has the expertise and wisdom to help all of them. We have met many other landowners who utilize their services, and the Noble Foundation consultants pinpoint a great program for each.”

Story \_ Martha Garrett  
Photographs \_ Broderick Stearns



Jack and Jackie  
Cunningham





Wadell Altom and Russ Gentry discuss forage quality during a farm visit.

## How are producers staying profitable?

“We tend to dwell on the negatives of the economy, but let’s not forget that there’s a lot of opportunity also.”

Evan Whitley  
Noble Foundation consultant

The dynamics of the cattle industry are changing. Farmers and ranchers face intense pressure from rising fuel costs, escalating grain costs, and sky-high fertilizer and chemical prices. In fact, almost everything in the expense column is higher than last year, while income items have not increased. Below in *Legacy’s* Agriculture Roundtable, Noble Foundation consultants examine a few tools and methods cattle producers can utilize to increase profitability and maintain their operation.

**Evan Whitley:** Let’s start with – you cannot improve what you don’t measure.

**Hugh Aljoe:** Agreed. Eighty percent of a profitable producer’s time is spent on the 20 percent of what is most profitable. You must commit time to working on business by assessing and reassessing records, and knowing the dollars in and out.

**Dan Childs:** Hard work in production agriculture is not necessarily the hard physical work any longer – the hard work today is putting data in and getting the answers to your questions. As but one example, beef cattle enterprises must now look at the productivity level of each cow. Producers need to look at netting a higher return per animal unit.

**Whitley:** Producers should also look at those producers who are profitable. What is it they do

that separates them from the rest? I think you will often find it is the non-glamorous things. I have noticed that successful operators have a set of goals – and good records. They have a plan in place and then work to achieve that plan. Also they seek new information and are not opposed to using it.

**Jim Johnson:** (*nodding in agreement*) A profitable producer is innovative.

**Whitley:** Further, you can’t operate in the same marketing routine every year any longer.

**Childs:** As a producer creates genetic attributes in their calf crops, then other marketing options open up to them, such as age and source verification, natural and hormone-free programs, to name a couple. If you create attributes in your calf crop, then it becomes critical that you market these. Marketing is key to profitability, and if you are going to create a product, you must find a market for it.

**Aljoe:** Producers must understand risk management as well. All of the production costs in agriculture are volatile right now, and volatility equals risk. Producers are in a high-risk situation and – I agree with Evan’s first point – they need to keep records. You must know the cost of production, so when a market hits a certain price,

you know to sell. Producers must become more knowledgeable regarding the tools available.

**Whitley:** Building on Dan’s earlier point [on the development of genetic attributes], a beef producer can make more progress through sire selection than just about anything else. It’s often difficult for a producer to understand that a bull is an investment, not something that needs to be purchased as cheaply as possible. Genetics and data should make your decision over costs. A cowman should study a bull sale catalog and make a paper cut based on the genetics and traits he needs to add to his herd before looking at the bulls. One bull can change your weaning weights by as much as 100 pounds per calf.

**Childs:** Another area for beef producers to carefully analyze is replacement females. In general, it is more economical to buy them than to raise them. It also allows you to select bulls with emphasis on growth and carcass rather than maternal and reproductive traits.

**Whitley:** Raising replacements is – in most cases – a drain on an operation. There are producers who specialize in raising and selling replacements as this has become a very specialized market.

**Aljoe:** Producers further need to consider how they can utilize grass to add pounds to calves after weaning through preconditioning and backgrounding programs; however, stocking rates

are critical with the costs of fertilizer this year. A producer needs to look at anything that adds a cost, and knowing how many animal units you can conservatively handle is paramount. If you back your stocking rate off 10 percent, then you can carry calves through the preconditioning phase, and if you destock by 30 percent, then you can potentially take those calves to 800 pounds before selling, depending on forage quality, type of forage and, of course, rainfall.

**Johnson:** Key to your point is the “cost of fertilizer” – producers need to understand that they need to fertilize for what they need. Do not take the shotgun approach to fertilizing or any other aspect of agriculture. Do what you can right. Rotational grazing is a management tool you may want to consider. It doesn’t necessarily give you more grass, although it can, but what it does do is make you a better manager. It forces you to study your grass supply, look at your cows and understand the dynamics.

**Childs:** If you are going to spend a dollar, then consider how you can get the most for that dollar. What does [the dollar] need to do: buy a bull, control weeds, build a fence or possibly start an agri-tourism venture?

**Whitley:** We tend to dwell on the negatives of the economy, but let’s not forget that there’s a lot of opportunity also. 🌱 **Story** \_ Martha Garrett

**Photographs** \_ Broderick Stearns



Aljoe



Childs



Johnson



Whitley







J. Adam Calaway  
Director of  
Public Relations

# Next Question

Leading tours is a mainstay of my job as Director of Public Relations for the Noble Foundation. For me, it’s an opportunity to throw open the doors and show off the world-class plant science, forage breeding and agricultural programs that occur daily on our 800-acre campus in Ardmore. It’s a chance to wow visitors and answer questions.

When I reflect on the many tours during the last few years, my mind immediately snaps back to one student, who I’ll just call “Stanley.”

Stanley sat on the front row during the opening presentation for a tour of young leaders. His hair was neatly combed. His clothes pressed. He wore thin-framed glasses, which made the young teen look dapper and astute like a miniature college professor.

Unlike most students whose attention invariably wanders, Stanley’s eyes never strayed from me. He was clearly the smartest kid in a class of smart kids.

As I closed out the introduction, I offered an opportunity for questions. Stanley – who clearly anticipated this moment – shot up his hand first. “Can you tell me what your scientists use to make their gels?” He asked smiling.

I went numb. I had nothing. Fifty-two pairs of eyes rested on me in increasing anticipation. Turns out Stanley had been working – in his room at home, mind you – on mastering the ability to create and load gels, a scientific tool used to visualize DNA. I finally answered with an apologetic, “I don’t know,” which elicited gleeful laughs from the other students. I promised Stanley we’d find a scientist to provide him a suitable answer.

While initially stunned by Stanley’s question, I quickly realized I was dealing with a future scientist. Scientists (even young ones) are curious people and questions often serve as the inspiration for their research. Richard Dixon, D.Phil., Plant Biology Division Director, has been a scientist for more than four decades. He once said, “Science is detective work really. Scientists want to know how the world works. A lot of important findings in science have been serendipitous, but you have to ask really good questions.”

Oilman and philanthropist Lloyd Noble established the Noble Foundation in part because he asked a simple question: What can I do to help humanity? His indelible spirit is our inspiration and motivates us to explore. In 1948, he said, “I am convinced that the only degree

to which we have reached the end of the road or opportunity is the degree to which we have exhausted the imaginative capacity of the human mind.”

If questions compel us, our confidence must assuredly be rooted in the fact we will always imagine new ways to answer them, even the seemingly impossible ones.

When Dixon arrived at the Noble Foundation 20 years ago, his curiosity drove him to study lignin – a substance that gives all plants their structure.

Turns out, decreasing lignin helps grazing animals with digestibility. Two decades later, a new line of low-lignin alfalfa is about to reach the marketplace, potentially saving farmers and ranchers millions of dollars.

Sometimes the questions lead to unexpected results. Noble Foundation researchers study condensed tannins as a way to reduce pasture bloat, but now scientists are quickly finding that tannins may help in the fight against Alzheimer’s and cancer. And switchgrass, which was originally studied at the Noble Foundation as part of range management, may fuel our cars in the next decade as part of the emerging cellulosic ethanol industry. There are countless more examples.

As for Stanley he finally met his scientist. Maria Monteros, Ph.D., assistant professor, wrapped up her talk as the last speaker of the day, and the floor opened up to questions. Again Stanley was ready. He looked Dr. Monteros square in the eyes and asked: “What’s your favorite plant?”

What?!? Favorite plant? I was nailed with the “gel” question, and now the scientist lands the “favorite plant” question. I knew that one: Fescue. Easy. I immediately stopped the tour and pointed out the injustice. After the laughter subsided, Stanley, undeterred by the momentary disruption, asked his earlier question. Dr. Monteros – partially stunned, but more so impressed – promptly provided him a satisfactory answer.

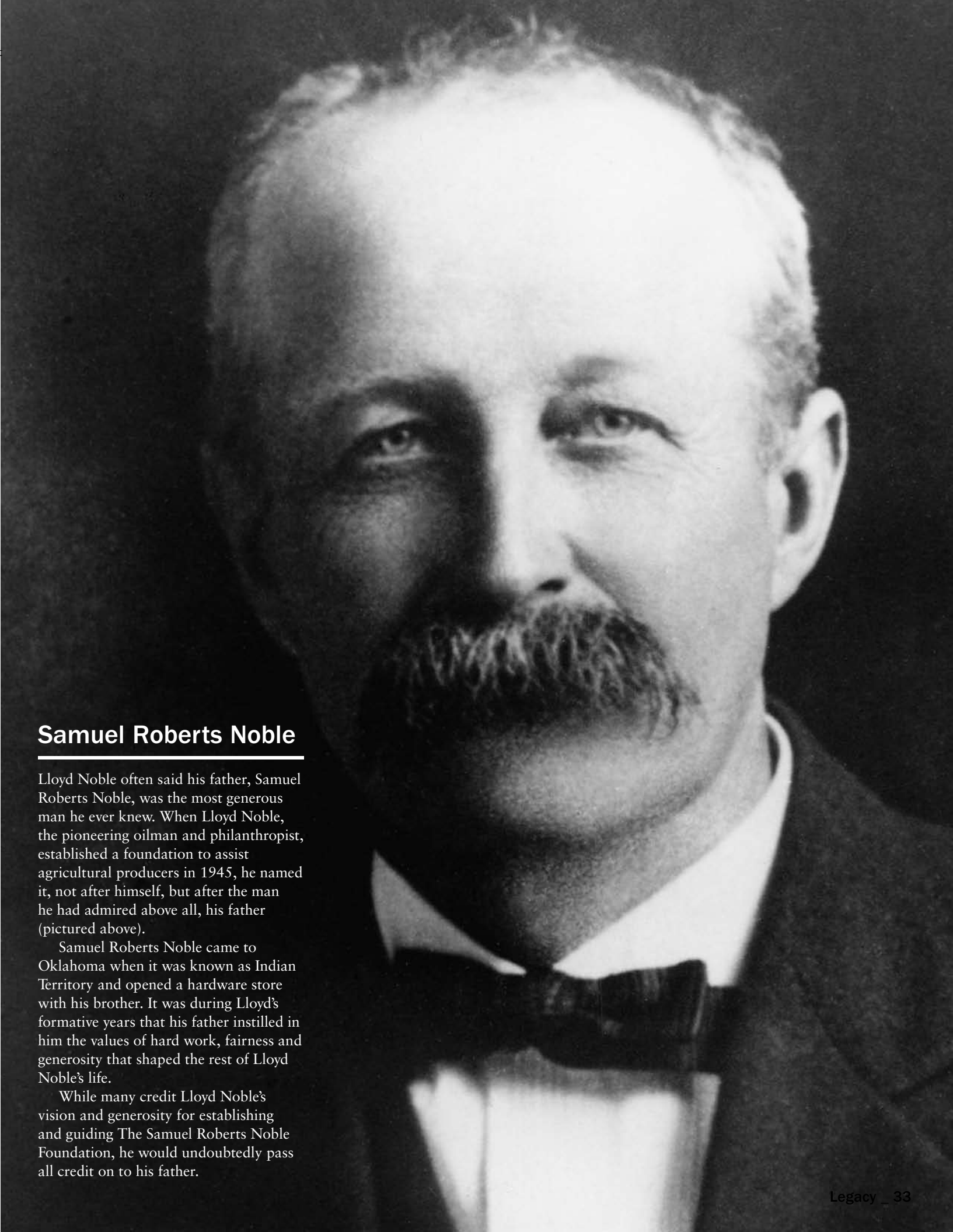
As I waved goodbye to their bus that day, questions still remained: What will happen to these students? What challenges will they face? How will they overcome them? The answer is simple and vaguely familiar: I don’t know, but with kids like Stanley, I’m confident the answers will amaze us all. 🌱

## Samuel Roberts Noble

Lloyd Noble often said his father, Samuel Roberts Noble, was the most generous man he ever knew. When Lloyd Noble, the pioneering oilman and philanthropist, established a foundation to assist agricultural producers in 1945, he named it, not after himself, but after the man he had admired above all, his father (pictured above).

Samuel Roberts Noble came to Oklahoma when it was known as Indian Territory and opened a hardware store with his brother. It was during Lloyd’s formative years that his father instilled in him the values of hard work, fairness and generosity that shaped the rest of Lloyd Noble’s life.

While many credit Lloyd Noble’s vision and generosity for establishing and guiding The Samuel Roberts Noble Foundation, he would undoubtedly pass all credit on to his father.





## Home on the range

The Noble Foundation's Agricultural Division service area extends within a 100-mile radius of the institution's Ardmore-campus. Within that area, there are more than 2.8 million cattle, making livestock the predominant agricultural industry and the focus of much of the Noble Foundation's efforts.



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