

Photo by **Anna Lemm-Wiegandt '20**



Beneath 60 miles of red, white, and blue streamers, contestants kick up the chips in Shepperd Arena at the 100th annual Little International livestock show — just as generations of NDSU students have done before them.

Experience the tradition at [NDSUFoundation.com/magazine](https://www.ndsu.edu/foundation/magazine)

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Photo by **Studio Freshly**

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Dear readers,

Do you remember the first time you felt a sense of belonging at NDSU? For me, belonging was built through storytelling.

More than five years ago, I moved from Spokane, Washington, back to my home state of North Dakota to help the NDSU Foundation launch this magazine.

I had just completed a graduate teaching assistantship at Eastern Washington University where I swore off any affiliation to NDSU after student-athletes in my composition class described their heart-wrenching loss to NDSU in the 2019 FCS National Championship.

But today, I feel like a Bison. It's because sharing the stories of NDSU has helped me build a genuine connection to people, place, and purpose.

I'm thinking about what it feels like to walk past the Babbling Brook on campus after learning that most of the trees and shrubs surrounding it are NDSU releases.

Or how I will never look at legumes the same way again after learning from Dr. Barney Geddes that they produce their own nitrogen — an evolutionary event he and his students are trying to recreate in cereal crops.

Or what it means to know that students on campus have engineering scholarships because former NDSU dean Dr. Joseph Stanislaw has joyfully chosen to work into his 90s so that he can continue investing in future generations of engineers.

I hope the stories in this magazine help you feel an even stronger sense of belonging with everyone who calls NDSU their school, alma mater, workplace, and team. It's because of all of these people (including you!) that we are launching a new name for the magazine: one that captures NDSU's enduring spirit of community and pride.

Whether you are an alumnus or, like me, a Bison-at-heart, these stories are for everyone who is rooting for NDSU.

Welcome to Herd.

Sincerely,

Micaela Gerhardt

Micaela Gerhardt

Editor of Storytelling and Development Communications
NDSU Foundation



Studio Freshly captured me (right) and magazine designer Leah Ecklund at one of our favorite places, the NDSU Archives, where we held a photo shoot for the home economics story. See page 12.

COATING THE EDGE

NDSU researchers in the coatings and polymeric materials department are upholding a 120-year tradition of industry-leading breakthroughs.

Story by Emily Erickson '15 | Illustrations by Leah Ecklund

As you drive through northern or central North Dakota in the late spring and into summer, between acres of golden wheat and green soybeans, you may be greeted by a surprising shade of blue: fields of *Linum usitatissimum*. Flax.

North Dakota leads the nation

in flax production, and the crop's significance stretches well past feed, fiber, and baked goods. Flax has played a pivotal role in the research and development of paints and coatings that have helped position NDSU as a leader in the field of coatings and polymers for more than a century.



The best way to test paint in 1906?
Apply it to fence posts and see how it holds up to the North Dakota elements. (Photo from NDSU Archives)

In the early 1900s, paints and protective coatings were developed primarily using lead carbonate and pure linseed oil, which is derived from flax. Despite its widely acknowledged toxicity, pure lead paint was highly sought after by U.S. consumers — it had exceptional durability, greater adhesion, moisture resistance, and long-lasting color.

To cut costs and increase volume, some producers would “adulterate” lead paints, adding ingredients like water, chalk, or oils other than linseed oil. In response, the North Dakota legislature passed “An Act to Prevent the

Adulteration and Deception in the Sale of White Lead and Mixed Paints,” which meant that paints and coatings

needed to be rigorously tested and researched to aid in the enforcement of the new law.

The conditions in North Dakota were ideal: The extreme weather was perfect for testing durability, flax was plentiful, and a pioneer in paint chemistry, Dr. Edwin F. Ladd, was on staff at the state’s land-grant institution.

Edwin arrived at NDSU (then North Dakota Agricultural College) as its second faculty member in its founding year, 1890. A passionate consumer advocate, he served the university first as a professor of chemistry, then as the dean of the chemistry department, and finally as the president from 1916 to 1921. Edwin and the chemists at NDAC were responsible for testing various paints and coatings, and in 1906, the first formal college course in paints and varnishes began at NDAC.

The program continued to grow in the following decades. In 1942, The New York Times published a short article detailing the specialized curriculum and successful job placement rate for graduates of the protective coatings program at the “small college located out on the Northern Plains.” Twenty years later, “polymers” was

added to the department name to keep up with the new developments in the relationship between plastics (polymers) and coatings. The rise of synthetic polymers (as opposed to natural materials like wood, metal, and rubber), plus a focus on mass production and disposable products, created a higher need for research and development in the field.

As research in coatings and polymers evolves, the list of use cases grows: Corrosion protection for pipelines and bridges. Automotive paints with long-term durability plus UV and scratch resistance. Plastic packaging for food, medicine, and chemicals. Anti-viral coatings that kill microbes. And NDSU researchers are on the cutting edge.

Today, NDSU’s programs are some of the most unique and sought-after in the nation. Students may earn a master’s and doctoral degree in coatings and polymeric materials, and a minor is available for any student majoring in a science or engineering discipline.

Between the ample laboratory spaces in Sugihara Hall, a dedicated teaching lab in the A. Glenn Hill Center, and the state-of-the-art Bioactive Materials Research Laboratory at the NDeavor™ Barry D. Batcheller Tech Park, students can focus on robotics, machine learning, composition research, liquid coatings, bioplastics and thermo-plastics, and more, plus have the opportunity to partner with private industry, government organizations, and researchers around the world. Program graduates are highly sought after by industry and experience exceptionally high job placement.

What began more than a century ago as a paint-testing initiative has become an industry-leading research powerhouse with global impact. On the following pages, **experience some of the department’s current projects.**

STRONG BONDS

The department collaborates with many organizations to **advance research discoveries:**

- Army Research Laboratory
- Defense Advanced Projects Research Agency
- National Park Service
- National Science Foundation
- Office of Naval Research
- Sherwin-Williams
- United Soybean Board
- And more companies, organizations, and universities

BARNACLES!

Adhesion-resistant coating materials

PARTNER: Office of Naval Research

ROUGH WATERS: When a ship is immersed in a body of water, it accumulates organisms like barnacles, algae, and bacteria that like to live on its surfaces. This is called fouling. Fouling creates drag, which can act like sandpaper, increasing fuel consumption and emissions, and even impairing ship operation.

OPPORTUNITY FOR INNOVATION: Most current antifouling coatings for ship hulls release toxic biocides. Researchers across the world are interested in finding new types of nontoxic antifouling coatings. NDSU has been working with the Navy since 2002 on various approaches in response to the epic challenge of designing a coating that an estimated 4,000 different organisms — and their unique (and not well-studied) adhesion mechanisms — will not adhere to.

UNEXPECTED DISCOVERY: Around 2017, NDSU researchers found that certain coatings that resisted adhesion of marine organisms also had low adhesion for ice. This led to broadening the program to investigate coatings for ship superstructures (which includes the main deck, bridge, and communication centers of a ship) in addition to the hull — plus additional ice adhesion

WHAT IS A COATING?

Most modern coatings are polymer-based. Polymer molecules act as binders to form protective, functional, or decorative films on surfaces. The coating offers properties like durability and corrosion resistance.

uses on power lines, solar panels, and aircraft. The ideal result? A tough, durable nontoxic coating that **lowers environmental impact** in bodies of water and **maintains safe, sustainable use** of essential infrastructure and equipment.

IN A LANDLOCKED STATE? The Bioactive Materials Research Laboratory is a state-of-the-art facility at NDeavor dedicated to studying the interactions of coatings and materials with live organisms. It includes a suite of automated tools, ocean water conditions for testing, and AI and machine learning to prepare coatings and analyze data. And yes, bacteria, algae, and barnacles are maintained year-round and used for research.

LEAD RESEARCHERS: Dr. Dean Webster, chair of NDSU Coatings and Polymeric Materials Department, with Dr. Andrew Croll, professor of physics, and Dr. Bakhtiyor Rasulev, associate professor of coatings and polymeric materials



SOY MUCH BETTER

Improving nonstick surfaces with a local crop

PARTNER: North Dakota Soybean Council

FLUOROPOLYMERS 101: Think of the nonstick pan you use for fried eggs. The nonstick coating that makes cooking and cleaning easier is made with a fluoropolymer. Graduate researcher Marcel Roy Domalanta '26 describes a polymer as a "long, twisty chain" — like a necklace made up of carbon "beads." And if fluorine atoms are added to the carbon beads in that chain, you get a fluoropolymer like Teflon.

NOT-SO-STICKY SITUATION: Fluoropolymers are difficult to adhere to surfaces. Current adhesion methods are often difficult to implement, expensive, and can be harmful to the environment. Plus, when

added binding materials get removed from wear and tear, they release compounds that can be harmful to users and the environment.

SOY-BASED SOLUTION: Soybean extracts contain sticky compounds that have anchoring parts — turns out, it sticks to both fluoropolymers and metal surfaces. Adding as little as 1% of soybean extract to a fluoropolymer solution improves adhesion strength and corrosion protection.

GLOBAL IMPACT: Beyond cookware, this simple, inexpensive, eco-friendly solution can also strengthen adhesion and extend the lifespan of steel structures like those used for industrial equipment, construction, and other consumer products like appliances and electronics. Regionally, the project strengthens North Dakota's soybean economy by creating new applications. Nationally and globally, it supports the shift toward greener technologies and reducing the environmental footprint of protective coatings across industries.

LEAD RESEARCHERS: Marcel Roy Domalanta '26, graduate researcher, and Dr. Eugene Caldona, principal investigator and assistant professor of coatings and polymeric materials



No. 4

ND ranked No. 4 in acres of soybeans planted and harvested

(ND Soybean Council, 2024)

6.5 million

acres of soybeans

harvested in ND

(ND Soybean Council, 2025)

FEELING THE HEAT

Developing and strengthening corrosion-resistant hybrids

CHALLENGE: When an aerospace vehicle like an airplane, spacecraft, or rocket launches, its exhaust plumes and external surfaces can reach hundreds and even thousands of degrees Fahrenheit — extreme temperatures that can destroy coatings and even melt metal.

LIQUID TO SOLID: Researchers at NDSU are working on a new type of protective coating that can withstand extremely high temperatures, like those reached by aerospace vehicles. They start with a liquid polymer that, when heated to high temperatures, chemically transforms into a solid, glass-like ceramic called silicon oxycarbide (SiOC). This research offers a reliable way to protect critical assets that operate in harsh, high-heat environments, like transportation exhaust systems, the energy sector, and various other industrial applications.

UNEXPECTED DISCOVERY: A surprising chemical compound that helps the coating work? Rust. When the metal substrate begins to rust at high temperatures, the rust components unexpectedly diffuse into the coating matrix. Instead of causing failure, the rust acts as a filler that prevents the coating from shrinking and cracking. This allows the final protective film to remain solid and stick tightly to the metal.

HOTTER YET: The next steps for this project involve pushing the boundaries by testing the coating at even higher temperatures (more than 1,800 degrees Fahrenheit) and measuring performance properties like how much it expands or contracts and whether it cracks or survives when rapidly heated or cooled.

LEAD RESEARCHERS: Dr. Xiaoning Qi, assistant professor of coatings and polymeric materials, Dr. Ravi Arukula, postdoctoral research associate, and Taehyun Kim, Ph.D. student



■ Challey Hall

A new space sets the tone for music and theater excellence at NDSU.

Taking the stage with the Summer Performing Arts Company in Grand Forks, North Dakota. Singing John Denver songs like “Sunshine on My Shoulders” with her dad. Visiting NDSU as a high school student and hearing the resonant, operatic voice of a graduate student in a concert choir rehearsal. Wondering, *Oh my gosh ... will I sing like that one day?*

These experiences shaped a lifelong love of music for vocal music performance major **Ellie Knudsvig '26**. But it wasn't until she received scholarships established by Bob '67, '09 and Sheila '23 Challey that Ellie felt certain: a career in music would be possible.

What she never anticipated? How holistically supported she would feel as a student in the Challey School of Music.

From singing with the NDSU Concert Choir, Madrigal Singers, and Bison Arts Singers to playing trombone in both the Gold Star Marching Band and Lab Jazz Band to working alongside top-of-the-line music educators and honing

her skills as a student director of the NDSU Statesmen, a tenor/bass choir, Ellie has pursued many unique opportunities to perform, learn, and lead.

During her graduating year, Ellie experienced a new kind of support through the renovation and addition to the Reineke Fine Arts Center, which was recently renamed Challey Hall in honor of Bob and Sheila's generosity.

Driven by growth in NDSU's music and theater programs, the nearly 10,000-square-foot expansion for the performing arts includes upgraded rehearsal and classroom spaces, advanced technology, a new recording studio, and updates to the exterior facade.

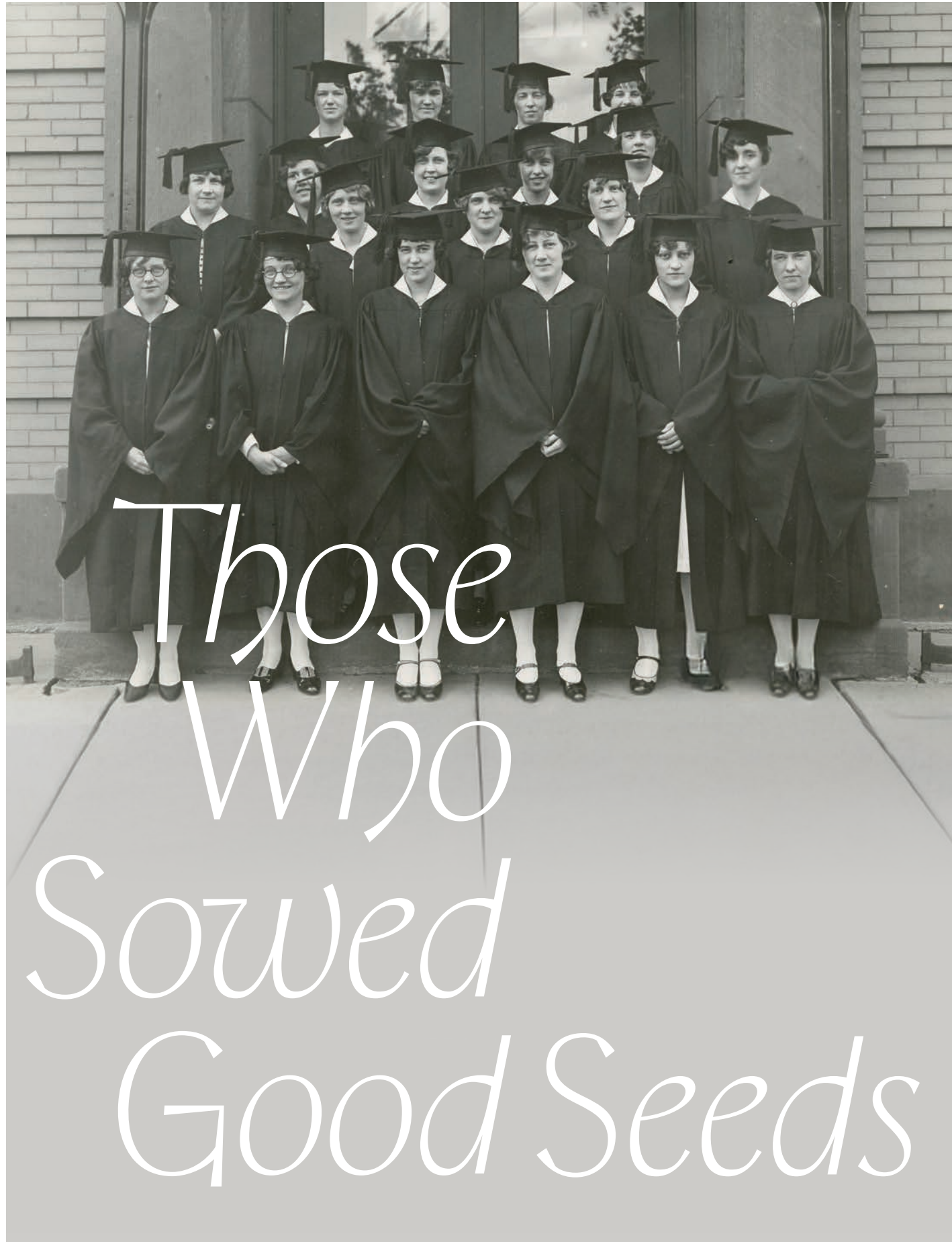
“NDSU is the place to be — and Bob and Sheila Challey know that,” Ellie said. “It's been so gratifying for us students to feel so supported emotionally, financially, and now physically with this new building.” 🍷

Photo by **Kensie Wallner**



**EXPLORE
CHALLEY HALL**

Ellie guides you through the new hub for performing arts at NDSUFoundation.com/magazine



Those Who Sowed Good Seeds

STORY BY MICAELA GERHARDT | PHOTOS BY NDSU ARCHIVES AND STUDIO FRESHLY

“TODAY’S ACHIEVEMENTS ARE BUT THE HARVEST OF GOOD SEEDS, WELL SOWN, AND OF PLANTS WELL-TENDED THROUGHOUT PAST YEARS.”

- LEITA DAVY, FORTY YEARS OF HOME ECONOMICS AT NDAC

As she studied a photograph of her mother, Eleanor (Stoltenow) Fitzgerald '38, in an old Bison yearbook, Dr. Margaret Fitzgerald '83 lit up.

“Oh, look at her,” Margaret said, doting on how young her mother appeared in her final year of college.

“I’ve never seen a photo of her that young,” Margaret’s son, Matthew Veit '23, said. He was only 4 years old when his grandmother, Eleanor, passed away.

He and Margaret examined the yearbook together, noticing the inscription beneath Eleanor’s name, which lists her involvement in campus organizations like Ceres Hall Club, Glee Club, riflery, and — much to her family’s surprise — basketball.

“Baller?” Matthew asked, leaning in to take a closer look. He currently serves as the head coach of the girls basketball and softball teams at Fargo Davies High School and did not know his grandmother once shot hoops too.

Three generations of the Fitzgerald/Veit family — Eleanor, Margaret, and Matthew — earned degrees from NDSU, or North Dakota Agricultural College (NDAC) as it was known when Eleanor was enrolled as a student in the **home economics**¹ program.

On this occasion, Margaret and Matthew were gathered around a table to share stories about Eleanor and reflect on the legacy of trailblazing home economists who were educated in the land-grant tradition and made important contributions in teaching, research, and Extension services.

Margaret and Matthew each brought a unique perspective. Matthew recently graduated with his master’s degree from NDSU in leadership in physical education and sport, where he cultivated a passion for coaching and

youth development that he shares with his students and student-athletes.

“I didn’t know my grandma very well, but the roots have stemmed because she had a passion for home economics, and my mom found her passion in something similar, and those things they studied ... that tradition and knowledge ... has been passed on to me and set me up for success,” Matthew said.

Margaret is an emeritus provost, professor, and dean of what is now called the NDSU College of Health and Human Sciences. She currently serves as co-chair for the NDSU College of Health and Human Sciences **Wisdom Keepers**².

“When I think back to my mom and her friends, a lot of them were home economists. They might have worked in Extension, or as high school teachers, or as interior designers, but they were all trailblazers,” Margaret said. “They were leaders in their communities, schools, churches, and organizations. These were women who knew how to get things done.”

SOWING GOOD SEEDS

Eleanor graduated from NDAC more than 40 years before her daughter, Margaret, and more than 80 years before her grandson, Matthew.

“Mom earned a degree at a time when very few women, or even men, went to college,” Margaret explained. “The domestic sciences enabled women, especially those from rural backgrounds, to access higher education.”

She pointed out that when Eleanor first arrived as a student at NDAC in the mid-1930s, she left behind a family



1

Home economics programs opened doors, particularly for women, to earn college degrees and pursue careers in education, Extension, state and federal government, business and industry, health care, and more. NDAC listed domestic economy as one of its courses in its founding year, 1890.



2

Established by Dr. Teresa Conner, dean of the NDSU College of Health and Human Sciences, and co-chaired by Dr. Margaret Fitzgerald '83 and Col. Esther Meyers '75, the **Wisdom Keepers** provide support and share their knowledge and expertise with students, faculty, staff, and leadership in the College.

MATTHEW VEIT '23 (LEFT) AND HIS MOM, DR. MARGARET FITZGERALD '83 (RIGHT), SEARCH THROUGH BOXES OF HOME ECONOMICS MEMORABILIA AT THE NDSU ARCHIVES IN FARGO.



3



The **home management house** at NDAC was the first facility built on a college campus specifically for home management practice. In 1954, it was named in honor of Alba Bales, the first female academic dean at NDAC.

farm in Great Bend, North Dakota. While Eleanor's family had electricity and running water, most rural homes in the Great Plains region did not have those utilities until the Rural Electrification Act of 1936 or later.

When Eleanor and her peers in the home economics program first stepped foot on the NDAC campus, many students must have been delighted by the modern amenities more common in urban areas like Fargo — especially those in the **home management house**³.

“The home management house was a model laboratory for young women, and so it was often their first exposure to the latest appliances, principles of budgeting and money management, and the fine art of entertaining,” Margaret explained.

More than 1,200 women lived at the home management house in its 58 years of operation. The six-week residency served as a graduation requirement and

an opportunity for home economics students to put their skills into practice in a real home setting. Duties included maintaining a budget; planning, preparing, and serving meals; cleaning; laundry; caring for walks and porches; managing the furnace; and entertaining guests.

During Eleanor's residency in the home management house, she was responsible for hosting a high-end dinner party. As Margaret recalls, Eleanor received the largest budget of all her peers.

“I could have sworn she said she made lobster, but then I got to thinking, ‘Where did she get lobster in North Dakota in the 1930s?’” Margaret mused. “For a girl who grew up on a farm in North Dakota, to come in and prepare an elegant meal and entertain others and be the gracious hostess ... it was very intimidating.”

Eleanor graduated from NDAC

with a degree in home economics education, taught home economics in two high schools, and later worked for the University of Minnesota Extension Office in Clay County, where she was promoted to the rank of assistant professor. Later, she did special projects for NDSU Extension, including a demonstration TV segment called “Ask Eleanor.”

“I think she felt a lot of responsibility because she had the privilege and opportunity to go to college,” Margaret said, “so she was always teaching and helping people and sharing what she had learned.”

Like her grandson, Matthew, Eleanor was dedicated to youth development. She mentored and prepared 4-H leaders to work with young people, and she also worked directly with 4-H participants on their projects for county and state fairs.

“Matthew wants to motivate students toward success,” Margaret said. “He’s

leading from where he’s at, in terms of his own school and the sports community, and he cares deeply for the kids that he teaches and coaches ... I very much see my mom in him.”

PRUNING AND PROGRESSING

The home management house hosted its last live-in residents in 1981, while Margaret was an undergraduate student at NDSU. As she earned her degree in child development and family relations and pursued a career in teaching, she experienced the evolution of the domestic sciences firsthand.

In 1988, Margaret returned to NDSU as a faculty member in the College of Home Economics. She taught courses in financial planning, public policy, and

gerontology in the same academic unit that had imparted lessons on food and nutrition, clothing and textiles, and educational principles when Eleanor was a student.

This led to some friendly teasing between mother and daughter. For all the skills and intelligence Margaret possessed, Eleanor would jokingly remind her she could “barely cook” and “hardly ever sewed.”

Yes, the times were changing, but the core principles of the domestic sciences — scientific methods and practical application — remained the same. In fact, the home economics program established at NDAC in 1890 helped lay the foundation for the hands-on education and innovative teaching and research taking place across NDSU's academic colleges today.

4



Core areas of home economics remain part of current NDSU degree programs such as accounting; apparel, retail merchandising, and design; education; family and consumer science; financial planning; human development and family science; interior design; and nutrition science.

“The programs that were **core areas of home economics**⁴ still exist at NDSU and other institutions and are no longer limited to women,” Margaret said. “Although names and structures have changed over time, home economics’ emphasis on multidisciplinary programs that focus on applied science to improve people’s lives is still of critical importance.”

CONTINUED GROWTH AND FLOURISHING

The legacy of home economics at NDSU is sustained by the University’s commitment to practical, hands-on education and the development of new knowledge — but it also lives on through individuals like Margaret, Matthew, and Yufang Tu ’27, who holds the **Eleanor S. Fitzgerald Memorial Graduate Student Scholarship**⁵.

Motivated by the desire to help people lead healthier and more fulfilling lives, Yufang is pursuing a dual Ph.D. in developmental science and gerontology at NDSU.

“Receiving this scholarship helped ease my financial burden as an international student from Taiwan, but most importantly it allows me to focus more fully on my research, teaching, and community engagement,” Yufang said.

In addition to her coursework, Yufang creates caregiving resources for NDSU Extension, volunteers at Sanford Health, and serves as a community educator for the Alzheimer’s Association. Drawing on her internship experience in Dr. Ellen Langer’s Mindfulness Lab at Harvard University, Yufang also leads mindfulness workshops at Good Samaritan Society, a senior living community in Fargo.

“Trailblazing women like Eleanor opened the doors for students like me to pursue advanced education and meaningful careers,” Yufang said, “and I try to honor that legacy by using my opportunities to serve others.”

It’s a value that Eleanor embodied, and one that carries on through Margaret, Matthew, and Yufang still today. As they each pursue education, careers, and outreach, they are reminded of Eleanor and the home economists who imparted positive values and greater educational opportunities for their families, communities, and NDSU.

“From the stories that I’ve heard growing up, or even new stories that I heard my mom share today, my grandma’s legacy is about caring for others,” Matthew said. “I think that’s a very noble thing.” 🍷



FROM LEFT TO RIGHT:
LEAD ARCHIVES
ASSOCIATE JOHN
HALLBERG, MARGARET,
MATTHEW, AND PH.D.
CANDIDATE
YUFANG TU '27



5

Margaret and her husband, Hugh Veit '79, established the **Eleanor S. Fitzgerald Memorial Graduate Student Scholarship** to support NDSU students earning advanced degrees in the Department of Health, Nutrition, and Exercise Sciences or the Department of Human Development and Family Science.



STORY BY KARA LIDBERG '17 | PHOTOS BY KENSIE WALLNER

BUILDING "CHAD"

EIGHTEEN ENGINEERS. ONE ROBOT. THREE DAYS TO SHOW WHAT'S POSSIBLE.



NDeavor mentors offer guidance and practical expertise throughout the robot-building process.



A

s most NDSU students enjoyed their final days of holiday break, members of the Bison Robotics club were already back on campus, preparing to strategize, design, build, wire, program, and test a fully functional robot in just three days.

Inspired by FIRST, a global youth robotics competition every January, this challenge is called Robot in 3 Days (Ri3D), and many universities participate. Fueled by adrenaline and caffeine, NDSU's Ri3D team tuned in for the FIRST Robotics Competition (FRC) global kickoff stream to watch an overview that would guide their robot's design and function.

This year's game challenged students to create robots that could score "fuel" (yellow balls) into a "hub" (basket), while also navigating field obstacles and a climbing tower. Points were awarded across multiple phases of

play, including fuel collection, shooting, and climbing.

While the competing high school teams would have six weeks to build their robots after the FRC game reveal, the goal for Bison Robotics was to compress the entire engineering cycle into one long weekend — creating a robot to serve as inspiration for high school teams in the weeks to follow.

"The main goal for me is to give high school competitors with smaller teams and tighter budgets a prototype they can learn from," computer science major and Harry D. McGovern Scholar Dylan Rattai '28 said. "I want them to have a better robot at the end of their six-week build cycle, even as they're still learning strategy, design, or coding fundamentals."

For the Ri3D team, it isn't about competition. They aren't striving for awards or rankings, but rather the opportunity to show what's possible.

BY THE NUMBERS

18

Bison Robotics members

4

engineering disciplines: mechanical, software, electrical, and computer science

10

hours creating design draft

3,558

lines of code

400

parts (approximately)

15

hours on the CNC Router, the most-used machine in the project

20

pizzas eaten

Teams earn points when their robots score fuel into a hub as "Chad" demonstrates below.



A TEAM EFFORT

After watching the initial stream, the countdown began, and creativity took hold almost instantly. Students broke into animated chatter, leaning toward their neighbors to share ideas and pulling up searches on their laptops to show design concepts they thought could work.

Sensing the surge of excitement, Ri3D lead and mechanical engineering major Jacob Vaerst '27 called the room to attention. He organized the team into four small groups, each composed of students representing the varying engineering majors involved.

One of the most striking aspects of the Ri3D challenge is how many disciplines converge in such a short time.

- **Mechanical engineers** design and build the robot's frame, intake, and moving mechanisms.
- **Computer and software engineers** write code that tells the robot how to move and act.
- **Electrical engineers** design and install the wiring that powers the robot and keeps it safe.

For many students, Ri3D is an exciting opportunity to actively work with peers outside of their specific engineering major, and that collaboration is one of the most important parts of this project.

"A mechanical engineer is going to learn different things than a computer science major, so when it comes to different areas of the robot, different disciplines must step up based on what they know," Jacob said. "It teaches us to lean on and trust each area of the team to create a robot in such a short amount of time."

During the first breakout session, each group reviewed the rulebook before reporting back to the full team, allowing students to dive deep into the game's requirements and ensure no rules were overlooked.

They uncovered the robot's design guidelines, from movement and size constraints, and laid out the rules for penalties and scoring.

The team then regrouped into four new breakout sessions to brainstorm robot design concepts. When everyone reconvened, each group presented its ideas, focusing on ball intake, storage, shooting, and climbing — their creativity on full display.

Groups derived inspiration from snowblowers and washing machines. They made sketches on the whiteboard that featured belt-driven intake systems feeding the balls into a storage hopper and a shooter capable of firing multiple balls at once. Others discussed climber designs with a multi-hook system to improve stability.

The presentation of ideas prompted energetic discussion, purposeful questions, and respectful yet focused debates — particularly around intake placement, such as cutting into the bumper versus going over it, and how each option would affect the robot's ability to take on damage.

Drawing on experience from past Ri3D seasons, veteran students weighed in on what designs had or hadn't worked before. Ultimately, the discussion helped narrow options to a few main design directions that balanced creativity with effectiveness, reliability, the constraints of the rulebook, and limited build time.

While the deadlines added pressure, the atmosphere remained collaborative and supportive as students cycled through design sessions, prototype builds, wiring, coding, and testing.

"People help each other whenever someone gets stuck, and workload shifts as needed so the team can still hit deadlines together," Dylan said. "It also helps that many people in Ri3D have worked with the technologies we use before, so there's usually someone around who knows what needs to be done and can help keep things moving."



DAY 1

DESIGN

Electronically draft entire robot

MECHANICAL

Prototype and start manufacturing

ELECTRICAL

Lay out all components needed

PROGRAMMING

Initial setup

FIELD ELEMENTS

Create parts list and start manufacturing



DAY 2

MECHANICAL

Finish manufacturing and start assembling

ELECTRICAL

Help with assembly

PROGRAMMING

Write all code

FIELD ELEMENTS

Finish manufacturing and assemble all field elements



DAY 3

MECHANICAL

Finish assembly and improvements

ELECTRICAL

Add all electrical components

PROGRAMMING

Test and fix bugs

POWERED BY PARTNERSHIP

The robot, who the students playfully began calling "Chad," took shape inside the Innovation Studio located within the NDeavor™ Barry D. Batcheller Tech Park. An engineering and prototyping foundry that holds a long-standing partnership with NDSU, NDeavor is built to support hands-on innovation and rapid problem-solving.

NDeavor's Innovation Studio offers professional-grade tools and resources in metalworking, woodworking, textiles, electronics,

and digital fabrication — empowering community members, organizations, and businesses to develop their own unique ideas and projects.

NDeavor views student organizations like Bison Robotics as strategic partners who activate the space with creativity and momentum. In return, the NDeavor team helps the students grow by offering mentorship and space to ideate.

"Testing, refining, and learning from failure are expected and encouraged parts of the process," Adam Elznic, manager of incubation and innovation at NDeavor, said.



"CHAD" IN ACTION

Bison Robotics team members make last-minute adjustments ahead of the highly anticipated intake, toss, and climb demo.

Inspired by the way Ri3D reflects everyday engineering scenarios — tight timelines, shared resources, and open-ended problem solving — as well as by Bison Robotics' broader work, NDeavor provides the club with free access to the space and a dedicated workroom for projects.

"Students can work in ways that mirror real-world innovation environments," Adam said. "They have room to spread out, prototype quickly, and collaborate across disciplines."

While the mechanical engineers worked in the Innovation Studio building field elements and robot components, the electrical engineer mapped out wiring on the floor of the club's workroom, planning circuits with precision.

Meanwhile, in one of the small breakout rooms, the computer science and software engineers huddled around a table. With their laptops humming, code running, and the whiteboard crowded with task lists and a sketch detailing what each controller button would do, they were bringing Chad's core systems to life.

"NDeavor has been an incredible partner for Bison Robotics," Jacob said. "They actively look for ways to help us grow and improve as an organization."

HANDS-ON LEARNING

For Bison Robotics members, Ri3D provides early exposure to real-life engineering and the use of professional tools. But beyond technical skills, Ri3D emphasizes collaboration across disciplines under strict deadlines — conditions that mirror professional engineering environments.

"Because of the short timeline and how closely the teams work together, you start to understand the realistic restrictions and limits that each discipline faces," Dylan said. "That carries over into future projects, where you naturally think about those constraints ahead of time. I think that makes you a better engineer."

One of the biggest hurdles was designing and building a functional climbing mechanism. When the climb design took longer than expected, the design and mechanical teams realigned their build hours to stay on track — reflecting the kind of flexibility required in a professional workplace.

The programming team experimented with a more structured approach this year, pre-programming basic components before the build even began. Their preparation paid off, with most of the programming

completed within the first day and a half, leaving time for testing and refinement and room in the schedule to adapt as the climb design was modified.

"Students aren't just following instructions — they're making decisions, solving unexpected problems, and owning the outcome," Adam said. "That level of immersion and responsibility is difficult to replicate in a traditional academic setting, and events like Ri3D translate learning at NDSU into career-relevant skills."

The students' hard work didn't go unnoticed. When FIRST Updates Now released its annual rankings, Chad placed sixth out of nearly 30 Ri3D teams worldwide. The recognition was a fulfilling end to an intense three-day build, reflecting the teamwork, creativity, and hands-on learning that shaped the experience.

"The high school teams we were able to help made up for the lost sleep and long build hours," Jacob said. "Along with the robot, I hope we showed that you don't always get something right the first time, and that's okay. The best engineers are the ones who make mistakes, learn from them, and keep improving." 🌱

2026 NDSU FOUNDATION

Alumni Award

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Congratulations to the 2026 honorees! These NDSU alumni and partners exemplify excellence through their professional achievements, volunteer leadership, community impact, and philanthropic commitment.



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Executive Director, Theodore Roosevelt Presidential Library



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Dr. Karen Launchbaugh '84

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Professor of Rangeland Ecology, University of Idaho



ALUMNI ACHIEVEMENT AWARD

Michael Uetz '82

BS, Agricultural Economics, Business Finance

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