



DONALD DANFORTH
PLANT SCIENCE CENTER

#39NORTHSTL

the
Leaflet

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**INNOVATION TO
FEED THE WORLD**

*The Leaflet is a publication for partners,
friends, and supporters of the Donald
Danforth Plant Science Center.*



Table Of Contents

News..... 4

Discovery 6

Innovation 10

Talent Pipeline..... 18

Our Supporters..... 20

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Mission

Improve the human condition through plant science

Vision

As a world center for plant science research, our discoveries will help feed the hungry and improve human health, preserve and renew our environment, and enhance the St. Louis region.

Values

Collaboration • Diversity and Inclusion • Innovation • Integrity and Respect • Environmental Sustainability • Stewardship



The Platinum Seal of Transparency is awarded to less than 1% of the 1.8 million nonprofits profiled on [GuideStar.org](https://www.guidestar.org).

Accelerating the Pace of Change

Recent headlines sound the alarm: "War in Ukraine could plunge world into food shortages" (*National Geographic*); "Enormous fertilizer shortage spells disaster for global food crisis" (*Politico*); "Climate change is disrupting our food system" (*Business Insider*). Population growth, a changing climate, and rising standards of living means that in just a few decades—by 2050—the world will not have enough land or fresh water to grow the food we need. Add in conflict and political turmoil, and the urgency is clear.

We need bold innovation to create sustainable solutions. And we must accelerate the pace of change.

Danforth Center scientists are making groundbreaking discoveries that form a critical foundation to address global issues of food security and climate change. But that science must be paired with strategies to deliver marketable solutions with the speed and urgency our times demand. The Danforth Center is doubling down on our intentionally created innovation ecosystem with a goal to found and spin out more companies and technologies than ever before. We are catalyzing change for the good of the planet while bringing jobs and opportunities to our region.



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News & Events

MEYERS ELECTED TO NATIONAL ACADEMY OF SCIENCES

Principal Investigator **Blake Meyers, PhD**, professor at the University of Missouri – Columbia, has been elected to the National Academy of Sciences for his contributions to science. Membership is among the highest honors bestowed on US scientists. Meyers led development and application of high-throughput DNA sequencing technologies leading to discoveries crucial for crop improvement. He is a prolific scientific author and among the most highly cited plant scientists in the world. Other NAS members at the Danforth Center include President and CEO **Dr. Jim Carrington** and Distinguished Investigator **Elizabeth Kellogg**. Read more about Dr. Meyers' work on [p. 6](#) of this issue.

EARLY CHILDHOOD EDUCATION CENTER

A new early childhood education center with a STEAM-based curriculum is coming to 39 North. The Danforth Center, St. Louis Economic Development Partnership, and the city of Olivette have joined forces with [YWCA Metro St. Louis](#) to bring this needed service to the 600-acre innovation district. "This will be a vital new amenity for company recruitment to our innovation community," said Stephanie Regagnon, executive director of innovation partnerships. "We are thrilled that the YWCA, a nationally recognized leader in early childhood education, is filling this gap."

UNITING OUR REGION FOR CLIMATE ACTION

The Midwest Climate Summit is coming to St. Louis on February 21-23, 2023. Hosted by the [Midwest Climate Collaborative](#), this in-person summit is for individuals, organizations, and key stakeholders to share knowledge across sectors, catalyze new partnerships, and accelerate climate action. It will be held on the campus of Washington University in St. Louis. The MCC consists of partners from business, academia, and nonprofit organizations across 12 states seeking a coherent Midwestern response to the climate crisis. The Danforth Center is a founding member.

RIBBON-CUTTING AT JJK FAN CENTER

The Jackie Joyner-Kersey Food, Agriculture, and Nutrition Innovation Center (JJK FAN) hosted a kick-off this spring, including tours and a ribbon-cutting on recently donated office space. The JJK FAN Center is a unique public-private partnership of the [Jackie Joyner-Kersey Foundation](#), the Danforth Center, and the [University of Illinois Urbana-Champaign](#). The mission of the JJK FAN Center is to provide quality youth and community programs in STEAM+Ag, food production, nutrition, and physical activity in East St. Louis and beyond. The Danforth Center's Education Research and Outreach Lab is developing curriculum.

NEW FUNDING FOR AGRI-FOOD TECH

One of the many hurdles for young startups is funding. Through their annual competition, the nonprofit Arch Grants awards funds to early-stage companies who headquarter in St. Louis. Now, the Danforth Center, [BioGenerator](#), and [The Yield Lab](#) are partnering with [Arch Grants](#) to fund a new track in this competition specifically for agri-food-tech startups. Each year, Arch Grants funds 20-25 early-stage companies through its annual Startup Competition. This year, it will include agri-food tech as well. The companies brought here thanks to this initiative will benefit from the 39 North innovation ecosystem and create new opportunities for our region.

HONORING THE OSAGE PEOPLE

As an institute focused on preserving and renewing the environment through plant science, the Danforth Center is committed to recognizing and honoring Indigenous Peoples as the original stewards of the land. During this November's Native American Heritage month, and every month, the Danforth Center acknowledges that it is located on the ancestral and unceded lands of the Osage, Missouri, and Illini people, who were removed unjustly, and that we in this community are the beneficiaries of that removal. By recognizing Indigenous Peoples and their traditional homeland, we seek to express gratitude for their enduring stewardship of the land. We pay honor and respect to Indigenous Peoples, past and present, by committing to build a more inclusive and equitable space for all.

• Blake Meyers, PhD



• Early Childhood Education



• Climate Summit



• Ribbon Cutting



• Agri-Food Tech





This project is funded by the National Science Foundation and by donors like you. To learn more about supporting research, visit danforthcenter.org.

National Academy of Sciences member Dr. Blake Meyers is leading a collaboration to unlock the secrets of exRNA, a discovery his lab published earlier this year.

Cracking the RNA (Non)Code

Look up RNA in the dictionary, and you will learn that ribonucleic acid (RNA) is a nucleic acid present in all living cells with the principal role of directing cells to synthesize proteins. This is called “coding.” For example, the mRNA in COVID vaccines contains coding to direct our cells to make a SARS-CoV2 spike protein. However, some RNAs serve other functions. In some viruses, RNA (rather than DNA) carries genetic information, but mostly the function of so-called “noncoding” RNAs is unknown. Recently, researchers at the Danforth Center have begun to explore how plants secrete noncoding RNA and how it helps protect plants from infections caused by fungi and bacteria.

The lab of **Blake Meyers, PhD**, Danforth Center principal investigator and professor of plant sciences at the University of Missouri-Columbia, discovered that noncoding RNAs are doing something interesting in plant leaves: they accumulate in the spaces *between cells and on cell surfaces* (so-called extracellular RNA or exRNA). Many of these exRNAs also have a circular structure, which is unusual and was unanticipated. The researchers speculate that this modification might be required for secretion of RNA. The discoveries were described earlier this year in an [article published in the scientific journal *The Plant Cell*](#).

A new collaborative research project led by Dr. Meyers, together with Danforth Center Research Scientist **Patricia Baldrich, PhD**, and Roger Innes, PhD, professor of biology at Indiana University, builds on these discoveries.

“It takes a large amount of energy for cells to make and secrete RNA, thus this secreted RNA must benefit the plant in some way,” said Meyers. “If our hypothesis is correct, this research will enable the development of crop plants with better immune systems. Improved disease-resistance is critical to feed a growing world in a changing climate.”



The Meyers lab and collaborators discovered RNA within plant leaves, but outside of plant cells. This extracellular RNA or exRNA is thought to help plants resist infection.

Sorghum Bioenergy Research

Danforth Center Principal Investigator **Andrea Eveland, PhD**, will lead a multi-institutional project to deepen the understanding of sorghum, specifically its drought response, in a continuing project to enhance sorghum’s potential as a bioenergy feedstock. The research is funded by the [US Department of Energy](#), and includes **Todd Mockler, PhD**, the Danforth Center’s Geraldine and Robert Virgil Distinguished Investigator. Sorghum’s natural resilience to drought stress and excessive heat, which allows it to grow on marginal lands, makes it a leading bioenergy candidate. Drought tolerance is a complex trait and understanding its regulation in the broader context of the whole plant and its environment will require advanced approaches in genetics, genomics, phenotyping, and gene editing. “There is extraordinary genetic diversity underlying sorghum’s adaptation to stressful environments,” said Eveland. “Unlocking this information could help efforts to make other crops more stress resilient too.”



Dr. Andrea Eveland directs DOE-funded research on the source of sorghum’s drought-tolerance in a continuing project to consider sorghum as a bioenergy feedstock.

Support for Climate-Smart Sorghum

Danforth Center Principal Investigator **Nadia Shakoor, PhD**, is part of a nationwide team led by the [National Sorghum Producers](#) that will work to quantify the climate impact potential of sorghum with support from [USDA Partnerships for Climate-Smart Commodities](#). Sorghum is a naturally drought-tolerant grain crop, making it a leading contender in climate-mitigation strategies that would allow farmers to feed people, while also combatting climate change. Shakoor, a nationally recognized expert on sorghum, is also the lead sorghum researcher on the Harnessing Plants Initiative, a collaboration with Salk Institute. “This grant will allow us to partner directly to implement climate-smart production practices on working land,” said Shakoor. “Farmers have an important role to play in combatting climate change,” said Shakoor. “Implementing further climate-smart production practices on working lands will achieve substantial carbon capture, reduce greenhouse gas emissions, and offer benefits to farmers as well.”



Dr. Nadia Shakoor is partnering with sorghum farmers to deploy climate-smart practices that will help feed people while also combatting climate change.



Dr. Nigel Taylor (far right) with collaborators in cassava fields in Kenya. Danforth Center scientists recently discovered a genetic mutation responsible for resistance to cassava mosaic disease.

Activating Disease Resistance

NEW RESEARCH REVEALS MUTATION RESPONSIBLE FOR CMD RESISTANCE IN CASSAVA

Cassava, a root crop rich in carbohydrates, is one of the most important staple foods in the world. Hundreds of millions of people in Africa depend on cassava for their daily calories. Drought-tolerant and able to grow in poor soils, cassava is a sturdy crop, but it is also susceptible to devastating viruses that cause huge yield losses.

Cassava mosaic disease (CMD) is considered among the most damaging crop diseases in the world. Infected plants are stunted and do not fully develop the storage roots used for food, resulting in near-total crop failure. Certain varieties of cassava are naturally CMD-resistant, but scientists have not understood why. Now, exciting new information has been discovered that could help breed more desirable resistant varieties.

Danforth Center Principal Investigators **Becky Bart, PhD**, and **Nigel Taylor, PhD**, the Center's Dorothy J. King distinguished investigator, led a team in collaboration with [ETH Zurich](#) that has identified the genetic mutation that confers CMD resistance. This seminal work was recently published in the scientific journal *Nature Communications*. Danforth Center Postdoctoral Associate **Ben Mansfeld, PhD**, was first co-author.

Their findings have significant implications for improving cassava yield and sustaining farmer income in the face of a widespread disease. The discovery could also shed light on disease-resistance in other major crops. "Similar viruses attack many other crops, including cotton and tomato," said Bart. "This discovery could provide disease-resistance strategies in those crops, too."

This work was supported by a grant from the [Bill & Melinda Gates Foundation](#) and by donors like you, whose support of the Innovation Fund benefits early-stage projects.

"Farmers in Africa identified CMD-resistant plants and maintained them over generations. Now we have discovered the gene behind that CMD resistance."

- **Nigel Taylor, PhD, Dorothy J. King Distinguished Investigator**



Defeating Drought

PIONEERING NEW DATA MODEL IDENTIFIES HELPFUL MICROBES

Drought is one of the greatest threats to agricultural systems, resulting in unpredictable crop yields, declines in farm revenue, and an increase in disease, insect, and fire outbreaks. In the United States alone, drought costs farmers and the public on average more than \$9B per year—and the threat of sustained drought is worsening with climate change.

New research spearheaded by Danforth Center Senior Data Scientist **Jeffrey Berry** and Principal Investigator **Becky Bart, PhD**, is advancing one potential way to enhance crop resilience through "plant probiotics," or microbes known to improve plants' drought tolerance. Through their work, the team identified new microbes that promote sorghum root growth, a critical characteristic to improve crop resilience to drought.

For years, scientists have identified promising microbes for drought tolerance in the lab. However, replicating their efficacy in the field has proven much more difficult due to the complexity of the environment. Soil characteristics like pH and phosphate content, site topography, moisture distribution, and other details can vary wildly across even a single field site. "Environmental variation makes the real world a noisy place to conduct science," said Bart.

By combining giant, multivariate datasets from collaborators across several institutions, Berry was able to use sophisticated computational models to understand and overcome variation in the field. **The result was a first-of-its-kind statistical model that, by accounting for variation in soil properties, revealed novel microbes that influence the plants' tolerance to drought stress.** Results were published recently in scientific journals *ISME Journal* and *eLife*.

The five-year project was funded by the [US Department of Energy](#), [National Science Foundation](#), [Howard Hughes Medical Institute](#), [Iowa State University](#), and by donors to the Danforth Center.

Drought threatens agriculture and society, and climate change is exacerbating the problem. Danforth Center scientists are creating tools to help identify novel microbes that can protect plants from stress.



Danforth Center scientists have identified new microbes that help with drought tolerance. The work is part of the [Subterranean Influences on Nitrogen and Carbon \(SINC\)](#) Center, which seeks to leverage the power of beneficial microbes to decrease the use of chemical nitrogen fertilizers.



In 2021, the Danforth Center, BRDG Park, and EDGE@BRDG had a combined economic impact of \$412M on the St. Louis region. The Center aims to maximize that impact with a new Startup Initiative.



Startup Peptyde Bio is developing sustainable solutions to fungal diseases. It was co-founded by Danforth Center Principal Investigators Dr. Dilip Shah (right) and Dr. Kirk Czymmek (not pictured).



Meet Isabel Acevedo

The Danforth Center's new manager of community innovation will work to operationalize Innovation team efforts across the Center and greater St. Louis. A native Spanish speaker, she will support strategies to attract agri-food-tech companies from Latin America to 39 North. Acevedo has an MBA from SLU, a BS in biomedical engineering from Washington University, and 10 years of experience helping universities commercialize intellectual property. She was formerly on the Danforth Center Development team.

From the Lab to the Land

NEW DANFORTH STARTUP INITIATIVE ACCELERATES SCIENCE TO MARKET

Danforth Center principal investigators are leading cutting-edge research in plant biology and genetics to make discoveries at the nexus of agriculture and the environment. But getting solutions into the hands of farmers requires more.

"To deliver on our mission at the Danforth Center, to have an impact from our work, means we need to move our scientific advances and technologies into the marketplace," said **Jim Carrington, PhD**, Danforth Center president and CEO.

The new Danforth Startup Initiative accelerates the pace of agtech startup creation to solve some of the most pressing challenges of the 21st century. The initiative is designed to:

- Help principal investigators and teams recognize opportunities for marketable applications of their research and secure **intellectual property**.
- Fund **proof-of-concept** research to further develop ideas and technologies with marketable potential.
- Provide **entrepreneurial talent** and guidance to assess new start-up ideas and technologies.
- Fund lift-off and early stages through the newly created **Danforth Technology Company**, a subsidiary designed to get startups funded and off the ground.

Danforth Center Principal Investigators have co-founded companies like **Benson Hill** and **RNAissance Ag**. This initiative aims to smooth the way for many more.

Fighting Fungus

STARTUP INITIATIVE LAUNCHES FIRST STARTUP: PEPTYDE BIO

Fungal diseases are a persistent problem in agriculture. These include diseases like soybean rust, corn smut, rice blast, tomato gray mold disease, and potato late blight. Causing up to 10-15% crop yield loss each year at a cost of nearly \$60B worldwide, fungal infections now outpace the crop damage caused by viral and bacterial diseases combined. And the risks are growing, as climate change improves conditions for these opportunistic fungi.

Chemical fungicides have been used to address this problem, but they are toxic, expensive, and losing efficacy because of growing fungal resistance. Now a new company is offering an alternative to chemical fungicides: **Peptyde Bio**, the first startup to spin out of the Danforth Center as a result of the newly launched Danforth Startup Initiative.

Peptyde Bio is pairing nature's abundance with the power of artificial intelligence to develop novel biofungicides that can complement or replace traditional chemical fungicides. Based on natural antimicrobial peptides (AMPs) derived from plants, these biofungicides are environmentally friendly, much less expensive to develop, and effective with novel modes of action against fungal disease.

The company was co-founded by Danforth Center principal investigators **Dilip Shah, PhD**, who has studied AMPs for more than 20 years, and **Kirk Czymmek, PhD**, an expert in cell biology and fungal disease mechanisms. The startup has secured several patents and received initial investments from the Danforth Technology Company and BioGenerator Ventures. It was selected to be part of the fourth agtech cohort of the Wells Fargo Innovation Incubator (see page 12). As this issue was headed to press, Peptyde Bio announced that it had closed an oversubscribed \$1.2M pre-seed funding round.

"Peptyde Bio is using this resource that already exists in nature to create newer, safer, less expensive crop protection."

- Dilip Shah, PhD, Principal Investigator, Danforth Center



Learn more at peptydebio.com.



Founders and paired Danforth Center principal investigators from the 2022 IN² agtech cohort. All startups this year focus on biological solutions for a more resilient agriculture.

Natural Solutions

WELLS FARGO IN², DANFORTH CENTER HELP SPEED PROMISING AGTECH TO MARKET

The Danforth Center partners with the [Wells Fargo Innovation Incubator \(IN²\)](#) to speed promising agtech to market. The sustainable agriculture initiative pairs agtech startups with Danforth Center principal investigators to validate their technology and accelerate their progress. Companies are selected for their potential to positively impact the environment and receive financial support and access to investor networks.

Recently, the fourth agtech cohort was announced. The focus was on biological solutions to improve the resilience of global food systems, and the startups are:

- [Cytophage Technologies](#) (Winnipeg, Manitoba)—using synthetic biology to generate bacteriophage that infect and kill bacteria damaging to crops.
- [Edison Agrosociences](#) (St. Louis, MO)—using sunflowers to create a domestic, renewable supply of rubber and prevent further tropical deforestation.
- [Peptyde Bio](#) (St. Louis, MO)—creating natural biofungicides from plant-derived antimicrobial peptides.
- [Robigo](#) (Cambridge, MA)—creating targeted antimicrobials for specific pathogenic bacteria.

“This year’s IN² agtech cohort companies are creating new technologies that can help control and mitigate a variety of emerging crop vulnerabilities,” said Elliott Kellner, Danforth Center senior program manager. “We’re excited to support the development of such a broad range of strategies.”



Candace Seeve, PhD, director of laboratory operations, at a RNAissance Ag field trial site. Danforth Center scientist Bala P. Venkata founded the biopesticide company.

Battling Bugs

DANFORTH CENTER FOUNDED STARTUP RNAISSANCE AG OFFERS TARGETED, SUSTAINABLE SOLUTIONS

Insect pests impact every person on our planet: nearly 20% of crops are lost each year to insect damage, costing billions of dollars. To tackle the problem, farmers have turned to chemical pesticides, but these are expensive, dangerous, and diminishing in potency due to evolving insect resistance. They also typically kill beneficial insects (like pollinators) along with pests. The need for new pest management technology is urgent and widespread.

Enter: [RNAissance Ag](#). In 2017, Danforth Center Senior Research Scientist **Bala P. Venkata, PhD**, an entomologist, discovered a groundbreaking new approach using RNA interference (RNAi) for specific control of target pests. Realizing the potential, Venkata partnered with venture and technology developer TechAccel to launch RNAissance Ag in 2019 to develop sustainable biopesticides. Later that year, the fledgling startup was selected as part of the first agtech cohort in the Wells Fargo Innovation Incubator (IN²).

Today, RNAissance Ag has offices in BRDG Park on the Danforth Center campus and employs 14 people. Their primary focus is the development of sprayable RNAi products against pests such as the diamondback moth, fall armyworm, and several others. These biopesticides are designed to be highly specific to the target pest, are not toxic to other organisms, and are biodegradable. The American Chemical Society identified RNAissance Ag earlier this year one of the “20 promising companies that will change the future of farming technology.” And the new technology didn’t arrive a moment too soon.

“Climate change is a game changer,” said founder Venkata. “Insect life cycles are limited primarily by the climate. In a warmer world, not only do insects expand their territory, but they can now experience more lifecycles per crop season. RNAissance Ag offers targeted, sustainable solutions to a growing problem.”



Colorado potato beetle, one of several pest targets for biopesticide development at RNAissance Ag.

“Future generations are counting on us to work together to transform the agriculture industry and increase food security.”

- **Jenny Flores, Head of Small Business Growth Philanthropy at Wells Fargo, Danforth Center partner in IN²**



Learn more at in2ecosystem.com.



Learn more at rnaissanceag.net.



Many Danforth Center scientists regularly utilize geospatial tech, particularly in field sensing, drone, AI, and smartfarm technology. The Danforth Center is a partner in the new Taylor Geospatial Institute.



Danforth Center Vice President for Research Toni Kutchan, PhD (third from right) at the Taylor Geospatial Institute announcement earlier this year.

Geospatial Plant Science

DANFORTH CENTER IS ONE OF EIGHT PARTNERS IN NEW TAYLOR GEOSPATIAL INSTITUTE

The Danforth Center is one of eight leading research institutions collaborating on geospatial technology and research as part of the new **Taylor Geospatial Institute (TGI)** launched earlier this year. Funded by a legacy investment by Andrew C. Taylor, executive chairman of Enterprise Holdings, Inc., with supporting investments from each of the eight member institutions, the Institute builds on St. Louis's significant geospatial assets and accelerates the region's position as the global center of geospatial innovation, impact, and excellence.

In addition to the Danforth Center, partners include Harris-Stowe State University, Missouri University of Science & Technology, Saint Louis University, University of Illinois at Urbana-Champaign, University of Missouri-Columbia, University of Missouri-St. Louis, and Washington University in St. Louis.

TGI projects target four key areas: food security, which includes climate-smart farming practices, increasing biodiversity and agricultural output; core geospatial science and computation; geospatial health; and national security.

"Our scientists have unique contributions to make through collaboration with TGI colleagues to address global issues at the nexus of food security and the environment," said **Jim Carrington, PhD**, Danforth Center president and CEO. "The breadth of geospatial science and technology with application to food systems and sustainable agriculture means we will see wide-ranging benefits from this exciting Institute."

In addition to conducting research, the TGI provides support to faculty, post-doctoral and graduate students, and visiting scientists with state-of-the-art indoor, mobile, and airborne imaging capabilities; research computing infrastructure; and access to regional innovation hubs at its SLU campus location, just a short distance away from the Next National Geospatial-Intelligence Agency (NGA) currently under construction.



Danforth Center scientist Nadia Shakoor (second from left) with SLU collaborators. Their new grant supports development of new technology to better share ag data.

Sharing Farm Intelligence

DANFORTH CENTER PARTNERS WITH SLU TO DEPLOY EDGE COMPUTING FOR BIG DATA ANALYSIS

Future-proofing agriculture for a changing climate is complicated by the volatile nature of science in the wild. Modern sensing technology can collect gigabytes of data on everything from hours of sunlight and inches of rain, to temperature, leaf coloration, soil health, etc. But the kinds of data, and even the sensors, vary by region and by nation. In order for scientists to detect climate change impacts—or assess plant pathology or various stress scenarios—scientists need the ability to integrate and interpret vast amounts of diverse data in the field.

A team of researchers from the Danforth Center and Saint Louis University is creating a solution: a cyber-physical system that reduces the timeline to analyze, normalize, and fuse farm-collected datasets. They are focusing on crops that have high potential for carbon capture and future climate resiliency, such as soybean and sorghum.

Danforth Center Principal Investigator **Nadia Shakoor, PhD**, is co-leader of the grant from the National Science Foundation. Shakoor is co-founder of the spinout company Agrela Ecosystems. Her team previously invented the PheNode, a field-deployable remote sensor, as well as the next-generation FieldDock, an all-in-one integrated smart farm system.

"It's critical that we create a system that is scalable, practically useful, and accurately translates and integrates data collected from vastly different sensing modalities deployed in agricultural environments across the globe," said Shakoor.

The assembled team has expertise in plant science, secure networked systems, artificial intelligence, privacy, and software engineering. They plan to deploy AI-enabled deep-learning via edge computing in the field to make sense of the datasets, which include image and video, as well as numerical data.

"Farmers are increasingly adopting automation in tractors, drones, and sensors. The FieldDock and PheNode integrate these types of tech into a universal platform."

- **Nadia Shakoor, Principal Investigator, Danforth Center**



Learn more at taylorgeospatial.org.



Danforth Center spinout founded by Nadia Shakoor; maker of the PheNode, an in-field sensor. Learn more at agrelaeco.com.



Artist's rendering of 39 North master plan, looking northwest from the intersection of Olive and Warson. The 600-acre innovation district has attracted \$64M in infrastructure investments.



The 39 North master plan includes mixed retail, residential, and office space connected by walking/biking trails and green space.



Learn more and sign up for the 39N newsletter at 39northstl.com.

Growing Innovation

39 NORTH INNOVATION DISTRICT CELEBRATES FIVE YEARS

At the intersection of Olive and Warson in Creve Coeur lies the not-so-little innovation district that could. **39 North** celebrated its fifth anniversary this year. Since its official debut in 2017, the 600-acre agtech district has grown quickly, thanks to a master plan developed with funding from the US Department of Commerce. The area encompasses the Danforth Center, BRDG Park, Helix Center, Bayer Crop Science, Benson Hill, CoverCress, The Yield Lab, the St. Louis Community College's biotechnician training program (see p. 19), and dozens of companies, large and small.

Today, 39 North plays a key role in the region's efforts to drive innovation in agriculture, bioscience, big data, geospatial technology, and logistics. The area has experienced significant growth and is home to over 1,000 plant science PhDs, hundreds of bioscience companies, and has \$2 billion in bioscience venture capital under local management. In the last five years, more than \$64 million in infrastructure investments have been made in 39 North—and \$11 million more in projects are currently underway.

GROWING AND ATTRACTING STARTUPS

39 North enterprises are met with resources, capital, networking opportunities, infrastructure, and the talent needed for their companies to thrive. Danforth Center spinout Benson Hill is headquartered at EDGE@BRDG, as CEO Matt Crisp explained: "Investors want companies that are in close proximity to, and have a good relationship with, their stakeholders. By virtue of being in 39 North, we're able to enjoy that proximity that contributes to the success of our business."

The district hosts a monthly Coffee with Colleagues event and pop-up happy hours to ensure networking and cross-pollination. Sign up for the e-newsletter for the latest happenings.



"A St. Louis Story"

COVERCRESS IS LATEST BIG WIN FOR ST. LOUIS AGTECH

Named this year by St. Louis Business Journal Inno as a "startup to watch," **CoverCress Inc.** is a startup no more, after Bayer Crop Science bought majority ownership in August in a deal with private terms that left investors "very happy." Bunge and Chevron are minority shareholders.

Founded by former Monsanto executives in 2013, CoverCress is headquartered in the 39 North innovation district. The idea was inspired by the Danforth Center's 2012 Ag Innovation Showcase (now **AgTech NEXT**), when researchers demonstrated the oil content of pennycress as showing promise for renewable fuel. As business reporter David Nicklaus wrote recently in the St. Louis Post-Dispatch: "The pitch sounded audacious: Turn a plant that most farmers considered a weed into a cash crop."

But turn it, they have. Through sophisticated breeding and gene editing, CoverCress has converted that common annual weed into a novel rotational cash crop. CoverCress™ fits between existing corn and soybean rotation in the Midwest as a winter cover crop, allowing farmers to grow three crops in two seasons. It is the first new cash crop since canola was introduced in the 1960s.

CoverCress provides all of the environmental benefits of a winter cover crop, such as soil erosion control and moisture retention. Once harvested and crushed, the oil produced is a lower carbon feedstock, ideal for renewable diesel and sustainable aviation fuel. The meal that is also produced is similar to canola, making it an ideal animal feed source.

CoverCress™ is currently planted on 8,000 acres across Illinois right now, and according to CEO Mike DeCamp, the plan is to expand to 250,000 acres in three years and 3 million acres by 2030. "It's a heck of a St. Louis story," said Jerry Steiner, former CoverCress chairman.

CoverCress™ is an improved version of the common weed pennycress. It rotates between corn and soybean in the Midwest, allowing farmers to grow three crops in two seasons.



The new sustainable cash crop CoverCress™ is currently planted on 8,000 acres in the Midwest. A cover crop that helps prevent soil erosion, CoverCress also produces valuable oil for sustainable fuel.



Learn more at covercress.com.

Education



The 2022 REU interns are elite undergraduate students who come to the Danforth Center from all over the country inspired by their interest in science. [Read more details on our blog.](#)

“The program helped me see the potential of a plant science degree. I hope to pursue a PhD in plant breeding.”

-2022 REU Intern



REU interns touring the Benson Hill Crop Accelerator in 39 North. Interns perform real science in the lab, but are also exposed to industry and the startup community.

Training Tomorrow’s Scientists

DANFORTH CENTER WELCOMES 2022 RESEARCH EXPERIENCE FOR UNDERGRADUATES

Each year, the Danforth Center hosts a select group of students from across the country for an 11-week internship. Funded by the National Science Foundation, the **Research Experience for Undergraduates** (REU) has been part of summer at the Danforth Center for 20 years.

After the pandemic forced a hiatus in 2020, REU interns were virtual in 2021, but 2022 marked the return to a fully in-person program. Interns came from as far away as Yale in Connecticut, Pomona College in California, and University of Florida, and were matched according to their interests with scientist-mentors from among Danforth Center senior researchers.

For most REU interns, the way they left the program was not the way they came into it. “Within just eleven weeks, we see the interns develop into scientists asking really interesting questions,” said **Sona Pandey, PhD**, Danforth Center principal investigator and co-director of the REU program. She is assisted by **Judy Mitchell** and **Monica Alsop**, who handle the extensive administrative responsibilities. Pandey has been with the program for twelve years. During that time, she has helped push the program forward to encompass more than just lab experiences. Today, REU interns are exposed to industry opportunities, the startup community in 39 North, networking opportunities with REU interns at other sites, and the critical importance of science communication with the public.

Principal Investigator **Tessa Burch-Smith, PhD**, was new to the REU program this year as co-director, but she brought her experience of working with REU students from the University of Tennessee. She enjoyed interacting with these early-career scientists—and even learning from them. “Their enthusiasm for science and openness to new ideas and possibilities are two things every scientist should keep in focus,” said Burch-Smith.



Closing the Talent Gap

DANFORTH CENTER & STLCC PARTNERSHIP AIMS TO BRING MORE PEOPLE TO STEM

Between 2000 and 2010, STEM-related jobs grew at nearly three times the rate of non-STEM jobs in the US. These are good-paying jobs with above average salaries, but not enough people receive training and education to benefit. It is estimated that approximately 2.4M STEM-related jobs go unfilled each year due to a shortage of qualified applicants. Individuals from minoritized communities remain significantly underrepresented in STEM fields.

In 2006, St. Louis Community College (STLCC) heard the call from businesses and organizations: they needed more skilled scientific talent. They established the **Center for Plant and Life Sciences**, which moved to BRDG Park on the Danforth Center campus in 2008. Drawing on the strength of relevant programming across the 39 North district, the Center collaborates with business and industry to bring STLCC students a cutting-edge education and to provide workforce training in this growing industry.

The Center houses three state-of-the-art laboratories with cutting-edge equipment. The Center works closely with a number of partners, especially the small startups populating BRDG Park and Helix Center in the 39 North district, to provide students real-world internships—a program that allows graduates from the program to be trained to go to work immediately and be highly sought after by regional bioscience companies. The program currently boasts a 95% placement rate for graduates.

“By providing early STEAM education, training, and internship opportunities, the Danforth Center is building scientific and entrepreneurial capacity for our region,” said Stephanie Regagnon, executive director of Innovation Partnerships at the Danforth Center. “At the end of the day, these are good jobs with a chance to make a real difference in our community and our world.”

Students using electrophoresis to separate DNA at the Center for Plant and Life Sciences. The Center moved to BRDG Park on the Danforth Center campus in 2008.



The Danforth Center’s partnership with St. Louis Community College is helping expand the talent pipeline. The Center was a response to industry demands for more skilled scientific talent.



Learn more about the Center for Plant and Life Sciences at stlcc.edu/cpls.

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Thank You, Grow Challenge

The Danforth Center's Young Friends once again set a new record this September in their annual peer-to-peer fundraiser, the Grow Challenge™ Week of Giving. The initial goal of \$75,000 was quickly surpassed to eventually raise nearly \$115,000! The funds raised will go toward the development of regional education programming, such as the Danforth Center's partnership with the Jackie Joyner-Kersey Foundation in East St. Louis. Thank you to everyone who contributed toward building a brighter future!



Party with the Plants Returns

On September 23, as the culmination of the Grow Challenge Week of Giving, Young Friends got together at Party with the Plants to have a good time for a good cause. (Images courtesy of Ladue News. See more at laduenews.com)





• *Tim Halls (left) and his father Gary, supporters of the Danforth Center. Two generations of the Halls family have made the Danforth Center a focus of their philanthropy and volunteering.*

The Family that Gives Together

HOW TWO GENERATIONS OF THE HALLS FAMILY ARE MAKING A DIFFERENCE AT THE DANFORTH CENTER

Gary Halls describes himself as “social.” The owner of Halls Sales & Marketing food brokerage, Gary is very active in the St. Louis Zoo's Marlin Perkins Society, which is how he first learned about the Danforth Center.

“When my friend George Fonyo started telling me about the Danforth Center, I had never heard of it,” says Gary, “But once I got over here, I realized **what the Danforth Center is trying to do is save the world!**”

Inspired, he and his wife Bonnie became Danforth Society members, and over the last dozen years, they have served on the Plantasia gala committee, and Gary served as chair of the Danforth Society Membership Committee.

Gary traces his philanthropy to early habits at his church, as well as his belief in giving during his lifetime. “I’ve always wanted my kids and grandkids to enjoy what we’ve been able to do in life.” That includes walking by the Bonnie & Gary Halls Greenhouse at the Danforth Center, where a local startup is growing dandelions for sustainable rubber.

Gary’s son Tim adds “My parents really established a culture of philanthropy in our family. I always knew that giving back was something we are supposed to do.” He adds with a twinkle: “Plus Dad said if I wanted an inheritance, I had to join the Danforth Center Friends Committee.”

With 30 years in the financial services industry, Tim is a partner at the Moneta Group. He is also a member of the Danforth Society and current chair of the Danforth Center Friends Committee. “I’ve lived here all my life and I want to see St. Louis succeed. Knowing that there’s not a single place on the planet that has this many plant science PhDs—that’s special. The Danforth Center is capitalizing on that, and the rising tide of economic activity helps everybody.”

Tim has made promotion of the Danforth Center his personal mission. “Unlike the Zoo, we don’t have cute animals,” he says, laughing. “But the more people know about the mission of the Danforth Center, the more they want to help.”

TRIBUTES

The Danforth Center is grateful to donors who choose to honor or memorialize their friends, loved ones, and colleagues with a gift to the Center. Gifts listed here were received by September 30, 2022. To make a tribute, visit danforthcenter.org/donate.

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