DONALD DANFORTH
PLANT SCIENCE CENTER

the Leaflet

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PLANT SCIENCE FOR PEOPLE AND PLANET

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

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OUR MISSION

Improve the human condition through plant science

Feed the hungry and improve human health

Preserve and renew our environment

Enhance our region as a world center for plant science

Printed on paper from sustainably managed forests with 10% post-consumer content.

Cover

Plants are the future and plant science is leading the way. Learn more about how plants can feed the world and sustain the planet in this issue.

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The Leaflet is a biannual publication for partners, friends, and supporters of the Danforth Center. Thank you.

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Leadership Transition at the Danforth Center

The Danforth Center is preparing for a significant leadership transition as President and CEO **Jim Carrington, PhD**, announced he will step down on July 1, 2025. Over his remarkable 14-year tenure, Dr. Carrington has doubled the Center's staff, expanded its scientific research portfolio, and spearheaded major initiatives like the William H. Danforth building and the 140-acre Field Research Site. He also played a key role in advancing the 39 North innovation district and fostering partnerships to bring plant science research to the marketplace.

"I've been so fortunate to have had this opportunity," said Dr. Carrington. "We've been able to do so much because of our exceptional people, our partners, and our supporters. But it's time to plan for a transition, and I know the Center will benefit greatly from the renewal of perspective, ideas, and talents that come with a new leader." Carrington remains committed to ensuring a smooth transition and abundant opportunities for the next president.

The search for a new leader is being led by Board Chair Penny Pennington, managing partner of Edward Jones. The process will include input from the Danforth Center community and stakeholders across the St. Louis region and beyond.

"Jim has elevated the Danforth Center to global prominence," Pennington said, noting the importance of the new leader building on his legacy of mission-driven innovation and impact. As the search for the next president unfolds, the Danforth Center looks ahead to a future of continued scientific discovery and worldwide partnerships. Learn more about the search process at **danforthcenter.org/presidential-search**.

President Jim Carrington as emcee for the recent Seeds of Change event featuring Penny Pennington. Carrington will transition from the presidency in July 2025.

November 2010 press conference announcing Carrington's hiring. Carrington succeeded Interim President Phil Needleman (right), who served following Roger Beachy's departure to help found the National Institute of Food and Agriculture.

News & Events

READ MORE AT
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CONGRESSMAN-ELECT VISITS

In November, the Danforth Center welcomed Congressman-Elect Wesley Bell from Missouri district 1 to the Center for a tour of our facilities and to learn more about 39 North and the ag innovation ecosystem. Bell and his team toured the greenhouse, growth chambers, phenotyping facility, and met with Danforth Center President **Jim Carrington, PhD**, and other members of the executive team.

AWARDS SEASON

The Danforth Center celebrates the outstanding achievements of our community members:

Tessa Burch-Smith, PhD, associate member, received the Excellence in Education Award from the American Society of Plant Biologists for her leadership in teaching, mentoring, and outreach, and in advocacy for students in the Deaf and Hard of Hearing community.

Kris Callis-Duehl, PhD, executive director of education, received the Impact Award from the Botanical Society of America for advancing diversity, accessibility, equity, and inclusion in botanical scholarship, research, and education.

Karla Roeber, vice president of public and government affairs, was named Member of the Year by the St. Louis AgriBusiness Club for her leadership in the club's activities and her work to promote the importance of food and ag within the region.

Veena Veena, PhD, MBA, director of the Danforth Center Plant Transformation Facility, received the Distinguished Service Award from the Society for In Vitro Biology, an organization devoted to fostering the exchange of knowledge of in vitro biology of cells, tissues, and organs.

Xuemin Wang, PhD, member and E. Desmond Lee Professor at University of Missouri – St. Louis, received the Terry Galliard Medal at the International Symposium on Plant Lipids in recognition of his outstanding career achievements in plant lipid research and his impacts on the field.

In addition, **Drs. Tessa Burch-Smith**, **Katie Murphy**, **Sona Pandey**, and **Ru Zhang** were named to a list of "inspiring women in plant science" by the American Society of Plant Biologists.

MILLER REIMAGINES AGRICULTURE

In May, Danforth Center Principal Investigator **Allison Miller, PhD**, who is also a professor of biology at Saint Louis University, took to the stage at the Missouri History Museum to inspire a new audience as a presenter at TEDxStLouis. Miller spoke on "Reimagining Agriculture" by improving existing perennial crops and developing new ones to support sustainable and resilient agricultural systems in changing climates.

RWANDAN PARTNER VISITS

Earlier this year, Danforth Center scientists hosted Hon. Francis Gatare, head of Rwanda's Development Board, and Ronald Mutabazi, First Counselor for Commercial Affairs at the Rwandan Embassy, to discuss plant science research supporting sustainable agriculture. The Virus Resistant Cassava for Africa (VIRCA) project, led by **Nigel Taylor, PhD**, is developing improved varieties, training scientists, and establishing a sustainable cassava seed system in Rwanda.

COVERCRESS: TIME'S TOP GREENTECH

CoverCress Inc. in the 39 North agtech innovation district has been named one of America's "Top GreenTech Companies" by *Time* magazine. Innovators of a new, climate-smart winter oilseed cash crop, CoverCress secured the 34th position overall and ranked 5th among agtech companies. CoverCress was also named a Bloomberg New Energy Finance Pioneer this year for "creating the next generation of net-zero fuels."

NEW PRINCIPAL INVESTIGATORS

The Danforth Center is proud to announce the promotion of two senior research scientists to principal investigator roles.

Nadia Shakoor, PhD, a sorghum genetics expert and tech entrepreneur, leads efforts to develop climate-resilient crops. As CEO of Agrela Ecosystems, she pioneers smart agricultural tools like PheNode and FieldDock while advancing global food security through crop innovation. In addition, Shakoor has launched innovative research on fonio, a critical and under-researched food security crop in West Africa.

Kevin Cox, PhD, a Florissant native, explores spatial genomics to map gene expression in plants, providing insights to enhance crop productivity and resilience. His innovative research combines advanced imaging and molecular techniques to understand plant defense mechanisms. Cox holds a joint appointment as an assistant professor of Biology at Washington University in St. Louis.

These outstanding scientists exemplify the Center's commitment to impactful, collaborative research. Full profiles will be featured in the *Leaflet* next year.

• Wesley Bell

• Veena and team

• Allison Miller

• Rwandan partners

• CoverCress Inc.

Danforth Center Principal Investigator Dr. Burch-Smith (center) consults with Dr. Amie Sankoh (right), the lead author on a study to standardize an important metric of plant immunity.

Enterprise Rent-A-Car Institute for Renewable Fuels

Creating green solutions for global challenges, Danforth Center scientists are working to develop plant-based materials for bioenergy that are more environmentally sustainable and higher in energy content.

Cracking the Algae Code

NEW TOOL REVEALS ALGAE'S POTENTIAL FOR SUSTAINABLE CROP INNOVATION

The Danforth Center's recent breakthrough brings us closer to realizing algae's potential as a sustainable crop. In collaboration with Saint Mary's College of California and other institutions, the lab of Danforth Center Principal Investigator **James Umen, PhD**, developed **pyMS-Vis**, a tool that decodes the "language" of gene expression in algae. Cracking this code is essential for enhancing algae's productivity and resilience, enabling higher yields of oil or other valuable products that support environmental sustainability.

Until now, the complexity of algae's genetic structure made decoding this language a challenge. Histones, the proteins that package DNA, have different chemical modifications in algae, creating a distinct "epigenetic language" that is more challenging to interpret than in other organisms. This new tool, pyMS-Vis, enables researchers to identify epigenetic markers associated with expression of beneficial traits, and will be an important tool to guide development of improved algal strains.

Algae's potential as a sustainable crop is vast, offering applications in food, feed, and renewable energy industries. Fast-growing and requiring minimal resources, algae also thrive without arable land. However, to be reliable in agriculture and industry, algae must be stable and consistent producers. With pyMS-Vis, researchers should be able to breed better varieties.

Published in *Analytical Chemistry*, this new tool enables the development of algae varieties to meet global needs for resilient crops. This ongoing research at the Danforth Center highlights the transformative potential of algae and moves us closer to a greener future where algae are an integral part of sustainable agriculture and bio-based industries.

"This new tool is a critical part of developing algae as a productive crop species that stably express beneficial traits such as increased yields of oil or high value products."

- Jim Umen, PhD
Joseph Varner Distinguished Investigator; Member, Enterprise Rent-a-Car Institute for Renewable Fuels

Strengthening Plant Immunity

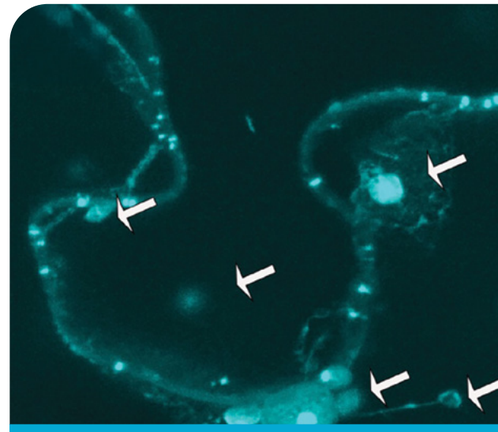
PIONEERING RESEARCH PAVES THE WAY FOR DEEPER UNDERSTANDING

In research published in *Molecular Plant-Microbe Interactions*, scientists in the lab of Danforth Center Principal Investigator **Tessa Burch-Smith, PhD**, have revealed key insights into how plants control cell-to-cell communication as part of their immune response. Their work focuses on plasmodesmata (PD)—tiny channels connecting plant cells—and how the accumulation of callose, a glucose polymer, affects the movement of molecules through these channels during infection.

When plants detect pathogens, they can either increase or decrease callose deposits around PD channels, thereby regulating the flow of information and nutrients. Plant defense hormones, like salicylic acid, play a critical role in this process, influencing PD proteins to strengthen the plant's defense.

Measuring callose deposits at PD in plants has emerged as a popular way to assess plant immune response. However, there was no standard for how these measurements should be made, making it challenging to compare findings across studies. Lead author **Dr. Amie Sankoh** and her undergraduate colleague **Joseph Adjei**, both of whom are Deaf and communicate through American Sign Language, compared three popular methods for detecting callose deposits. They found that aniline blue staining combined with fluorescent microscopy provided the most reliable results.

This refined method could help scientists better understand when and how callose levels can be manipulated to halt infection. By advancing knowledge of plant immune responses, this research sets the stage for developing crops that are more resilient to disease—a promising step toward a future of healthier, more sustainable agriculture.

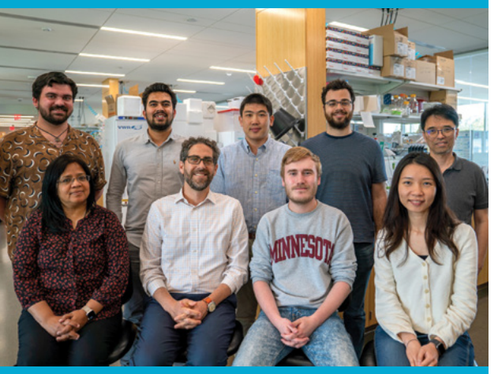


Aniline blue staining of fixed tissue combined with fluorescent microscopy provided the most reliable results for measuring callose deposits. (Image captured in Danforth Center Advanced Bioimaging Laboratory.)

The research was supported by a grant from the National Science Foundation—and by supporters like you. Donors to the Impact Fund are helping provide the Danforth Center's match for large national grants.

Danforth Center Principal Investigator Dr. Keith Slotkin (center) and team members. His lab, in collaboration with Dr. Veena Veena, director of the Plant Transformation Facility, have innovated a new molecular "scissors + glue" technique that is revolutionizing gene editing.

Members of the Slotkin lab presenting at Big Ideas 2.0 in 2019. Their idea won the competition, garnering a small grant, and launching the "big idea" that became TATSI.



Authors of the study in Nature. *Their groundbreaking new tool could significantly reduce the time and cost of crop improvement.*

Building the Future of Crop Breeding

DANFORTH CENTER UNLOCKS FASTER, COST-EFFECTIVE GENE EDITING

A recent breakthrough from the Danforth Center is transforming how we edit plant genomes to create crops better suited for sustainable agriculture. **Dr. Keith Slotkin's** lab, in collaboration with **Dr. Veena Veena**, director of the Danforth Center Plant Transformation Facility, have developed TATSI (Transposase-Assisted Target Site Integration) technology—a tool that uses the natural ability of transposable elements, often called "jumping genes," to insert custom DNA into plant genomes accurately. Published in the prestigious journal *Nature*, this groundbreaking advancement could significantly reduce the time and cost of crop improvement, leading to faster solutions for challenges like climate resilience and food security.

A critical bottleneck in modern crop improvement is the low frequency and error-prone integration of DNA into the plant genome. CRISPR/Cas technology functions as "molecular scissors," allowing scientists to make highly specific cuts in DNA. While effective at editing, it lacks an efficient way to insert new DNA at those cut sites. TATSI deploys transposable elements as "molecular glue" to precisely insert new genetic material. TATSI combines CRISPR's precision with the integrating ability of transposable elements, enabling an order-of-magnitude increase in the accuracy and frequency of DNA insertion.

This combined "scissors + glue" approach offers unprecedented control over plant genomes, allowing scientists to incorporate essential traits like virus resistance, improved nutritional content, and optimized oil composition more effectively than before. By reducing the time needed for these changes, TATSI provides a pathway for agricultural innovation that aligns with environmental sustainability.

The research on TATSI started in 2019 following the Danforth Center's event *Conversations: Big Ideas 2.0*, a competition in which a team from the Slotkin lab proposed harnessing the power of transposable elements for crop improvement. Often referred to as "junk DNA," transposable elements comprise over 70% of corn genome, for example. Using the enzyme called transposase encoded by certain transposable elements, the big idea was a new genome editing tool that could enable development of a wide variety of new traits faster, better, and cheaper. The Slotkin team won the competition and received seed money to initiate their research.

Over the last four years, TATSI technology has evolved from concept to practical application, enabling pre-commercial development of crops with enhanced traits to address global agricultural needs. The Slotkin lab garnered research funding from the National Science Foundation (NSF) and Bayer Crop Science. Further investment came from the Danforth Center Start-up Initiative's proof-of-concept fund.

"Born out of the Big Ideas 2.0 competition, this project changed the course of the research we're doing today and into the future," said Slotkin. "It is a real testament to the broader 'focus-on-impact' attitude of the Danforth Center."

"Born out of the Big Ideas 2.0 competition, TATSI changed the course of the research we're doing today and into the future. It is a testament to the broader 'focus-on-impact' attitude of the Danforth Center."

- R. Keith Slotkin, PhD
Danforth Center
Principal Investigator;
Professor of Biology,
U of MO - Columbia

NSF NobleReach FOUNDATION

ONE OF THE FIRST NSF/NOBLEREACH EMERGE PARTNERS

Earlier this year, the Slotkin lab's groundbreaking TATSI technology gained national recognition when it was chosen as an inaugural project of the NSF/NobleReach Emerge partnership. This program supports government-funded research in becoming market-ready.

This research was supported by NSF, Bayer Crop Science, and by Danforth Center donors to the Impact Fund, which supports the Danforth Center Start-up Initiative and Big Ideas.

Danforth Center team with partners from Ghana, Nigeria, Burkina Faso, Australia, and the US visiting the PBR cowpea field site in Nyankpala.

Farmers celebrating the release of pod borer resistant cowpea seeds this July in Nyankpala, northern Ghana. Ghana has joined Nigeria in adopting this improved crop.

BENEFITS OF PBR COWPEA

Reduced pesticide use
Better farmer health
Better ecosystem health
Less expense
Economic growth

Ghana Achieves Milestone

DANFORTH CENTER & PARTNERS CELEBRATE PBR COWPEA ADOPTION IN WEST AFRICA

In July 2024, Ghana marked a significant advancement in agricultural biotechnology with the commercial release of its first genetically modified crop: the pod borer resistant (PBR) cowpea. The Danforth Center **Institute for International Crop Improvement** (IICI) has played a pivotal role in the crop's approval and dissemination. This development promises to enhance food security and improve the lives of farmers across the nation.

A STAPLE, A CHALLENGE

Cowpea, widely known as black-eyed pea, serves as a critical protein source for more than 200 million people in sub-Saharan Africa, particularly in West Africa, where it holds a cherished place in daily life and culture. In this region, cowpea is affectionately referred to as simply "beans," reflecting its ubiquity in households and markets. Its versatility shines in a variety of beloved dishes, from savory *red-red* stew in Ghana to *akara* (bean fritters) and *moi moi* (bean pudding) in Nigeria. As a staple crop, cowpea not only provides essential nutrition but also plays a vital role in the region's economy, offering livelihood opportunities for millions of smallholder farmers.

However, the cultivation of cowpeas has been severely hindered by the pod borer pest (*Maruca vitrata*), which can devastate yields by boring into pods. Traditional methods to combat this pest— including a pesticide spraying regimen of 10x per season—have proven unhealthy, expensive, and inadequate, leading to substantial losses for farmers. Conventional breeding has not been able to produce a resistant variety. Ghana currently imports cowpeas from neighboring Niger, Mali, and Nigeria. Officials hope with the adoption of PBR cowpea that Ghanaian farmers can increase their production and become self-sufficient.

A COLLABORATIVE EFFORT

The journey to develop the PBR cowpea spanned over a decade and involved extensive research and testing. Partners in this project include the Danforth Center; African Agricultural Technology Foundation (AATF) in Kenya; Council for Scientific and Industrial Research - Savanna Agricultural Research Institute (CSIR-SARI) in Ghana; Commonwealth Scientific and Industrial Research (CSIRO) in Australia; Institute for Agricultural Research (IAR) in Nigeria; and the Institute for Environment and Agricultural Research (INERA) in Burkina Faso.

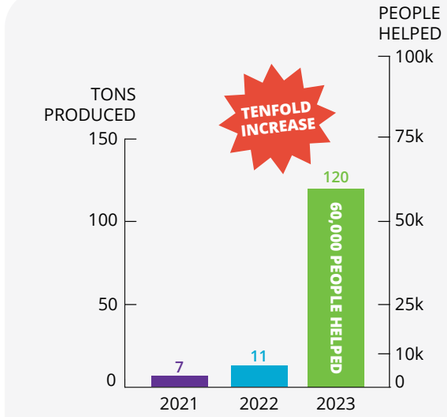
Before its commercial release in Ghana, PBR cowpea underwent additional rigorous regulatory assessments. The National Biosafety Authority (NBA) approved its environmental release and market placement, followed by the National Seed Council's endorsement for commercial cultivation. These approvals underscore the crop's safety and efficacy, paving the way for its integration into Ghana's agricultural system. PBR cowpea has already demonstrated its transformative potential in neighboring Nigeria, where it was first released in 2021 and where farmers quickly embraced the crop.

SUSTAINABLE SOLUTIONS

The Danforth Center's IICI is dedicated to a simple idea: that no matter where they live, farmers—and the people who depend on them—deserve better crops. "We're just scratching the surface of what's possible with cowpea," said **Don MacKenzie, PhD**, executive director of the IICI. "Future innovations must include varieties that can thrive in even more challenging climates, resist new pests and diseases, and deliver higher economic value to farming families. With our partnership, local institutions are leading new product development and seed distribution to ensure that these advancements will continue to transform the lives of smallholder farmers."

YOU CAN HELP

The Danforth Center IICI and partners have brought PBR cowpea to farmers' hands in Nigeria and Ghana—but the work doesn't stop there. If you care about improving food security in Africa, please consider a gift of support.



PBR cowpea seed quantity ramped up sharply in Nigeria last year to meet farmer demand. The Danforth Center is working to train in-country seed certification and production scientists to ensure supply.

Cowpeas in a confined field trial. The Danforth Center's Institute for International Crop Improvement is working to continue cowpea improvements—as well as improvements to other "orphan" crops like cassava, teff, and fonio.

Kong Wong, Chris Topp, and Mitchell Sellers inspect cover crops growing at a Danforth Center field site. Cover crops retain moisture, enrich soil, and prevent erosion.

Farming for the Future

EXPLORING HOW COVER CROPS ENHANCE SOIL HEALTH AND CROP YIELD

The Danforth Center's **SINC Center**, in collaboration with the University of Illinois Urbana-Champaign (UIUC), is launching a research initiative to explore the impact of cover crops on soil health and corn production to promote a more sustainable agriculture. Supported by a grant from the National Institute of Food and Agriculture, the project aims to provide farmers with tools to make informed decisions about cover crop selection, enhancing both yield and environmental benefits.

Danforth Center Principal Investigator **Chris Topp, PhD**, and his team including **Marcus Griffiths, PhD**, **Kong Wong, PhD**, and **Cody Bagnall, PhD**, and colleagues at UIUC will conduct multiyear field trials of 12 cover crop species. This research will use advanced technologies—such as root phenotyping, high-resolution sensing, and machine-learning-based agroecosystem modeling—to analyze the diversity in root traits among cover crops and understand how these traits affect soil health and cash crop performance. By integrating cover crops with corn production, the study will assess which species best improve soil quality, yield, and ecosystem health.

Cover crops offer numerous benefits, including reduced soil erosion, improved water retention, and enhanced soil fertility. Despite these advantages, cover crop adoption remains low in the US, partly due to limited understanding of which cover crops would most benefit cash crops to make them worth the investment in time and labor. The research findings will be used to develop tools to help farmers make decisions about when, where, and what type of cover crops to deploy. By filling this knowledge gap, the study supports broader adoption of cover cropping and more effective conservation practices.

Cover crops offer many ecosystem benefits, but only 5% of US farmers grow them. A new study hopes to provide more information for decision-makers to encourage adoption.

SINC Center

The Subterranean Influences on Nitrogen and Carbon (SINC) Center is dedicated to developing technology that will reduce the use of chemical nitrogen fertilizer without sacrificing crop yield.

"We are now in a position to make step changes in crop productivity by making plants more resilient to erratic climate pressures."

- Andrea Eveland, PhD
Danforth Center
Principal Investigator

Building Resilience from the Roots Up

DANFORTH CENTER TACKLES CROP STRESS FROM ACIDIC SOILS

Acidic soils, increasingly prevalent due to climate change, present a serious threat to global agriculture by weakening crop resilience and reducing yields, particularly in staple cereals like maize and sorghum. Acidification occurs as climate-driven increases in rainfall leach basic nutrients like calcium and magnesium from the soil, while heavy use of nitrogen fertilizers introduces additional acids. Together, these factors create conditions that lead to aluminum toxicity, damaging plant roots, limiting nutrient absorption, and increasing vulnerability to drought—all of which heighten food insecurity.

To address this urgent issue, a new collaborative research team from the US and Brazil received a grant from the National Science Foundation to tackle aluminum toxicity by uncovering connections between gene regulation and aluminum tolerance in maize and sorghum.

Danforth Center Principal Investigator **Andrea Eveland, PhD**, and her team will use advanced single-cell genomics and gene-editing technologies to study how gene networks in maize and sorghum respond to aluminum stress. This research is expected to reveal critical genetic elements that can be targeted to strengthen crop resilience to acidic soils, supporting more reliable food supplies worldwide. Eveland's team has recently implemented an in-house sorghum transformation and gene editing pipeline, which will be key to functionally validating genetic elements.

Beyond research, the project will provide hands-on training in cutting-edge genomic techniques for early-career scientists from the US and Brazil, strengthening global expertise in sustainable agriculture. By enhancing crop resilience to challenging soil conditions, this initiative supports a more sustainable and food-secure future.

Sorghum field in Africa. Acidic soils are common in tropical and sub-tropical regions, and they are worsening due to effects of climate change. New research aims to make crops more resilient.

Environment

Mosses in the lab of Principal Investigator Dr. Sona Pandey. A new grant supports her lab's study of spaghnum moss, which creates peatlands that store around 30% of Earth's carbon.

"Despite its clear importance to our environment, relatively little is known about the genetics and biology of sphagnum mosses."

- Sona Pandey, PhD
Danforth Center
Principal Investigator

Protecting Peatlands for the Planet

DANFORTH CENTER STUDIES SPHAGNUM MOSS TO PRESERVE GLOBAL CARBON STORES

A new research collaboration by scientists at the Danforth Center and HudsonAlpha Institute for Biotechnology is set to unlock the genetic mysteries of sphagnum moss—a key species in peatlands, which store an astounding 30% of Earth's terrestrial carbon. Although peat bogs occupy only 3% of the planet's land, their spongy, acidic environment stores twice as much carbon as all the world's forests combined. Preserving these peatlands is essential for combating climate change, as they prevent the carbon stored within plant material from being released into the atmosphere.

With a four-year National Science Foundation Enabling Discovery through GEnomics (EDGE) grant, the collaboration will create new genomic tools and study sphagnum's biology and adaptation to climate stress. Danforth Center Principal Investigator **Sona Pandey, PhD**, and her team will grow sphagnum moss under varied conditions, studying its life cycle and growth patterns, and developing genetic and genomic resources. They'll focus on two sphagnum species with differing water and decay needs, offering insights into how climate impacts the diverse roles these mosses play in peatland ecosystems.

At HudsonAlpha, Alex Harkess, PhD, and colleagues will produce a gene expression atlas for sphagnum and investigate how sex chromosomes affect its growth and resilience. This work will reveal genetic factors critical to peatland stability, offering essential knowledge for preserving these unique ecosystems.

By advancing understanding of sphagnum moss at the genetic level, this project provides strategies to protect peatlands, which are essential for climate regulation, biodiversity, and long-term carbon storage.

Innovation

Metablify is helping decode metabolites rapidly and at scale, opening the door to unprecedented discoveries in nutrition, medicine, and more.

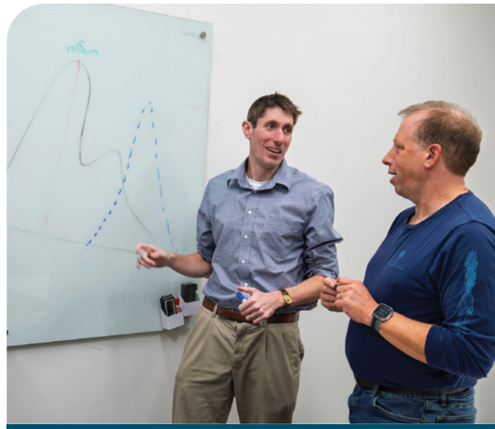
Unlocking the Secrets of Cellular Health

DANFORTH CENTER STARTUP METABLIFY ADVANCES METABOLITE DETECTION

The Danforth Center's Start-Up Initiative has fostered a new success with the launch of Metablify, a tech company pioneering a breakthrough in metabolite detection. Metabolites are the products of metabolism, such as glucose, amino acids, vitamins, etc. This new technology can detect and quantify previously undetectable metabolites—and do so rapidly and at scale across large sample populations. Metablify's advanced LC/MS platform can reveal valuable insights for personalized medicine, agriculture, and nutrition—such as identifying new plant-based compounds or health biomarkers.

Developed by Danforth scientists **Ivan Baxter, PhD**; **Allen Hubbard, PhD**; and **Louis Connelly**, Metablify was shaped by the **Danforth Center Start-Up Initiative**, which works to identify scientific discoveries with commercial potential. Through the Initiative, the team received IP and legal guidance, proof-of-concept funding, and mentorship, and even initial investment by the Danforth Technology Company. This ecosystem enables Danforth scientists to transform lab research into impactful technologies. Metablify also received early seed funding in 2023 after winning the Danforth Center's Big Ideas 3.0 competition—a *Shark Tank*-inspired event where scientists pitch world-changing projects.

"The Danforth Center Start-Up Initiative has provided us with unparalleled support. The resources, the access to experienced entrepreneurs, feedback, and mentoring, it helped us translate this breakthrough technology at breakneck speed to the marketplace," said Hubbard.



Drs. Allen Hubbard (left) and Ivan Baxter, along with Louis Connelly, are the co-founders of Metablify, a Danforth Center spinout with new tech that detects previously invisible metabolites.

Start-Up Initiative

By nurturing startups like Metablify, the Danforth Center Start-Up Initiative accelerates science from the lab to the market, where it can have the greatest impact, driving positive global change in health, agriculture, and sustainability.

AgTech Corn Camp brought together students from urban and rural communities to study the technology and science used to improve maize plants.

Empowering Youth in Agriculture

AGTECH CORN CAMP CONNECTS YOUTH WITH PLANT SCIENCE AND INNOVATION

At the third annual AgTech Corn Camp this summer, middle and high school students from rural and urban Illinois came together for an immersive plant science experience led by the Danforth Center, the Jackie Joyner-Kersee Foundation, and the University of Illinois Urbana-Champaign. The three-week camp introduced youth to cutting-edge agriculture technology, including drones, robotics, and environmental monitoring tools like the Danforth-developed PheNode®.

Throughout the program, students engaged in hands-on studies comparing genetically modified (GM) and non-GM corn, conducting experiments on plant height, pest resistance, and climate resilience. Field trips, urban farming activities, and team-based challenges fostered a collaborative environment where students learned from one another, gaining new insights and a deeper appreciation for agriculture's role in food security. The camp culminated with students presenting their findings to scientists at the Danforth Center.

"Many youth participants entered the program with little knowledge of corn or scientific research," said lead instructor **Zachary Stafford**, Urban STEAM and Agriculture Educator at the Danforth Center, "But through hard work and dedication, they gained confidence and produced impressive poster presentations showcasing their data."

By bridging urban and rural perspectives through agriculture education, the AgTech Corn Camp inspires the next generation of leaders prepared to tackle global challenges in food security and environmental resilience.

The three-week AgTech Corn Camp culminated with a poster presentation of students' findings, where Danforth Center scientists like Dr. Katie Murphy (center) engaged with their research.

AgTech Corn Camp is supported by the USDA's National Institute of Food and Agriculture. Donors to the Danforth Center Impact Fund support STEAM enrichment programs throughout the St. Louis region.

The 24th Research Experience for Undergraduates program this summer at the Danforth Center was one of the largest in the nation: 19 interns from across the country pursued plant science.

Inspiring the Next Generation of Scientists

REU INTERNS LEARN HANDS-ON RESEARCH FOR GLOBAL CHALLENGES

The Danforth Center's 24th annual Research Experience for Undergraduates (REU) program welcomed 19 interns in the summer of 2024, making it one of the largest cohorts in the country. Funded by the National Science Foundation, and co-directed by Danforth Center Principal Investigators **Tessa Burch-Smith, PhD**, and **Kirk Czymmek, PhD**, the program provides undergraduates with immersive experiences in plant science, preparing them to address global challenges like food security, climate change, and sustainable agriculture.

The competitive program attracts students from across the country, offering exposure to cutting-edge research and technology. This year, the Danforth Center was proud to welcome a Deaf participant, **MJ Jones**, from the National Technical Institute for the Deaf. Interns work alongside Danforth scientists, gaining hands-on experience in labs such as **Dr. Allison Miller's**, where **Morgan Murff** of Purdue University studied root-and-shoot phenotypes in perennial grains. Others learned advanced data visualization, coding in R, and techniques tied to sustainable agriculture and environmental resilience.

Students also valued the community-building and mentorship aspects of the program. **Ethan Richardson** from the University of Pittsburgh noted: "I learned that it takes more than intellect to be an accomplished scientist. It's what you do beyond research that makes you stand out."

Through the REU program, students gain practical skills, mentorship, and inspiration to become future leaders in plant science. By investing in these young scientists, the Danforth Center hopes to inspire and empower the next generation of scientists to tackle the world's most pressing challenges.

REU interns at the Danforth Center Field Research Site. Interns experience cutting-edge research in both lab and field, as well as networking and mentoring opportunities.

"This internship was very helpful for understanding the possibilities for careers in plant science. I want to pursue a graduate-level degree and hope to do plant phenotype research."

- Daniela Ceballos, intern from University of the Pacific

The Young Friends' Grow Challenge / Party with the Plants 2024 blew fundraising goals out of the water: raising more than $130,000 for the Impact Fund.

"While our financial success is obvious, getting new minds and new hearts through these doors to see what the Danforth Center is up to is just as impactful."

- Matt Plummer, chair, Danforth Center Young Friends

SEE THE 2024 PARTY WITH THE PLANTS HIGHLIGHTS REEL:

A Botanical Bash

CELEBRATING SCIENCE AT PARTY WITH THE PLANTS 2024

On paper, a plant science research institute might not seem like the best place for a party. Yet on the night of September 27, the Danforth Center treated guests to a unique, fun-filled, and entertaining night in support of a meaningful cause at the sixth Party with the Plants.

This year, the Danforth Center Young Friends set a goal to raise more than $100,000, and as the evening's master of ceremonies, Blake Whiteside, told the crowd as the event kicked off: "I have a feeling we're going to be able to make that happen!" The event turned out to be the most successful Party with the Plants yet, generating more than $130,000 as part of the Grow Challenge® Week of Giving to help fund early-stage research projects, training for young scientists, and local STEM education opportunities.

SEE. HEAR. TASTE. LEARN. WIN.

Around every corner at Party with the Plants, there was something new to experience. Along with a wide array of food and drinks from local vendors, there were also games and raffles (where lucky guests could win anything from a bucketful of booze to a 2-night stay in a private lake house) and a host of skilled performers. Local band New Crime Theatre played era-spanning cover songs throughout the night. Magician Josh Weidner and juggler Ryan Himmel offered wandering entertainment. Additional fun and games of chance included a plant pull/wine pull, booze ring toss, and artistic face and body painting. And while many events can boast live performers and great refreshments, fewer can tout disease-infected plants and *Chlamydomonas reinhardtii*.

Six different science stations offered guests the opportunity to meet with Danforth Center scientists and learn firsthand about their work through interactive displays. This included one of the night's most popular attractions: a "piano" where guests could make music by touching different fruits and vegetables, thanks to their ability to conduct electricity.

"It's very inspiring to see this generation's talent, creativity, and imagination," said Liz Beeks, director of accounting at Christner Architects. "I'm learning just being here."

READY, SET, GROW!

Since its inception in 2017, Party with the Plants has been the signature event of the Danforth Center's Young Friends—a community of professionals, aged 40 and younger, who champion the Center's mission. It is also the culmination of the Grow Challenge® Week of Giving, an online, peer-to-peer fundraiser in support of the Center's Impact Fund.

THANK YOU

PARTY CO-CHAIRS: Matt Plummer, chair; Erin Jones, vice-chair
EMCEE: Blake Whiteside
SCIENTIST ORGANIZERS: Kerri Gilbert and Katie Murphy
SCIENTISTS: Luke Brewer, Autumn Brown, Keith Duncan, Kristen Edgeworth, Patricia Gallardo, Vanessica Jawahir, Johnny Johns, Divya Kanna, Ray Kannenberg, Stefanie King, Trey Klaas, Clara Lebow, David Li, Dan Lin, Neeta Lohani, Doris McCarter, Meter Nusinow, Dom Pham, Seth Polydore, Nushrat Rashid, Rhiannon Vargas, Emma Wozniak



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Father and son, Dennis and Matt Plummer at Toast to Innovation in 2023.

Cultivating Solutions

DENNIS AND MATT PLUMMER'S SHARED FAMILY PASSION FOR PLANT SCIENCE

For Dennis and Matt Plummer, supporting the Danforth Center is a family affair, driven by shared values of innovation, philanthropy, and a deep belief in the Center's mission to *improve the human condition through plant science.* Their connection began with Dennis, an agtech investor and co-founder of CoverCress Inc., who discovered the Danforth Center through the Ag Innovation Showcase. Inspired by its focus on solving challenges that private industry couldn't, Dennis has been an active supporter for more than a decade, serving on the Danforth Leadership Council Executive Committee and as a Danforth Society member alongside his wife, Carolyn.

Matt's journey began in 2014 when he returned to St. Louis to work in the startup space after competing on the US Speedskating Team. Now COO of Saluna, Inc., Matt chairs the Danforth Center Young Friends Committee, driving the group's growth and leading the record-breaking 2024 Grow Challenge fundraising campaign. Like his father, Matt is committed to the Center's vision. "It was not hard for me to make a decision to contribute financially," he says. "The Danforth Center's mission touches every single person on this planet."

For the Plummers, the Danforth Center embodies their belief in creating a better future. "I couldn't be happier that Matt is involved," says Dennis. "The best conversations I have are with the people at the Danforth Center—they're solving problems that matter." Together, Dennis and Matt exemplify the power of generational commitment to advancing science for the greater good.

Matt Plummer delivering remarks at Party with the Plants 2024. He was co-chair of the Danforth Center Young Friends event, which raised more than $130,000 for the Impact Fund.

"I'm all-in on the Danforth Center's mission. It's better for the environment, better for the food system, better for the human condition."

- Dennis Plummer, co-founder of CoverCress and Danforth Center supporter

During a recent lunch and learn, docents, including retired IT director Robbye Frank, learned the basics of plant transformation from Danforth Center Principal Investigator Dr. Veena Veena (left).

Docents: Champions of Plant Science

The Danforth Center's docent program is integral to sharing its mission with the wider world. This dedicated group of volunteer educators, often retired scientists, academics, or entrepreneurs, leads engaging tours for community groups, professionals, and potential donors. Docents play a pivotal role in promoting the Center's work, its global impact, and its contributions to St. Louis as a hub for plant science innovation.

Docents are extensively trained, combining their passion for education with deep knowledge of the Center's cutting-edge research. Beyond their technical expertise, docents excel in communication and tailoring their presentations to diverse audiences. Through ongoing training and collaboration with the Center's scientists, they ensure each tour highlights the Center's transformative research addressing global challenges like food security and climate change.

As one docent shares, "It's rewarding to see visitors leave with a deeper understanding of the Center's work and the impact plant science can have on our world." Through their volunteer efforts, Danforth Center docents are more than guides—they are ambassadors of science, fostering connections that inspire support for the Center's mission.

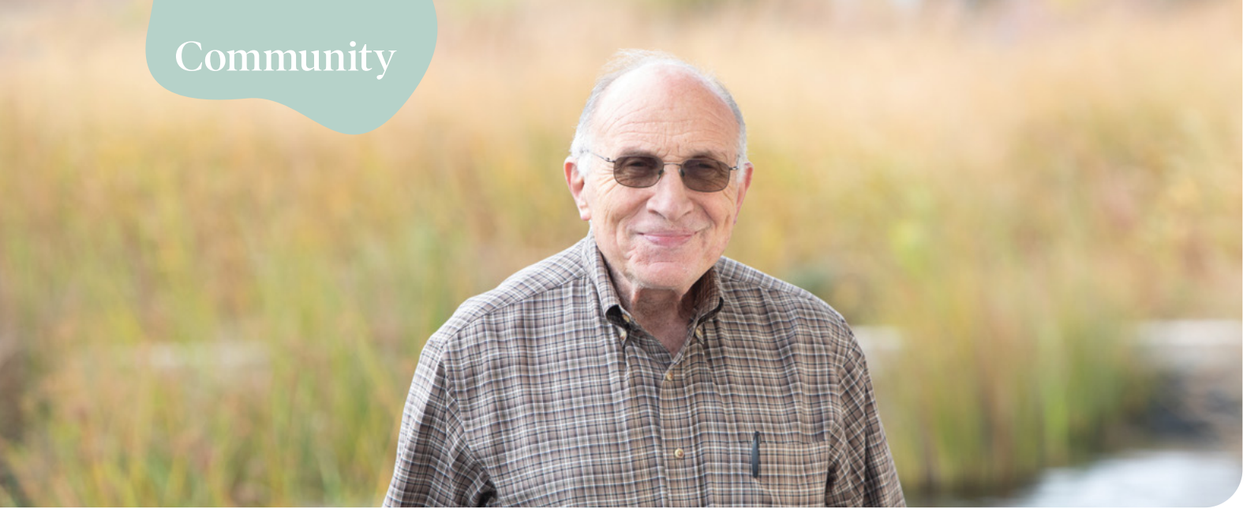
THANK YOU TO OUR 2024 DOCENTS

Azmy Azmy
Molly Cline, PhD
Joan Culver
Steve Epner
Martha Ferdinand
Glenn Fischer
Robbye Frank
Gary Mindel
Rashmi Nair, PhD
Fred Perlak, PhD
Matthew Rubin, PhD
Rich Schumacher, PhD
Austin Tao
Ted Vehige, PE
James R. von der Heydt

Professor of entrepreneurship Steve Epner leading a tour. Docents lead tours of the Danforth Center to help increase public awareness. Epner's motivation: "the impact the Center is having on the world."

Retired plant scientist Dr. Molly Cline presenting at a Danforth Center event. Cline worked for 35 plus years in commercial agriculture. Dr. Cline believes deeply in the "vision created by Dr. Bill Danforth" and enjoys staying up to date on plant science as a docent.

Industrial engineer Azmy Azmy started his career with Ralston Purina and has now "come full circle" by volunteering with the Danforth Center. His motivation: "I am fascinated by plant science research."



Dr. Needleman in the Danforth Center prairie on the occasion of the 2022 WHD Legacy Society Luncheon.

Danforth Center President Jim Carrington, Sima and Phil Needleman, and Danforth Center Founding Chair Dr. Bill Danforth. Phil was presented with the Danforth Distinguished Service Award in 2011 in gratitude for his work as interim director of the Center.

To inquire about special tribute giving, please contact the Development team at 314.587.1234 or **development@danforthcenter.org**.

In Memoriam: Former Interim President Dr. Philip Needleman

HONORING A LEGACY OF SCIENTIFIC RIGOR AND COMPASSION

The Danforth Center community mourns the loss earlier this year of Dr. Philip Needleman, a brilliant scientist, visionary leader, and dedicated board member, who passed away on March 25, 2024, at the age of 85. Renowned for his groundbreaking research as a biochemist and pharmacologist, Dr. Needleman's work led to the development of Celebrex, a COX-2 inhibitor that revolutionized the treatment of arthritis and chronic pain, improving the lives of millions.

In 2005, Dr. Needleman brought his remarkable talents to the Danforth Center when he joined the Board of Directors at the invitation of Dr. William Danforth. He served nearly two decades as a trusted advisor, interim president, and passionate advocate for plant science. Dr. Needleman's scientific acumen, relentless curiosity, and insistence on data-driven decisions elevated the Center's research and mission.

Dr. Needleman was a beloved mentor and friend, offering guidance and encouragement to scientists and staff alike. His steadfast belief in the transformative power of research inspired countless innovations. One of his most lasting contributions was his role in the creation of the **Subterranean Influences on Nitrogen and Carbon (SINC) Center**, dedicated to addressing the environmental challenges posed by synthetic nitrogen fertilizers. As President Jim Carrington reflected, "Phil cared deeply about solving big problems in the world, and he supported us in doing so."

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 Oct. 31, 2024. To make a tribute, visit **danforthcenter.org/donate**.*

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