Rooted in Impact

2024 ANNUAL REPORT



DONALD DANFORTH PLANT SCIENCE CENTER

Rooted in Impact

At the Donald Danforth Plant Science Center, our roots run deep—in science, innovation, and community. In 2024, we made strides toward a more sustainable future, from feeding the world to healing the planet and empowering the next generation. Guided by our mission and driven by discovery, we continue to transform challenges into opportunities, creating lasting impact through collaboration and dedication. With your support, we are shaping a healthier, more resilient world.

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Letter from the Chair

The Danforth Center is deeply rooted in impact something I have witnessed firsthand in my inaugural year as board chair. In 2024, our influence was evident through many incredible achievements: the successful launch of improved cowpeas in Ghana; bold steps to heal the planet through work on mosses, perennials, and cover crops; and new momentum in innovation—from promising technologies like FieldDock to startups like Metablify that are shaping the future of agtech.

As we build on this progress, I want to recognize my predecessor, Todd Schnuck, for his years of dedicated service. Under his steady leadership, the Center expanded its reach, deepened its impact, and entered a period of transformative growth. I'm grateful for his continued partnership.

We're also preparing for a significant moment in our journey. Jim Carrington, our president since 2011, has announced plans to step back in 2025. Jim has led with strategic vision, scientific rigor, and unwavering commitment to the mission. His leadership has shaped the Danforth Center in extraordinary ways.

As we plan for what's next, I'm filled with inspiration and gratitude—for our dedicated leadership, and for the generous community of supporters who make this work possible. Together, we are advancing solutions that matter—to our region, to our planet, and to future generations.



Penny Pennington

Letter from the President

As an institution focused on scientific discovery, the Danforth Center is an *exciting* place. As an institution committed to having impact, the Danforth Center is a *meaningful* place. Exciting discoveries lay the groundwork for meaningful impact, but only if time, resources, and hard work are invested. Indeed, impact is rooted in discovery and investment.

In 2024, Danforth Center teams made scientific advances that lay the foundation for improved agricultural traits, increased productivity of international staple crops like cassava and teff, and more sustainable farming systems. Impact in global food and agriculture was realized, for example, through delivery of improved cowpea varieties in expanded West African geographies. Impact locally was realized through startup company creation based on Center technology and growth of training programs for the next-generation scientists.

I came to the Center in 2011 because of the opportunity to achieve meaningful impact from scientific discovery—to use plant science to improve the human condition. I've been honored to serve alongside exceptional scientists, leaders, team members, and supporters to turn that opportunity into reality, and to all I give my sincere thanks.



James C. Carrington

Seeds of Security

The fight against hunger begins with farmers—and with the science that supports them. Around the world, smallholder farmers face rising challenges with limited tools. At the Danforth Center, we believe everyone deserves access to nutritious food, and every farmer deserves crops that thrive. That's why our scientists work hand-in-hand with partners to develop resilient, high-performing crops that meet local needs, strengthen communities, and help build a more food-secure future.

"We're just scratching the surface of what's possible with cowpea."

- <u>Don MacKenzie, PhD</u>, IICI executive director cowpea

HARVESTING HOPE IN WEST AFRICA West African farmer winnowing cowpeas. Donor support helped make history in July 2024, when Ghana released its first genetically modified crop—pod borer resistant cowpea to farmers there. This breakthrough crop reduces pesticide use, boosts yields, and is already strengthening food security in nearby Nigeria. The Danforth Center's Institute for International Crop Improvement played a pivotal role in regulatory approval and seed readiness—and is co-leading a partnership to advance more improvements. Farmers are already celebrating—and the ripple effects are just beginning. Read more>>

teff

TRANSFORMING TEFF FOR TOMORROW With donor support to the Impact Fund, the Danforth Center's **Dr. Getu Duguma** advanced gene editing in teff—Ethiopia's most important crop, which feeds more than 80 million people daily. Now a \$4.9M grant from the <u>Gates Foundation</u> will scale that work. Partnering with EIAR, Ethiopia's top ag research institute, the Duguma lab aims to deliver lodging-resistant, semi-dwarf teff varieties that ease labor demands and boost yields for smallholder farmers. **Read more>>**

CASSAVA IS LIFE.

Across sub-Saharan Africa, this hardy root crop is a dietary staple and economic lifeline for more than 500 million people. It grows in poor soils, tolerates drought, and stores underground for months—qualities that make it critical to food security. But cassava is vulnerable to devastating diseases, which can rot the root before harvest, leaving farmers with nothing. Danforth Center scientists led by **Dr. Nigel Taylor** have developed a virusresistant cassava, a major step forward in strengthening food systems for African families and communities.

WEST TEXAS IS DRY—AND GETTING DRIER. That's why farmers are turning to sorghum, a resilient crop that uses 30% less water than corn and thrives where other crops falter. Danforth Center scientists, like **Dr. Nadia Shakoor** and **Dr. Ivan Baxter**, are working alongside growers and partners to unlock sorghum's full potential—from improving seed traits to expanding its role in sustainable feed and biofuels. With deep roots and climatesmart qualities, sorghum is helping farmers adapt, conserve resources, and protect their land for the next generation. **Read more>>**

sorghum

cassava

This year, three new efforts are expanding cassava's potential. In Uganda, a global partnership launched the Cassava Whitefly Control Project to protect yields from a pest that spreads disease and devastates crops. In Rwanda, a new five-year agricultural biotechnology initiative is scaling improved cassava varieties to reach more than 500,000 farm households. And in St. Louis, the Center welcomed Rwanda's top economic official, strengthening connections between researchers and policymakers committed to transforming cassava from a vulnerable staple into a sustainable solution for Africa's future. <u>Read more >></u>

Read more>> Read more>>

Roots of Renewal

Imagine crops that not only feed us, but also restore the land. Crops that require fewer inputs, protect soil and water, and contribute to healthier ecosystems. At the Danforth Center, scientists are rethinking what agriculture can do—for people and for the planet. By exploring the potential of deep-rooted perennials, resilient cereals, and beneficial plant-microbe interactions, we are working to build a future where farming sustains the earth as much as it nourishes us.

DEEP ROOTS, LASTING IMPACT At the Danforth Center's Field Research Site, the lab of **Dr. Allison Miller** is leading groundbreaking studies on perennial grain crops that can rebuild soil, reduce inputs, and support more sustainable agriculture. From innovative root imaging tools to field trials of Kernza[®], sainfoin, and silflower,

trials of Kernza[®], sainfoin, and silflower, researchers are exploring how these deep-rooted plants perform across seasons and landscapes. Their findings could transform farming—shifting from short-term productivity to long-term resilience for people, the land, and future generations.

Read more>>

THE ROOTS OF CARBON STORAGE Sphagnum moss plays a starring role in one of the planet's most powerful natural carbon storage systems: peatlands. With a new NSF EDGE grant in 2024, Danforth Center scientists led by **Dr. Sona Pandey** are building the genetic tools needed to study this vital plant and its impact on global ecosystems. By learning how sphagnum grows, decays, and adapts, researchers aim to protect peatlands fragile habitats that cover just 3% of Earth's land but store more carbon than all the world's forests combined. **Read more>>**

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STRONGER ROOTS FOR TOUGHER SOILS Acidic soils—common across the tropics threaten global food security by damaging crop roots and reducing yields. A new US-Brazil collaboration, including the lab of Danforth Center scientist **Dr. Andrea Eveland**, is tackling this challenge head-on. With NSF support, researchers are using advanced genomics and gene editing to uncover how maize and sorghum can better withstand aluminum toxicity. This work will help develop more resilient cereal crops, strengthening food systems in regions where agriculture is most at risk. **Read more>>** **00t**

TEAMING UP UNDERGROUND The Danforth Center has partnered with Enhanced Nature to improve the cultivation of arbuscular mycorrhizal fungi (AMF)—microscopic soil fungi that help crops absorb nutrients and tolerate stress. Led by **Dr. Armando Bravo**, this collaboration aims to unlock the full potential of AMF, making it easier to scale and integrate into sustainable farming systems. By advancing both basic science and production methods, the project brings us closer to agricultural practices that benefit crops, soil, and the planet. Read more>>

CRACKING THE CODE

How do plants share signals—and stop invaders? New research from the lab of Dr. Tessa Burch-Smith at the Danforth Center extends understanding of how callose, a carbohydrate polymer, controls the tiny intercellular pores that plants use to communicate. By identifying the most reliable methods to measure callose during immune responses, the team is laying the groundwork for deeper understanding of plant defense. This foundational work could help scientists develop crops that are better equipped to resist disease and protect yields. Read more>>

SMARTER COVER CROPS

With support from NIFA, researchers from the Danforth Center's **Subterranean Influences on Nitrogen and Carbon (SINC) Center** led by **Dr. Chris Topp** are teaming up with the University of Illinois to study how cover crop root systems affect soil health and corn production. By combining root phenotyping, field trials, and advanced modeling, the team aims to give farmers better tools for choosing the right cover crops—boosting yields, protecting soils, and expanding sustainable practices across Midwestern agricultural landscapes. **Read more>>**



Grow our community.

Building Futures

Innovation thrives where ideas take root—and people grow together. At the Danforth Center, we believe discovery is just the beginning. By fostering a culture of entrepreneurship, bold thinking, and inclusive opportunity, we're building a community where breakthroughs become solutions, and students become the next generation of scientific leaders. Through handson experiences and real-world impact, we connect education, research, and industry to power progress. **CUT, PASTE, TRANSFORM** Born from the Danforth Center's 2019 Big Ideas competition, a breakthrough genome editing tool will change how scientists improve crops. The Slotkin Lab's TATSI technology-published in Nature in 2024—combines CRISPR "scissors" with a transposase "glue" to insert beneficial traits into plant DNA faster and with greater precision. By streamlining how traits are engineered into crops, this tool holds enormous potential for advancing sustainable agriculture—from disease resistance to enhanced nutritionmore efficiently and affordably than ever before. <u>Read more>></u>

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FieldDock

FARMING SMARTER, NOT HARDER Meet FieldDock: a solar-powered, sensorintegrated smart-farm system designed at the Danforth Center to revolutionize precision agriculture. Developed by Dr. Nadia Shakoor and collaborators, FieldDock collects and analyzes realtime crop, soil, and environmental data using wireless sensors, drones, and edge computing. Built in partnership with Agrela Ecosystems and the Taylor Geospatial Institute, this powerful tool debuted in 2024 and is already shaping the future of sustainable farming-where better decisions begin with better data, right from the field. Read more>>

STARTUP TO WATCH

Launched in 2024 through the Danforth Center Startup Initiative, Metablify is redefining what's possible in metabolomics. With a breakthrough platform to detect previously invisible compoundsdeveloped by the **Baxter Lab**—the startup won the 2023 Big Ideas competition, secured early funding from Arch Grants and QRM Capital, and was named a "Startup to Watch" by *St. Louis INNO*. Backed by strong science and entrepreneurial support, Metablify is opening new frontiers in precision medicine, nutrition, and plant-based discovery. Read more>>

PLANTING SEEDS OF SCIENTIFIC LEADERSHIP In its 24th year, the Danforth Center's REU program welcomed one of the largest cohorts in the nation in 2024—19 undergraduate interns from across the US—for a hands-on summer in plant science. Funded by the NSF, the program equips students with cuttingedge research skills, mentorship, and realworld perspective on global challenges like food security and sustainability. Whether in the lab or field, students leave inspired and empowered to become the next generation of scientific innovators and problem-solvers. **Read more>>**

> A PIPELINE FOR TOMORROW'S TALENT In 2024, St. Louis Community College opted to extend its lease at BRDG Park, reinforcing its long-standing commitment to training students in the heart of the Danforth Center innovation ecosystem. STLCC's Center for Plant and Life Sciences prepares students for well-paying careers in biotech and agtech. Their continued presence affirms the value of proximity to world-class science and strengthens the pipeline of skilled talent essential to growing St. Louis's innovation economy.

Read more>>

GROWING YOUNG AGTECH MINDS The third annual AgTech Corn Camp empowered middle and high school students from rural and urban Illinois with hands-on experience in plant science and agricultural technology. Hosted by the Danforth Center and partners, the three-week program introduced youth to tools like drones and the <u>PheNode</u>, while exploring corn genetics, sustainability, and food security. By connecting students across communities and sparking curiosity through real-world science, the camp is cultivating the next generation of innovators in agriculture. <u>Read more>></u>

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Reimagining Agriculture

ALLISON

TED[×]StLouis

Danforth Center Principal Investigator **Dr. Allison Miller** took to the TEDxStLouis stage in May to discuss "Reimagining Agriculture." She highlighted the potential of perennial crops to enhance resilience in agriculture and help build a sustainable future. **Read more>>**



The Danforth Center hosted the <u>St. Louis Civic</u> <u>Pride Explorer Series</u> in August, highlighting community collaboration and plant science innovation to address global challenges like food security and sustainability. **Watch the video>>**

Supporters

Community Engagement and Contributions

Our donors and supporters are the lifeblood of the Danforth Center's mission. They champion our vision, amplify our impact, and help us grow. Together, we build a vibrant community dedicated to advancing plant science for a healthier, more sustainable future.

Docents

The Danforth Center is grateful to our highly trained docents who led tours and increased public awareness of the Danforth Center in 2024.

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

At the Missouri Botanical Garden's Kernels of Culture exhibit, Danforth Center scientist **Dr. Katie Murphy** joined other maize experts to explore how this vital crop fuels agriculture, shapes the economy, influences culture, and drives scientific innovation. **Watch the video>>** The Danforth Center Café earned a prestigious four-star certification from the <u>Green Dining</u> <u>Alliance</u>, recognized for its efforts in water and energy conservation. Inspired by feedback, the team is now striving for a fifth star with sustainable dining initiatives. **Read more**>>

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Friends Committee

The Danforth Center is grateful to the Friends Committee, which promotes the work of the Center and grows membership and financial support through annual giving.

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"The Friends Committee is dedicated to sharing the Danforth Center mission with the community. This year, we hosted Conversations: Nourishing Our Future, focused on food security in Africa. We're proud to report that 2024 was a record year for annual giving, both in the number of donors and dollars raised. Thank you!"

- Timothy Halls, Chair, Friends Committee



Public Events

The Danforth Center offers free public events to provide the opportunity to learn about the work of the Center, our partners, and be inspired. View recordings on our website.

CONVERSATIONS: NOURISHING OUR FUTURE | MARCH 27

Hosted by the Friends Committee, Nourishing Our Future explored the critical role of plant science in global food security. The discussion centered on cassava, a staple crop in Africa, and the Virus Resistant Cassava for Africa (VIRCA) project. Moderator Dr. Benjamin Ola Akande, chair of the Danforth Leadership Council, who grew up in Nigeria, opened the event with personal remarks about the centrality of cassava to culture in much of Africa. Panelists, including **<u>Dr. Nigel Taylor</u>** and **Dr. Douglas Miano**, highlighted the project's potential to empower farmers and boost economic security. Dr. Saharah Moon Chapotin emphasized agriculture's global impact, stressing the need for innovation to enhance food systems worldwide. Read more>>

SEEDS OF CHANGE: LEADERSHIP AND PURPOSE | OCTOBER 29

The Danforth Leadership Council hosted Seeds of Change: *Success, Leadership, and Finding Purpose* this fall with **Penny Pennington**, managing partner of Edward Jones and chair of the Danforth Center Board of Directors, as the featured speaker. She emphasized the importance of "falling in love with a problem" to drive positive change. A panel discussion followed, featuring plant scientist Dr. Allison Miller, artist Christine Corday, and Kemper Art Museum curator **Dr. Meredith Malone**. The speakers shared their passion for addressing global challenges, highlighting the power of purpose-driven leadership and crossdisciplinary collaboration.

Read more>>

Media sponsorship by:





Dr. Benjamin Akande, Dr. Douglas Miano, Dr. Nigel Taylor, and Dr. Saharah Moon Chapotin. Conversations 2024 addressed cassava food security.



Penny Pennington on the worldchanging power of "falling in love with a problem" at Seeds of Change 2024. The event included a panel as well.

Danforth Leadership Council

The Danforth Center is grateful to the Danforth Leadership Council, a group of prominent St. Louisans and corporate representatives interested in the role of plant science in the future of the region.

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"The Danforth Leadership Council continues to expand our community, now welcoming members through individual invitation and corporate partnership. This year, we hosted *Seeds* of Change, an inspiring event where leaders from diverse fields shared insights on leadership, purpose, and making a positive impact. Thank you to all who support our mission.."

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-Benjamin Ola Akande, PhD Chair, Danforth Leadership Council

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The Danforth Center is grateful to the Young Friends, a group of professionals, 40 and under, who raise friends and funds to advance the mission of the Danforth Center.

2024 STEERING COMMITTEE

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"As I wrap up my two years as chair, I'm proud that the Danforth Center Young Friends is a leading young professionals' group in the region. Our signature event, Party with the Plants, raised over \$130,000 this year, reflecting the dedication and passion of our members in supporting plant science and STEM education"

on through plant scien

- Matt Plummer Chair, Young Friends **Courtesy Ladue News**

Grow Challenge®

The annual Grow Challenge Week of Giving online donation campaign culminates in the ticketed fundraiser Party with the Plants.

PARTY WITH THE PLANTS: A BOTANICAL BASH | SEPTEMBER 27

The Danforth Center's Young Friends hosted the sixth annual Party with the Plants, raising over \$130,000 through the Grow Challenge[®] to support early-stage research, STEM education, and young scientist training. The evening featured live music from New Crime Theatre, performances by magician Josh Weidner and juggler Ryan Himmel, interactive science stations organized by Drs. Katie Murphy and Kerri Gilbert — including a popular produce-powered piano-and a variety of games and raffles. Cochaired by Matt Plummer and Erin Jones, the event exemplified the Young Friends' commitment to advancing plant science and community engagement.

Read more>>

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Young Friends Steering Committee



The fruit-and-veggie piano was one of the popular science stations at Party with the Plants. The annual fundraiser gathered more than \$130,000 for the Impact Fund.

Gold



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The Danforth Center is grateful to donors who have planned for future needs of the Center by designating a gift in their will or estate plans. To learn more about making a gift through your will or estate, visit legacy.danforthcenter.org.

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† Deceased

Founding members of the society include Dr. William H. Danforth¹, Mary¹ and Oliver¹ M. Langenberg, and Mrs. Jefferson L. Miller¹.

Legacy Advisory Council

The Danforth Center is grateful to these legal and financial planning experts who provide assistance with the promotion of planned gifts to the Center.

Kenneth J. Bower, Clayton Financial Group Stephen B. Daiker, Harrison LLP Matthew G. Perlow, Husch Blackwell LLP Bud Strong, Husch Blackwell LLP

In Memoriam: Dr. Phil Needleman

Dr. Phil Needleman (1939–2024) was a pioneering scientist whose discoveries transformed medicine, including the development of Celebrex and other drugs. As a long-time Danforth Center board member and interim president, he championed scientific rigor, mentorship, and innovative problem-solving, leaving a profound legacy of leadership and impact.

Tributes

The Danforth Center is grateful to donors who chose to honor or memorialize their friends, loved ones, and colleagues with a gift to the Center in 2024. To make a tribute, visit danforthcenter.org/donate.

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To learn about each scientist's research area, scan the code below.



Selected Financial Data Fiscal Year Ended December 31, 2024

UNRESTRICTED OPERATING SUPPORT AND REVENUE¹

(Unaudited)

2024 Unrestricted (Operating
	Other l <i>6.4%</i>
Core Facility	1
Fees 4.6%	

Donor Support 44.6%

2024 Operating Expenses²

Development and Public Relations 5.7%

Administration 14.1%

¹ Cash basis and excludes income(loss) on Endowment investments and reimbursement for subcontracted research. ² Excludes subcontracted research on Grants and Contracts and Depreciation Expense.

Research Grants and Contracts			\$23,574	44.4%
Donor Support			\$23,661	44.6%
Unrestricted Donor Gifts	\$2,254	4.3%		
Gifts Released from Restriction	\$1,290	2.4%		
Endowment Draw	\$20,117	37.9%		
Core Facility Fees			\$2,448	4.6%
Other Income			\$3,409	6.4%
Total Operating Revenues			\$53,091	100%
OPERATING EXPENSES ²			Amount	Expense %
Total Research/Science/Innovation			\$38,369	80.2%
Administration			\$6,739	14.1%
Development and Public Relations			\$2,718	5.7%
Total Expenses from Continuing Operations				
Total Expenses from Continuing	Operations		\$47,827	100.0%
Total Expenses from Continuing	Operations		\$47,827	100.0%
Total Expenses from Continuing CAPITAL EXPENDITURES Lab and Core Facility Equipment	Operations		\$47,827 \$433	100.0%
Total Expenses from Continuing CAPITAL EXPENDITURES Lab and Core Facility Equipment Greenhouse Office Building	Operations		\$47,827 \$433 \$315	100.0%
Total Expenses from Continuing CAPITAL EXPENDITURES Lab and Core Facility Equipment Greenhouse Office Building All Other	Operations		\$47,827 \$433 \$315 \$210	100.0%
Total Expenses from Continuing CAPITAL EXPENDITURES Lab and Core Facility Equipment Greenhouse Office Building All Other Total Capital Expenditures	Operations		\$47,827 \$433 \$315 \$210 \$958	100.0%
Total Expenses from Continuing CAPITAL EXPENDITURES Lab and Core Facility Equipment Greenhouse Office Building All Other Total Capital Expenditures	Operations		\$47,827 \$433 \$315 \$210 \$958	100.0%
Total Expenses from Continuing CAPITAL EXPENDITURES Lab and Core Facility Equipment Greenhouse Office Building All Other Total Capital Expenditures REPLACEMENT AND RENEWAL	Operations	RES	\$47,827 \$433 \$315 \$210 \$958 \$881	100.0%
Total Expenses from Continuing CAPITAL EXPENDITURES Lab and Core Facility Equipment Greenhouse Office Building All Other Total Capital Expenditures REPLACEMENT AND RENEWAL NON-OPERATING EXPENDITUR	Operations EXPENDITU ES	RES	\$47,827 \$433 \$315 \$210 \$958 \$881	100.0%
Total Expenses from Continuing CAPITAL EXPENDITURES Lab and Core Facility Equipment Greenhouse Office Building All Other Total Capital Expenditures REPLACEMENT AND RENEWAL NON-OPERATING EXPENDITUR Debt Principal Payments	Operations EXPENDITU ES	RES	\$47,827 \$433 \$315 \$210 \$958 \$881 \$514	100.0%
Total Expenses from Continuing CAPITAL EXPENDITURES Lab and Core Facility Equipment Greenhouse Office Building All Other Total Capital Expenditures REPLACEMENT AND RENEWAL NON-OPERATING EXPENDITUR Debt Principal Payments DEPRECIATION EXPENSE	Operations EXPENDITU ES	RES	\$47,827 \$433 \$315 \$210 \$958 \$881 \$514	100.0%

2024 (\$000's)

Source %

Amount

g Support and Revenues¹









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