fall 2002

VOLUME 4

ISSUE 3

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

DONALD DANFORTH PLANT SCIENCE CENTER
DISCOVER • ENLIGHTEN • SHARE • NOURISH

The Leaflet

Three to Be Honored at Danforth Center Event

The Danforth Center has instituted two awards to recognize individuals who have been instrumental in the development of the St. Louis region as a center for plant science and in the advancement of plant science research. The awardees will be honored at the Danforth Center's first annual awards presentation on November 1, 2002.

U.S. Senator for Missouri Kit Bond and President and CEO of Monsanto Company Hendrik Verfaillie will receive the Danforth Distinguished Service Award. Dr. Mary-Dell Chilton, Distinguished Science Fellow and Principal Scientist II at Syngenta Biotechnology Inc., will receive the Danforth Award for Plant Science.

Senator Bond will be recognized for his many long-standing efforts in support of the plant and agricultural sciences as well as for his support of the Danforth Center. His efforts in Washington, D.C. have helped the Center to secure federal funding for the construction of the greenhouse complex, grants for major equipment, and grants for research activities targeted at bringing the benefits of agricultural biotechnology to the developing world.

Mr. Verfaillie is one of the founding visionaries of the Danforth Center. As a member of the board of trustees he continues to work to make the Center and its programs a success. In addition, he is a tireless champion of the efforts to promote the St. Louis region as the BioBelt—a thriving center for plant and life sciences research, development, and commercialization.

Dr. Chilton was instrumental in early research in microbiology and plant biology which showed how DNA was transferred from bacterial cells to plant cells. Her research led to the development of technologies that she and others used to develop the first transgenic plant in 1982. Current plant science research benefits greatly from her pioneering work.

Hendrik A. Verfaillie

The Honorable Christopher S. "Kit" Bond

The **Danforth Distinguished Service Award** recognizes outstanding individuals or organizations that have been important partners in the development of the Donald Danforth Plant Science Center and/or in the development of St. Louis as an international center for plant science.

Dr. Mary-Dell Chilton

The **Danforth Plant Science Award** recognizes a prominent national or international leader for outstanding achievement and service in the conduct and/or advocacy of science for the benefit of agriculture, food, nutrition, or human health.

"An Evening of Exploration"

The Danforth Awards will be presented during "An Evening of Exploration" on November 1 at the Center. The evening will feature music, food, and drink, and each guest will have the opportunity to become a scientist for the evening. Guests can see and use sophisticated equipment and technology employed by Danforth Center scientists in their daily research. If you would like to attend the event, please call the Development Office at 314-587-1070.

Table of Contents

Jeff Miller and John Danforth

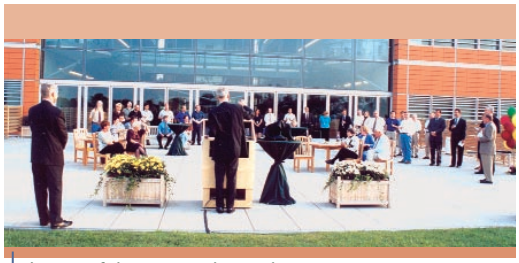
Carolyn Danforth and Mel Bahle

Terrace Named at Danforth Center

On September 16, 2002, the rooftop terrace on the northern side of the Danforth Center facility was dedicated to Dotty and Jeff Miller in recognition of their generous support of the Danforth Center. A plaque naming the terrace for Mr. and Mrs. Miller was unveiled at the ceremony. The naming of the terrace was the first such dedication since the building opened in October 2001 and is especially meaningful because it acknowledges the continued involvement of members of the Danforth family in ensuring our success. Dr. Roger Beachy, president of the Danforth Center, Dr. William Danforth, chairman of the board of trustees, and former senator Jack Danforth were on hand to thank the Millers for their gift to the Center. Mrs. Miller, Dr. Danforth, and Senator Danforth are children of Donald Danforth for whom the Danforth Center is named.

(left to right) Abby Castle and Jeff Miller, Jr., Dotty and Jeff Miller, Julie Miller Stewart and Jack Lampen

(left to right) Jeff and Dotty Miller, Claude Fauquet, William Danforth and Ernest Jaworski



A view of the terrace during the ceremony

Donors

Gifts Received Between June 28 and September 30, 2002

Senior Research Sponsor
($10,000 - $24,999)
Mr. & Mrs. J. Hord Armstrong, III
Interco Charitable Trust

Fellows Research Sponsor
($5,000 - $9,999)
Mr. & Mrs. John C. Danforth
Jim & Maebelle Reed

Scholar Research Sponsor
($2,500 - $4,999)
Dr. & Mrs. Robert T. Fraley
Mr.* & Mrs. Charles Guggenheim
Mr. & Mrs. Kenneth Kranzberg
Mr. Richard P. Tolan, Ms. Tina M. Hoechst, and family
Mary Ann & Michael Van Lokeren
Mr. & Mrs. James von der Heydt

Research Sponsor
($1,000 - $2,499)
Mr. & Mrs. Charles L. Barnes
Mr. & Mrs. Jack Barsanti
Ben & Janet Brink
CASCO
Mrs. Donald Danforth, Jr.
Miss Carol B. Danforth
Mr. Christopher B. Danforth
ESCO Technologies Inc.
Ms. Linda Fanter
Mr. & Mrs. Whitney R. Harris
Sally & Bruce Higginbotham
Sally & Ned Lemkemeier
Luke Kissam & Kathryn Schanen Kissam
Janet M. & Newell S. Knight, Jr.
Mr. & Mrs. Thomas C. Melzer
Rick Oertli
Osborn & Barr Communications
Emily & Derek Rapp
Dr. & Mrs. Timothy Root
Mr. & Mrs. Robert M. Sankey
Mr. & Mrs. Warren M. Shapleigh
Frank & Teg Stokes
Thomas J. Ward, D.D.S.

Additional Gifts
Commercial Property Services Inc.

Matching Gifts
Monsanto Fund
Philip Morris Companies Inc.

Tribute Gifts
In honor of
Jan & Dale Fanter
Linda Fanter

The end of the year can be a good time to review important financial matters, including your charitable gift commitments. This may be especially true in 2002, as provisions of last year's tax legislation continue to be phased in.

Every attempt has been made to assure the accuracy of this list. In case of error or omission, please contact the Development Office at the Danforth Center.
* Deceased

It's About People, Not About Science

When Dr. Florence Wambugu says, "It's about people, not about science," she is talking about biotechnology—specifically about her work in applying the tools of biotechnology to address the concerns of African farmers. Dr. Wambugu is the founder and executive director of A Harvest Biotechnology Foundation International (AHBFI), a non-profit organization whose mission is to fight hunger, malnutrition, and poverty in Africa. AHBFI meets this challenge by focusing on what farmers want and finding innovative, yet practical ways to meet their needs.

Dr. Florence Wambugu

Dr. Wambugu spoke in the Danforth Center's Southwestern Bell Auditorium on August 5, 2002 and described her success in improving the harvest of such crops as sugarcane, bananas, sweet potatoes, and cotton in African countries. "The way forward," she stressed, "is through local knowledge and expertise and by strengthening local institutions."

In Africa, the population has been increasing at a rate of 3.5% per year, but food production has been increasing by only 2.5%.

On average, in Africa people spend 65-80% of their income on food; in developed nations people spend less than 10% of their income on food.

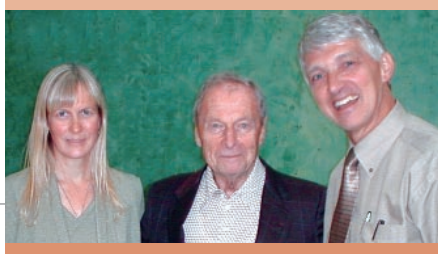
Dr. Wambugu *(third from left)* inspects a field of sweet potatoes in Kenya.

Her organization respects and utilizes the community-mindedness of many African groups. "In Kenya," Dr. Wambugu explains, "farmers are their own extension service. People depend on and help each other." By involving people and communities in setting the goals of research and development, her organization has been very effective in making a positive impact.

Dr. Wambugu is also the author of *Modifying Africa*, and more information about her book can be found at www.modifyingafrica.com. The web site of AHBFI is www.ahbfi.org.

Discoverer of Oral Polio Vaccine Visits Center

(left to right) Dr. Terry Woodford-Thomas, Dr. Hilary Koprowski and Dr. Roger Beachy



According to Dr. Hilary Koprowski, plants may become a source for producing immunotherapeutics to treat infectious diseases such as HIV-AIDS, rabies, and hepatitis B. In a seminar presented at the Danforth Center on September 6, 2002, Dr. Koprowski, Professor of Microbiology and Immunology at the Center for Neurovirology at Thomas Jefferson University and president of the Biotechnology Foundation Laboratories, spoke of his recent research investigating the production of vaccines in plants. Such work can lead to safe, inexpensive oral vaccines, which are the key to controlling infectious diseases worldwide.

Dr. Koprowski has a lifetime of experience in this field. He developed the first oral (as opposed to injectable) vaccine against polio, which made it possible for large-scale vaccination around the world. Dr. Koprowski first began his work on polio in 1947 and can look with pride on the fact that as a result of his pioneering research, polio has been nearly eradicated.

Yet, the world faces other epidemic diseases and the problem of finding methods of combating them remains especially acute in developing countries. "Efforts to vaccinate against any disease are doomed to fail," Dr. Koprowski said, "without a readily available vaccine that can be taken orally." Research on plant-based vaccines offers the possibility for effective production of such a vaccine.

Dr. Koprowski collaborates with Dr. Terry Woodford-Thomas of the Danforth Center. Dr. Woodford-Thomas investigates the plant-based production of an antibody against the rabies virus that was originally developed in Dr. Koprowski's laboratory.

What's Happening in the BioBelt?

BioBelt℠
The Center of Plant and Life Sciences

Start-Up Company Profile

Divergence: The Nematode Genomics Company

"Divergence has benefited in a myriad of ways from the strong life sciences base that exists in the St. Louis region. Without the many resources that exist locally, Divergence would have a much more difficult path to success."

Derek Rapp

Part of our founders' vision was that the Donald Danforth Plant Science Center would serve as the cornerstone for the St. Louis region to grow into a thriving commercial center for the plant and life sciences. Strong evidence that this vision is well on its way to being realized can be found just across the street from the Danforth Center at the Nidus Center for Scientific Enterprise, a business incubator where the laboratories and offices of a startup company named Divergence are located.

Divergence is dedicated to the discovery of highly effective and ecologically sound strategies for parasite pest control, focusing initially on the control of parasitic nematodes. Nematodes are one of the major agricultural pests in the world, causing significant damage to dozens of major crops. Nematodes are also major parasites of humans, companion animals, and livestock. Current nematicides are environmentally dangerous, expensive, and difficult to use.

Derek Rapp

The team at Divergence is led by chief executive officer, Derek Rapp, a former Monsanto executive, and president and chief scientific officer, Dr. Jim McCarter, an expert in the application of genomics to parasitic disease. Derek and his wife Emily are Charter Members of the Danforth Center's Friends Program, and Derek graciously volunteers his time as a member of the Danforth Center's Friends Committee.

The company was founded in 1999 by Dr. McCarter, currently an adjunct faculty member of Washington University, while a post-doctoral fellow at the Washington University Genome Sequencing Center.

More information about nematodes and their impact on crops can be found on page 6, which describes the research of Dr. Christopher Taylor at the Danforth Center. The intersection of Dr. Taylor's research with the goals of companies such as Divergence is a prime example of the kind of synergy that the BioBelt initiative hopes to foster.

DIVERGENCE
The nematode genomics company

News Briefs

Dr. Eliot Herman, principal investigator at the Danforth Center and U.S. Department of Agriculture, Agricultural Research Service scientist, was featured in the September issue of *Agricultural Research* magazine, the monthly research publication of the USDA. The article described research by Dr. Herman and his collaborators which has resulted in hypoallergenic soybeans, a breakthrough that could make a great difference to children and adults who suffer from food allergies.

Soybeans, milk, eggs, peanuts, tree nuts, fish, wheat, and shellfish cause over 90 % of food allergic reactions, and soy protein is found in so many processed foods that it is difficult to avoid. Most allergic reactions to soybeans are caused by a single protein that scientists have named P34. Dr. Herman and Dr. Rick Helm have found a way to turn off the gene that makes P34 in soybean plants so that these plants lack the allergenic protein. Their success story has been picked up by the BBC and Reuters and featured in the *Des Moines Register*, the *Toronto Globe and Mail*, and the *New Scientist*.

Dr. Eliot Herman *(left)*, Gael Cockrell *(center)*, and Dr. Rick Helm (both with the University of Arkansas) examine the results of an allergy test on the skin of a soybean-sensitive pig.

"This is probably the first time a major human allergen has been knocked out of a food crop using biotechnology."

Eliot Herman

Dr. Claude Fauquet, principal investigator at the Danforth Center and director of the Center's International Laboratory for Tropical Agricultural Biotechnology (ILTAB), has been elected as a fellow of the Academy of Sciences of St. Louis. The Academy has a venerable history, being the oldest science academy west of the Mississippi. It works to promote scientific literacy and educational initiatives such as the Junior Academy of Science and the Greater St. Louis Science Fair.

In early October of this year, Dr. Claude Fauquet and Lawrence Kent, International Programs Manager at the Danforth Center, helped to organize an international strategic meeting in Italy to advance the Global Cassava Improvement Plan (GCIP). The meeting was attended by scientists and policy makers from around the world representing over twenty countries and several international organizations including the Food and Agriculture Organization, the International Institute of Tropical Agriculture, the International Center for Tropical Agriculture, the United Nations, and the U.S. Agency for International Development. The Rockefeller Foundation provided funding for the meeting.

The GCIP aims to create a worldwide initiative for applying biotechnologies to the improvement of cassava, a staple food for about 600 million people. Participation in the GCIP reflects the Danforth Center's commitment to research to benefit developing countries.

The Danforth Center welcomed two principal investigators to its research staff this past month. Dr. Joseph Jez, from Kosan Biosciences Inc. and formerly a post-doctoral research fellow at the Salk Institute for Biological Studies, will be investigating plant defense mechanisms, plant growth and development, and the symbiosis of plants with soil organisms. Dr. Liming Xiong, from the University of Arizona, will be studying how plants react to stress conditions such as low temperature, drought, high salt, lack of nutrients, and acidity. With the addition of Dr. Jez and Dr. Xiong, a total of fourteen principal investigators head research projects at the Danforth Center.

Focus on Research

Christopher Taylor, Ph.D.

Under the surface of the soil, an intricate network of living things exists. The roots of plants participate in this underground community, cooperating with some organisms and fighting off others. Dr. Christopher Taylor studies the biology of plant roots, specifically investigating the strategies plants have developed to fend off soil organisms that feed on roots. At the Danforth Center, Dr. Taylor and his research group focus on plant responses to plant-parasitic nematodes. His work addresses a critical agricultural problem, because worldwide, nematodes account for about $77 billion in annual crop losses.

Nematodes are tiny roundworms and, in fact, are incredibly abundant forms of life. Scientists have discovered about 20,000 different species of nematodes but estimate that there may be 40,000 or even up to 10 million species. And since there may be millions of individual nematodes per square yard of soil, it is not surprising to find that plants possess mechanisms for controlling them.

Dr. Taylor works to characterize how plants have adapted their biology to respond to parasitic nematodes. His group studies changes in the movement of materials in roots under attack by nematodes and works to identify the substances roots produce to control nematode hatching, behavior, growth, and development. This research will lead to the development of plants that have enhanced internal mechanisms for keeping nematodes at bay.

A nematode at high magnification.

The patch of sparse vegetation in this field demonstrates the damage that can be inflicted by nematodes.

Chris Taylor *profile*

Chris Taylor's interest in roots reaches back to days growing up on a farm in Pennsylvania: when rootworms attacked the sweet corn, the plants would topple over and the ears would have to be picked by hand from off the ground. There's nothing like a little manual labor to get a young man to look for better solutions, and in Chris's case, he looked to the root where the source of the corn's weakness lay.

In graduate school, investigating mechanisms of gene expression in roots, Chris found a particular gene that was induced by nematode attack. And here, his interests in roots and pests came together. "Nematodes are an up and coming pest," Chris says, "Those nematode deterrents that are available are being rapidly removed from the market due to animal and bird toxicity, ground water contamination, and ozone depletion, so the need and the opportunity to make a difference are definitely there."

Besides that, nematodes are scientifically intriguing. A plant-parasitic nematode will enter a root and remake the nearby plant cells so that they funnel nutrients from the rest of the plant right to the nematode. "I want to find out how nematodes are feeding and target that mechanism to develop plants that will prevent nematode attack," Chris says.

But, Chris is also thinking about the bigger picture:"There are many complex relationships in the rhizosphere. [The rhizosphere is the system created by the interaction between the root and the soil and soil organisms.] To facilitate research in this area, I've initiated a rhizosphere research group, a group of root experts who can share their knowledge about this complex system."

The Danforth Center Alliance was created to further scientific research and facilitate collaboration leading to new research opportunities that enrich the environment at each member institution in the areas of plant science, life science, and agriculture. Members of the alliance include the Missouri Botanical Garden, Purdue University, the University of Illinois at Urbana-Champaign, the University of Missouri-Columbia, and Washington University in St. Louis.

Danforth Center Alliance: Research News

From Purdue University

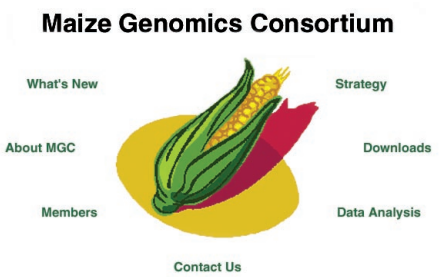
Grow a Better Tomato...

Few foods are more welcomed than the first fresh, hand-picked tomatoes of summer. These bright red, juicy fruits are consumer favorites whose popularity has grown in the past twenty years—so much so, that the average American eats about 90 pounds of tomatoes or tomato products each year. And that's good for more reasons than one: in addition to their good taste, tomatoes are an important source of phytonutrients.

Now researchers at Purdue University in collaboration with the U.S. Department of Agriculture have developed a better tomato, one that contains two to three times more of a natural antioxidant called lycopene than regular tomatoes do. These scientists have been able to increase the production of lycopene through transgenic technology that enhanced the biological processes responsible for lycopene production. In addition, the transgenic tomatoes have a prolonged vine life and enhanced juice quality. Lycopene is a natural antioxidant that is twice as effective as beta-carotene and is able to mitigate breast and prostate cancer and coronary heart disease.

Advancing Corn Genetics

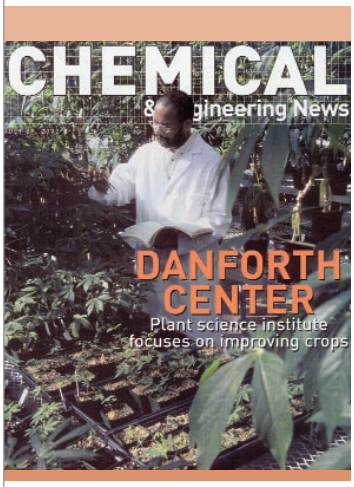
The Human Genome Project has made it clear that we can derive tremendous benefit from knowing the linear sequence of an organism's whole set of genes. Similar sequencing projects are proceeding for many other organisms, ranging from bacteria to fruit flies to plants, and researchers studying important agricultural plants need to obtain this type of genetic data as well. Corn is especially challenging for researchers because it has 20 times more information in its genome than does *Arabidopsis*, the plant many researchers use as a model for investigating plant biology.



A screenshot of the MGC web site.

A newly funded project, led by the Danforth Center, will pave the way for sequencing all of the genes of corn, (also called maize). The project establishes a collaboration, called the Maize Genomics Consortium (MGC), between researchers at the Danforth Center, Purdue University, The Institute for Genomic Research in Rockville, Maryland, and Orion Genomics in St. Louis. Funded by a $6 million grant from the National Science Foundation, the MCG will test new methods for efficient sequencing of the complex set of corn genes and will place the resulting data into publicly accessible databases. The project is coordinated by Dr. Karel Schubert, Danforth Center Vice President for Technology Management and Science Administration. Researchers can access information from the MCG on a web site hosted by the Danforth Center: http://maize.danforthcenter.org.

Media feature



Donald Danforth Plant Science Center researcher Justin Pita stands amid a greenhouse full of healthy cassava in the cover photo of the July 29, 2002 edition of *Chemical & Engineering News*. The issue features a six-page, 3,000 word feature story describing the Danforth Center's mission, research initiatives, and novel intellectual property policies. *Chemical & Engineering News* is the official weekly news publication of the Washington, D.C. based American Chemical Society and, in addition to the on-line version, is circulated to nearly 200,000 public-sector, private-sector and academic scientists each week. The story can be viewed at http://pubs.acs.org/cen/coverstory/8030/8030danforth.html.

Newsletter Staff

Managing Editor:
Gwen Ericson, Ph.D.
Coordinator of Education and Outreach/Science Writer
gericson@danforthcenter.org

Editors:
Jeannette R. Huey
Vice President for Development
jhuey@danforthcenter.org

Derek J. Montgomery
Director of Government Relations and Public Affairs
djmontgomery@danforthcenter.org

Contributors:
Gwen Ericson
Jeannette Huey
Derek Montgomery
Elizabeth Vancil

Phone: 314.587.1000
www.danforthcenter.org
newsletter@danforthcenter.org

Printed on recycled paper.

Donald Danforth Plant Science Center
975 North Warson Road
St. Louis, Missouri 63132 USA

Address service requested

NONPROFIT ORG
U.S. POSTAGE
PAID
ST. LOUIS, MO
PERMIT NO. 5385