Delivering Specialty Traits
The Raymond F. Baker Center for Plant Breeding

CENTER REPORT
2006
The Raymond F. Baker Center for Plant Breeding

—advances the science of plant breeding through hypothesis driven research,

—develops enhanced germplasm and superior cultivars for improved productivity, nutritional value, and adaptability,

—and educates the next generation of public and private plant breeders.
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Many of the top stories in the news during 2006 highlighted the importance of plant breeding and the impact that plant breeders have on people’s lives. Efforts to increase America’s energy independence became a leading priority for state and federal governmental actions. Developments in biofuels and renewable energy resources captured the attention of public legislative bodies and elected officials. In addition, studies on health benefits related to the consumption of oats and barley, grains rich in ß-glucan, drew the interest of health professionals and the general public. Studies have shown links between increased amounts of dietary ß-glucan and lower incidences of diabetes and improvements in heart-health. Other studies indicate that consumption of products rich in ß-glucan may help in reducing obesity rates, a major health problem in the United States. News stories about artificially produced trans-fats were also featured by the media in 2006. Mandatory labeling of trans-fat content in processed foods went into effect, and in New York City, trans-fats were banned from most restaurants. Members of the Raymond F. Baker Center for Plant Breeding were working behind the scenes on all these stories, developing cultivars for use by the biofuels industry, oat and barley varieties with increased ß-glucan, and soybeans with oil that can by-pass partial-hydrogenation, a process that creates artificial trans-fats.

Center members have long been instrumental in the development of plant-based biofuels and the search for cultivars best adapted to those systems. The Center’s researchers recognize the importance to farmers of increasing the marketability and value of commodity crops. Members are currently conducting research on developing corn hybrids particularly suited to the ethanol industry, alternative crops that could be used as biofuels, including soybean and switchgrass, and cultivars high in corn stover content for use by industries exploring biofuels from cellulosics.

Dr. Walter Fehr’s work with low-linolenic soybeans garnered much attention as people began to learn about the health risks associated with eating foods containing artificial trans-fats. The research he has done with his several varieties of specialty soybeans highlights the importance of plant breeding.

Dr. Jean-Luc Jannink has been working on projects to identify genes associated with ß-glucan content in oats and barley. From this knowledge, researchers can more easily identify those cultivars rich in ß-glucan.

Outreach and education are significant components of the mission of the Center. In 2006, the Center sponsored and directed a series of lectures for scientists and students focusing on scientific innovations in data collection and analysis and their impacts on crop improvement. More than 180 people attended those lectures. Center members also participated in field day events designed to educate farmers on current research in plant breeding. Members participated in forums on the biofuel industry, the status of public plant breeding in the United States, and a Symposium focusing on worldwide issues in agriculture and crop improvement. Funding from the Center paid registration fees and travel expenses for Iowa State plant breeding graduate students to attend the 2006 International Plant Breeding Symposium. Students presented posters outlining their projects and attended lectures by twenty-eight experts in plant breeding research. Twenty-six plant breeding graduate students selected Center Members as their major professors. The Center also hosted delegations of plant breeders from China and Indonesia.

We invite you to read about the accomplishments of the Raymond F. Baker Center for Plant Breeding in this report and to visit the Center’s Web site (www.plantbreeding.iastate.edu) for additional information about the Center, its people, and our work. We also invite you to visit us in Agronomy Hall on the Iowa State University campus.
The Center is named for Raymond F. Baker, a corn breeder, researcher, and leader in the Pioneer Hi-Bred, International organization. His work was instrumental in developing the superior hybrid corn cultivars that made Pioneer one of the leading seed corn companies in the world. Under Mr. Baker’s guidance, the research budget at Pioneer Hi-Bred grew dramatically from the $2000 allotted in 1932 to $54,484,000 in 1988, the year he stepped down from the Board of Directors. The success of the Pioneer’s research department can be attributed both to Baker’s commitment to scientific rigor and to his strong leadership qualities. Forrest Troyer said of Mr. Baker, “He was a knowledgeable, innovative corn breeder and a conscientious, progressive leader.” Troyer reports that Mr. Baker was an excellent scientific investigator, particularly skilled at drawing essential inferences from pages of data collected from field trials. Arnel Hallauer wrote of Mr. Baker, “His personal development of outstanding hybrids and his ability to assemble and direct a high-quality plant breeding staff formed the base for rapid expansion of Pioneer Hi-Bred, International.” Mr. Baker’s research techniques were firmly founded on proven principles from successful plant breeding programs, and the success of Pioneer Hi-Bred can be directly attributed to his belief in those proven techniques. He believed that cultivars with high quality traits could be developed only through careful research and considerable hard work. He also fully understood the importance of hiring qualified staff and giving them the support and independence needed for success. In 1955, Mr. Baker wrote for the Proceedings of the Tenth Annual Hybrid Corn Industry Conference, “Corn breeders have continually experimented with some simpler way to evaluate the performance of new hybrids. I know of no substitute for the careful detailed work of planting and harvesting these hybrids under all types of soil and weather conditions. Here more than any place else, systematic detailed work by careful technicians is most important.”

Mr. Baker was committed to advancing plant breeding for future generations and supporting the organizations that foster that development. He was a Fellow of the American Society of Agronomy, the American Association for the Advancement of Science, and helped to organize the National Council of Commercial Plant Breeders. In 1946, he initiated, through funding from Pioneer Hi-Bred, a research assistantship for Iowa State University students studying corn breeding. He regularly participated in field days and conferences, interacting with scientists and farmers.

Mr. Baker recognized the advantages that improved crops could bring to the citizens of Iowa and to the world. He was a man who devoted his life to advancing his profession for the benefit of science and the larger community. Forrest Troyer wrote, “Mr. Baker often stated he enjoyed corn breeding so much he would pay for the opportunity to do it, and in a way he did. Corn breeding became his entire life.” The Raymond F. Baker Center for Plant Breeding strives to continue the good work begun by him.

I know of no substitute for the careful detailed work of planting and harvesting these hybrids under all types of soil and weather conditions. Here more than any place else, systematic detailed work by careful technicians is most important.

—Raymond F. Baker
Kendall R. Lamkey, Corn Breeding  
Director, Raymond F. Baker Center for Plant Breeding  
Pioneer Distinguished Chair in Maize Breeding  
Interim Chair, Department of Agronomy  
Professor, Department of Agronomy  
Ph.D. (Plant Breeding/Cytogenetics), 1985, Iowa State University  
M.S. (Plant Breeding/Genetics), 1982, University of Illinois  
B.S. (Agronomy), 1980, University of Illinois  

Walter R. Fehr, Soybean Breeding  
Charles F. Curtiss Distinguished Professor in Agriculture  
Professor, Department of Agronomy  
Ph.D. (Plant Breeding/Genetics), 1967, Iowa State University  
M.S. (Agronomy/Plant Genetics), 1962, University of Minnesota  
B.S. (Agronomy), 1961, University of Minnesota  

Arnel R. Hallauer, Corn Breeding  
Distinguished Professor Emeritus, Department of Agronomy  
Ph.D. (Plant Breeding), 1960, Iowa State University  
M.S. (Plant Breeding), 1958, Iowa State University  
B.S. (Plant Science), 1954, Kansas State University  

Jean-Luc Jannink, Small Grains Breeding  
Associate Professor, Department of Agronomy  
Ph.D. (Plant Breeding/Sustainable Agriculture), 1999, University of Minnesota  
M.S. (Plant Sciences), 1995, University of Maine  
B.A. (Biology), 1991, Haverford College  

Michael Lee, Plant Breeding and Genetics  
Professor, Department of Agronomy  
Ph.D. (Plant Breeding), 1986, University of Minnesota  
M.S. (Plant Breeding), 1984, University of Minnesota  
B.S. (Plant Science), 1981, Rutgers University  

Nurturing a tradition of service to the people of Iowa, the nation, and the world.
IOWA STATE UNIVERSITY PLANT BREEDING AND GENETICS FACULTY

Scientists in the Raymond F. Baker Center for Plant Breeding are also members of the Department of Agronomy's plant breeding and genetics faculty. Faculty conduct research, teach courses in plant breeding and genetics, and mentor graduate students by serving as major professors and on Program of Study Committees.

Philip W. Becraft, Development and Molecular Biology
Madan Kumar Bhattacharyya, Soybean Molecular Genetics
Michael Blanco, Maize Germplasm Enhancement
Steve Cannon, Genetics
Silvia Cianzio, Soybean Breeding
Jode Edwards, Maize Quantitative Genetics
Walter Fehr, Soybean Breeding
Candice Gardner, Plant Germplasm and Conservation
Michelle Graham, Genetics
David Grant, Plant Genetics
Jean-Luc Jannink, Small Grains Breeding
Kendall Lamkey, Maize Breeding

Carolyn Lawrence, Plant Genetics
Michael Lee, Plant Breeding and Genetics
Reid G. Palmer, Soybean Genetics
Peter A. Peterson, Cytogenetics
Thomas A. Peterson, Maize Molecular Genetics
Linda Pollak, Corn Breeding
Patrick Schnable, Plant Molecular Genetics
Paul Scott, Maize Grain Quality
Randy Shoemaker, Soybean Genomics and Gene Discovery
Kan Wang, Plant Genetics and Molecular Biology
Mark Widrlechner, Plant Germplasm Conservation

USDA-ARS CORN INSECTS AND CROP GENETICS RESEARCH UNIT

Since about 1922, scientists at Iowa State University have benefited from the presence of an outstanding United States Department of Agriculture-Agricultural Research Service (USDA-ARS) unit on campus working in the general area of plant breeding and genetics. Many members of the Raymond F. Baker Center for Plant Breeding maintain long-standing collaborations with the USDA-ARS Corn Insects and Crop Genetics Research Unit lead by Dr. Leslie C. Lewis.

Leslie C. Lewis, Research Leader, Entomologist
Steven Cannon, Research Geneticist
Brad Coates, Research Geneticist
Jode Edwards, Research Geneticist
John C. Golden, Plant Geneticist
Michelle Graham, Research Geneticist
David M. Grant, Plant Geneticist
Richard Hellmich, Research Entomologist
Kyung Seok Kim, Research Molecular Biologist
Nicholas Lauter, Research Geneticist
Carolyn Lawrence, Research Geneticist
Rex Nelson, Research Geneticist
Reid G. Palmer, Research Geneticist
Linda M. Pollak, Research Geneticist
Jarrad Prasifka, Research Entomologist
James Robbins, Entomologist
Thomas Sappington, Research Entomologist
M. Paul Scott, Research Geneticist
Randy Shoemaker, Research Geneticist
Douglas Sumerford, Research Entomologist
Roger Wise, Research Geneticist

Keith Bidne, Agricultural Science Research Technician
Brian Burnham, Biological Research Technician
Darwin Campbell, Information Technology Specialist
Jeanette Dyer, Biological Science Technician
Janet Erb, Secretary
Jill Fleming, Statistician
Gregory Fuerst, Biological Science Lab Technician
Karin Gobelman-Werner, Biological Science Lab Technician
Linda Griffin, Biological Science Lab Technician
Robert Gunnarson, Biological Science Technician
Jody Hayes, Biological Science Lab Technician
Lori Lincoln, Biological Science Lab Technician
Miriam Lopez, Biological Science Technician
Penny Meyerholz, Agricultural Science Research Technician
Greg Peiffer, Biological Science Technician
Randy Ritland, Agricultural Science Research Technician
Jose Rodriguez, Biological Science Technician
Trent Seigfried, Information Technology Specialist
Judy Shoen, Secretary
Merinda Struthers, Biological Science Technician
An important component of the mission of the Raymond F. Baker Center for Plant Breeding is the work members do guiding and training future scientists in the field of plant breeding. In 2006, thirty-nine students worked toward advanced degrees in plant breeding and genetics. Listed below are their names, degrees sought, the place they call home, their expected year of graduation, and the focus of their study in plant breeding. Congratulations to Alona Chernyshov, Von Mark V. Cruz, Pedro Lopez, Marcus Marine, Tom E. Scheffler, Jordan Spear, Clinton J. Turnbull, and Brandon M. Wardyn for graduating with plant breeding degrees in 2006.

Major Professor: Dr. Michael Lee
Mohamed B. Ali (Egypt), Ph.D. “Plant breeding.”
Major Professor: Dr. Kan Wang
Major Professor: Dr. Walter Fehr
Anastasia Bodnar (Florida), Ph.D., 2012. “Genetics.”
Major Professor: Dr. Paul Scott
Alona Chernyshov (Ukraine), M.S., 2006. “Selection for high β-glucan content and good agronomic performance in oat grain.”
Major Professor: Dr. Jean-Luc Jannink
Von Mark V. Cruz (Philippines), Ph.D., 2006. “Molecular genetic analyses of oil seed Brassica germplasm: Determination of life forms and germplasm management strategies by using microsatellite markers and FLOWERING LOCUS-C (FLC1 and FLC3) gene.”
Major Professor: Dr. Candace Gardner, Dr. E. Charles Brummer
Thanda Dhliwayo (Zimbabwe), Ph.D., 2008. “Selection for resistance to maize weevil (Sitophilus zeamais Motchulskey) and its effects on the nutritional profile of maize.”
Major Professor: Dr. Michael Lee
Moises Roman-Gonzalez (Puerto Rico), Ph.D. “Plant breeding.”
Major Professors: Dr. Linda Pollak, Dr. Susana Goggi
Lucia Gutierrez (Uruguay), Ph.D., 2007. “Genetic diversity of cultivated barley and its wild relatives.”
Major Professors: Dr. Jean-Luc Jannink, Dr. John Nason, Dr. Phillip Dixon
Major Professor: Dr. Paul Scott
Sara Helland (Iowa), Ph.D., 2008. “QTL/gene detection and linkage disequilibrium after 4 and 10 generations of random mating in a maize inbred population.”
Major Professor: Dr. Michael Lee
Laurie Hyrkas (Minnesota), M.S., 2008. “Heterosis of maize: Yield loss in F2 plants and comparison of heterosis models.”
Major Professor: Dr. Kendall Lamkey
Bindu Joseph (India), Ph.D., 2007. “A structural analysis of a region of the soybean genome containing a major QTL for seed protein composition.”
Major Professor: Dr. Randy Shoemaker
Krystal Kirkpatrick (Iowa), M.S., 2008. “Identification and characterization of maize varieties with beneficial traits for biobased industries.”
Major Professor: Dr. Kendall Lamkey
Keith E. King (Oklahoma), Ph.D., 2010. “Genetic mapping of iron stress response genes.”
Major Professors: Dr. Randy Shoemaker, Dr. Silvia Cianzio
Travis J. Lee (Kansas), Ph.D. “Evaluation of recurrent selection in BS10 and BS11.”
Major Professor: Dr. Kendall Lamkey
Bryce Lemke, Ph.D. “Corn breeding.”
Major Professor: Dr. Kendall Lamkey, Dr. Jode Edwards
Pedro Lopez (Mexico), Ph.D., 2006. “Phenotypic, biochemical, and molecular diversity in coriander (Coriandrum sativum L.) germplasm.”
Major Professors: Dr. Mark Widrlechner, Dr. Ricardo Salvador
Marcus Marine (Iowa), M.S., 2006. “Genetic mapping of the Glu-1Dx5 transgene in maize (Zea mays L.).”
Major Professor: Dr. Michael Lee
Major Professor: Dr. Kan Wang
M. Laura Mayor (Argentina), Ph.D., 2008. “Genetic analysis of ear development in maize.”
Major Professor: Dr. Michael Lee
Kendra A. Meade (Indiana), Ph.D., 2010. “Maize breeding.”
Major Professor: Dr. Michael Lee
Milly Nambogga Kanobe (Uganda), Ph.D., 2010. “Nutritional crop improvement through plant biotechnology.”
Major Professor: Dr. Kan Wang, Dr. Steve Rodermel

Jamie A. O’Rourke (Utah), Ph.D., 2008. “Genetic analysis of iron deficiency chlorosis in soybeans.”
Major Professor: Dr. Randy Shoemaker

Julia E. Olmstead (Minnesota), M.S., 2006. “Comparative genetics for yield and yield stability in annual and perennial Medicago species.”
Major Professors: Dr. Jean-Luc Jannink, Dr. E. Charles Brummer

Massiel A. Orellana (Chili), Ph.D., 2008. “Application of Bayesian models with heterogeneous variances to GxE models in oat seed.”
Major Professors: Dr. Alicia Carriquiry, Dr. Jean-Luc Jannink

Major Professor: Dr. Reid G. Palmer

Valentin D. Picasso Risso (Uruguay), Ph.D., 2007. “Crop diversity and ecosystem functioning in perennial polycultures for forage, biomass, and grain.”
Major Professors: Dr. E. Charles Brummer, Dr. Matt Liebman

Tom E. Scheffler (Iowa), Ph.D., 2006. “Evaluation of seven stiff-stalk and five non-stiff-stalk corn populations, hybrids, and S1’s.”
Major Professor: Dr. Kendall Lamkey

Curtis Scherder (Missouri), M.S., 2005. “Soybean breeding.”
Major Professor: Dr. Walter Fehr

Yoon-Sup So (South Korea), Ph.D., 2007. “Heterogeneity of error and genotype x environment interaction variance in state corn yield test and cultivar selection.”
Major Professors: Dr. Jean-Luc Jannink, Dr. Jode Edwards

Matthew Sorge (Iowa), M.S., 2005. “Corn breeding.”
Major Professor: Dr. Michael Lee

Jordan D. Spear (Iowa), M.S., 2006. “Genetic improvement of seedling emergence of soybean lines with low phytate.”
Major Professor: Dr. Walter Fehr

Daniel R. Stribe (Iowa), M.S. “Plant breeding.”
Major Professors: Dr. Randy Shoemaker, Dr. E. Charles Brummer

Oswaldo Taboada-Gayton (Mexico), Ph.D., 2006. “Heritability and heterosis of wet milling efficiency in hybrids of exotic by adapted inbreds lines in corn.”
Major Professor: Dr. Linda Pollak

Clinton J. Turnbull (Nebraska), Ph.D., 2006. “A quantitative trait response evaluation to selection in the BS13(S) maize (Zea mays L.) population.”
Major Professor: Dr. Kendall Lamkey

Brandon M. Warden (Nebraska), Ph.D., 2006. “The quantitative genetics of a non-stiff stalk maize (Zea mays L.) population.”
Major Professor: Dr. Kendall Lamkey

Christiana Wiebbecke (Iowa), Ph.D. “Plant breeding.”
Major Professor: Dr. Silvia Cianzio

The education I received in plant breeding from Iowa State has been the single most influential element of my career. The worldwide impact of Iowa State’s plant breeding education and research is unsurpassed. Whenever I hire or collaborate with an Iowa Stater, I know I’m working with a top-notch scientist.

—Ted Crosbie, MS Plant Breeding 1974, Ph.D. Plant Breeding 1976
Vice President of Global Plant Breeding and Distinguished Science Fellow,
Monsanto Company
2006 International Plant Breeding Symposium

The 2006 International Plant Breeding Symposium was held in Mexico City during August 20-25. The Symposium honored the service of Dr. John W. Dudley, emeritus professor in plant breeding from the University of Illinois and brought together about 350 plant breeders from more than 60 countries. The proceedings will be published as a supplement to *Crop Science* and will be available online. The Symposium was cosponsored by Iowa State University, Pioneer Hy-Bred International, Monsanto Company, the University of Illinois, and CIMMYT. Dr. Kendall Lamkey, Director of the Raymond F. Baker Center for Plant Breeding, served on the program committee and the governance committee.

Dr. Dudley’s career, spanning 49 years, focused on developing improved cultivars in maize, alfalfa, and sugar beets. He is best known for the classic University of Illinois experiment that developed long-term selection for protein and oil. Dr. Dudley received his Ph.D. in plant breeding from Iowa State University in 1956.

Eight Iowa State University plant breeding graduate students attended the Symposium, the largest contingent of students from any university. The students’ expenses were paid, in part, by grants provided by the Raymond F. Baker Center for Plant Breeding. Students attended lectures, participated in tours, and presented posters outlining the research they have undertaken for their graduate degrees. Poster topics included the identification of maize traits beneficial to the biofuels industry, QTL mapping for ear shoot development in maize, the evaluation of heterosis in soybeans, and an investigation of alternative maize cultivars particularly suited to organic and sustainable farming systems.

**Center Staff**

The Center employs talented and dedicated individuals who support the work of the members of the Raymond F. Baker Center for Plant Breeding. Many have advanced degrees in their field of study.

- **Mike Barker**, Agricultural Specialist, Forage Breeding
- **Dan DuVick**, Research Associate, Soybean Breeding
- **James Jensen**, Field Specialist, Soybean Breeding
- **Susan Johnson**, Assistant Scientist, Soybean Breeding
- **Robbie Kerkove**, Office Coordinator
- **Marcia Minear**, Administrative Specialist
- **George Patrick**, Research Associate, Small Grains Breeding
- **Kevin Scholbrock**, Research Associate, Soybean Breeding
- **Ronald Skrdla**, Agricultural Specialist, Small Grains Breeding
- **Mark Smith**, Agricultural Specialist, Forage Breeding
- **Grace Welke**, Assistant Scientist, Soybean Breeding
- **Paul White**, Field Lab Technician, Corn Breeding
The Raymond F. Baker Center for Plant Breeding, a Center affiliated with the Plant Sciences Institute and Iowa State University, is committed to the mission of the land-grant institution. It is a public sector breeding operation, responding to the needs of the people of Iowa. The Center works to develop and preserve elite germplasm and advocates its fair and public use for farmers, as well as public and private breeders.

The Center’s members have offices and lab space in Agronomy Hall on the campus of Iowa State University. In addition, facilities for cultivation, drying, and seed processing are housed at the Agronomy and Curtiss farms in Ames. Members also extensively use outlying research farms managed by the College of Agriculture for test plots and planting. Many of the Center’s constituents rent or lease crop land from Iowa farmers for plot work.

Members of the Center are full-time state employees who have primary faculty appointments in the Agronomy Department. They direct active plant breeding programs, advise graduate students majoring in plant breeding, and teach courses in plant breeding.

**Center Facilities**

The Raymond F. Baker Center for Plant Breeding, a Center affiliated with the Plant Sciences Institute and Iowa State University, is committed to the mission of the land-grant institution. It is a public sector breeding operation, responding to the needs of the people of Iowa. The Center works to develop and preserve elite germplasm and advocates its fair and public use for farmers, as well as public and private breeders.

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Members of the Center are full-time state employees who have primary faculty appointments in the Agronomy Department. They direct active plant breeding programs, advise graduate students majoring in plant breeding, and teach courses in plant breeding.

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**2006 Plant Breeding Lecture Series**

More than 180 students and public and private plant breeders and researchers attended the 2006 Plant Breeding Lecture Series held May 18 and 19. The title of the lecture series was *Data Analysis Innovations Contributing to Crop Improvement*. Speakers for the series were David Butruille (Monsanto Company), James Holland (North Carolina State University), Laurence Moreau (Station de Genetique Vegetale, France), Chris Theobald (Biomathematics & Statistics Scotland), Daniel Nettleton (Iowa State University), and Shizhong Xu (University of California). The Plant Breeding Lecture Series, held at the Memorial Union on the Iowa State University Campus, brought together participants from ten states and a delegation of scientists from Nigeria. The Raymond F. Baker Center for Plant Breeding and the Plant Sciences Institute contributed financial support for the Lecture Series. Additional information, including some of the presentations, are available on the Plant Breeding Lecture Series Web site at www.plantbreeding.iastate.edu/pbllsched.html.

Center scientists, staff, and students work on farms located throughout Iowa. Soybeans, corn, oats, barley, and forage crops are bred to improve yield, grain quality, and nutritional value.
Baker Oat Released
A new oat variety was developed and released by Dr. Jean-Luc Jannink, the small-grains breeder with the Raymond F. Baker Center for Plant Breeding. The oat variety, called ‘Baker,’ was named both for Raymond F. Baker and for traits prized by the milling and baking industry. The oat was developed from a cross between the ‘Blaze’ and ‘Vista’ varieties. Baker oat exhibits high yield and high β-glucan content. Consumption of β-glucan, the soluble fiber in oats and other grains, has been linked to decreases in blood cholesterol, and specific minimum levels of β-glucan must be present in processed products to qualify for the “heart-healthy” label. Baker oat is currently being sold and marketed by Prairie Brand Seed, located in Story City, Iowa. Jannink’s research was supported by the Raymond F. Baker Center for Plant Breeding and by a grant from the North American Millers’ Association.

The greatest service that can be rendered to any country is to add a useful plant to its culture.

-Thomas Jefferson

People in the News
Low-Linolenic Soybeans—In 2006, several developments spotlighted dietary trans-fats. New York City passed a ban on trans-fats in restaurant food and new labeling requirements on processed foods went into effect. As a result, Walter Fehr’s low-linolenic acid soybeans have received some much deserved notice. Fehr’s work was discussed in several national news services, including the Wall Street Journal and National Public Radio. His low-linolenic soybean varieties eliminate the need for partial-hydrogenation, a process that creates harmful trans-fats.

Young Crop Scientist Award—Jean-Luc Jannink, small grains breeder, was recognized as this year’s recipient of the Young Crop Scientist Award by the Crop Science Society of America. One award is given each year to a scientist who has made an outstanding contribution in crop science by the age of 37.

Interim Department Chair—Kendall Lamkey was appointed Interim Chair of the Agronomy Department in February of 2006. He has continued his work as a maize breeder and as Director of the Raymond F. Baker Center for Plant Breeding.

Brummer to University of Georgia—E. Charles Brummer, a forage breeder at Iowa State University for twelve years, accepted a position at the University of Georgia, where he will continue his work in forage and biomass crop breeding. He will be missed by his colleagues at Iowa State.

Grass Breeders’ Conference—The 39th Grass Breeders’ Conference was held on the Iowa State University campus on July 31-August 1. This year’s conference was organized by E. Charles Brummer and Shui-Zhang Fei, Assistant Professor in Horticulture. The conference was held at Reiman Gardens and brought together about 40 scientists from across the United States. Lectures and tours of the Agronomy Farms and the Horticulture Research Station were featured as events.

Dr. Kendall Lamkey

Editor, Crop Science

Publications


Dr. Walter R. Fehr

Publications


Dr. Michael Lee

Ad Hoc Reviewer, Journal of Crop Science
Ad Hoc Reviewer, Journal of Theoretical and Applied Genetics
Ad Hoc Reviewer, USDA-NRI

Publications


Raymond F. Baker Center for Plant Breeding
Delivering Speciality Traits
Dr. Kendall Lamkey  
**Title:** “Integrated Feedstock Supply Systems for Corn Stover Biomass”  
Amount: $1,999,724  
**Funding Source:** Department of Agriculture  
**Title:** “Research Support”  
Amount: $120,777  
**Funding Source:** Department of Agriculture-ARS  
**Title:** “Half-Time Research Assistantship”  
Amount: $15,000  
**Funding Source:** Monsanto Company

Dr. Walter R. Fehr  
**Title:** “Assessing the Value of a Novel Soybean Oil with Mid-Oleic and 1% Linolenic Acids”  
Amount: $67,505  
**Funding Source:** Iowa Soybean Association  
**Title:** “Breeding General-Use and Specialty Soybeans for Iowa”  
Amount: $156,000  
**Funding Source:** Iowa Soybean Association  
**Title:** “Development of Maturity I-IV Varieties for the Better Bean Initiative”  
Amount: $125,300  
**Funding Source:** United Soybean Board  
**Title:** “Departmental Support”  
Amount: $639  
**Funding Source:** Iowa State University Foundation  
**Title:** “CAD Royalties”  
Amount: $4012  
**Funding Source:** Iowa State University Foundation

Dr. Michael Lee  
**Title:** “Research in Corn Breeding and Genetics”  
Amount: $38,250  
**Funding Source:** Nidera Semillas, S.A.

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**Dr. Jean-Luc Jannink**  
**Title:** “ß-glucan Mediated Impacts of Genotype and Processing on Oat Nutritional and Sensory Function”  
Amount: $360,000  
**Funding Source:** United Soybean Board  
**Title:** “National Oat Germplasm Enhancement at Iowa State University”  
Amount: $49,000  
**Funding Source:** Department of Agriculture  
**Title:** “QTL Dissection of Variance Sources for Long-Term Selection”  
Amount: $175,000  
**Funding Source:** Department of Agriculture  
**Title:** “Small Grains Crop Performance Testing”  
Amount: $50,000  
**Funding Source:** Iowa Crop Improvement Association  
**Title:** “Comprehensive Oat Improvement Through National Germplasm Enhancement at Iowa State University”  
Amount: $9,000  
**Funding Source:** Department of Agriculture-ARS  
**Title:** “Departmental and Research Support”  
Amount: $51,447  
**Funding Source:** Iowa State University Foundation  
**Title:** “Small Grains Breeding at Iowa State University”  
Amount: $20,000  
**Funding Source:** Quaker Oats Company  
**Title:** “Barley Coordinated Agricultural Project: Leveraging Genomics, Genetics, and Breeding for Gene Discovery”  
Amount: $104,095  
**Funding Source:** University of Minnesota  
**Title:** “Practical Biodiversity: Keeping Oats on Farms by Helping Farmers Enhance Disease Resistance”  
Amount: $111,548  
**Funding Source:** University of Nebraska

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**FINANCES**

The Raymond F. Baker Center for Plant Breeding, an affiliate of the Plant Sciences Institute, receives support money from several sources. External funding includes money received from competitive grants, funded by state and federal government agencies, and money from grants awarded by foundations and private companies. In addition, the Center receives money from the Plant Sciences Institute and income generated from an endowment established by Raymond F. Baker to support the scientific advancement of plant breeding and genetics. Money supports research projects, salaries, and Center expenses.

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**Income FY 2006**

- Raymond F. Baker Endowment Income: $324,530
- Plant Sciences Institute Support: 108,612
- Total Income: $433,142

**Expenditures FY 2006**

- Graduate Student Education/Training: $225,000
- Research Support: 100,000
- Salaries: 101,871
- Operating Expenses: 6,271
- Total Expense: $433,142
Summary of Iowa State University Plant Breeding over Past 5 Years

### Plant Breeding Efforts by Activity (5 Plant Breeders)

<table>
<thead>
<tr>
<th>Activity</th>
<th>% of time devoted to activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Breeding Research</td>
<td>42.7</td>
</tr>
<tr>
<td>Germplasm Enhancement</td>
<td>11.7</td>
</tr>
<tr>
<td>Cultivar Development</td>
<td>16.6</td>
</tr>
<tr>
<td>Biototechnology Research and Development</td>
<td>9</td>
</tr>
<tr>
<td>Plant Breeding Education</td>
<td>20</td>
</tr>
<tr>
<td>Totals</td>
<td>100</td>
</tr>
</tbody>
</table>

### Breeding Efforts by Crop

<table>
<thead>
<tr>
<th>Crop Group</th>
<th>Disclosures past 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>2</td>
</tr>
<tr>
<td>Maize</td>
<td>16</td>
</tr>
<tr>
<td>Small Grains</td>
<td>2*</td>
</tr>
<tr>
<td>Forage Grass</td>
<td>1**</td>
</tr>
<tr>
<td>Popcorn</td>
<td>21</td>
</tr>
<tr>
<td>Soybean</td>
<td>192</td>
</tr>
<tr>
<td>Total</td>
<td>234</td>
</tr>
</tbody>
</table>

*Oat **Orchard Grass

### Plant Breeding Graduate Students

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>U.S.</th>
<th>Intl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Graduate Students</td>
<td>25</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Graduates in 2006</td>
<td>8</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Graduates in 2005</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Graduates in 2004</td>
<td>7</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Graduates in 2003</td>
<td>14</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Graduates in 2002</td>
<td>9</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Graduates in 2001</td>
<td>13</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Graduates in 2000</td>
<td>10</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

### Job Placement of Recent Plant Breeding Graduates

<table>
<thead>
<tr>
<th>Year</th>
<th>Graduates</th>
<th># of Graduates to Job Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>8</td>
<td>5-Indust, 1-Public Univ.</td>
</tr>
<tr>
<td>2005</td>
<td>8</td>
<td>1-Industry, 1-Public Univ., 1-Farmer 1-ARS, 1-Nat. Program, 2-Student</td>
</tr>
<tr>
<td>2004</td>
<td>7</td>
<td>2-Indust, 2-Public Univ., 3-Student</td>
</tr>
<tr>
<td>2003</td>
<td>14</td>
<td>7-Indust, 1-ARS, 3-Public Univ., 1-Student</td>
</tr>
<tr>
<td>2002</td>
<td>9</td>
<td>5-Indust, 1-ARS, 1-Public Univ., 1-NGO, 1-Student</td>
</tr>
</tbody>
</table>

Demand for plant breeders is high. Industry representatives report shortages of applicants and jobs unfilled. Employers and potential students increasingly interested in "professional degree," which focuses more on basic breeding and research techniques.

### Iowa State University Plant Breeding Courses

**Introduction to Plant Breeding.** Breeding methods used in the genetic improvement of self-pollinated, cross-pollinated and asexually reproducing agronomic crops.

**Principles of Cultivar Development.** Theoretical and practical analysis of alternative breeding methods to improve crop plants.

**Field Methods in Plant Breeding.** Field experience in planning and conducting plant breeding research for cross-pollinated and self-pollinated crops.

**Advanced Plant Breeding.** Estimation and interpretation of genetic effects and variances of plant populations, prediction of genetic gain, inbreeding and heterosis.

**Genetic Strategies in Plant Breeding.** Evaluation of genetic, molecular, and cellular approaches to crop improvement; gene transfer methods.

**Plant Breeding Seminar.** Reports and discussion of recent literature and research in plant breeding.

### Institutional Philosophy

Establishment of the R.F. Baker Center for Plant Breeding, through endowment funding, shows the strong commitment of the university toward plant breeding efforts. Support for plant breeding has diminished over time as evidenced by the decrease in the numbers of plant breeders and the lack of state and federal funding support.

### External Grants and Contracts-Past 5 Years

<table>
<thead>
<tr>
<th>Crop Group</th>
<th>Funding Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage</td>
<td>$472,726</td>
</tr>
<tr>
<td>Maize</td>
<td>$5,7977,734</td>
</tr>
<tr>
<td>Small Grains</td>
<td>$1,362,189</td>
</tr>
<tr>
<td>Soy</td>
<td>$3,156,639</td>
</tr>
</tbody>
</table>

-15-
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