

# Plant Sciences Institute UPDATE

## New building is under way!

Friends and donors joined students, faculty and staff at the north edge of Iowa State's campus on a crisp October morning to commemorate breaking ground for the first building of the Plant Sciences Institute. The ceremonial groundbreaking for the Roy J. Carver Co-Laboratory culminated a weekend celebration that included an academic

symposium and a dinner with guests from the World Food Prize proceedings in Des Moines.

Speaking at the groundbreaking ceremony, Iowa State president Gregory Geoffroy said the new building is the outcome of the Plant Sciences Institute's early success and growth. "It's growing because it has the support of the universi-

ty and the people of Iowa. The institute and the new co-laboratory are a testament to the great spirit of cooperation that exists between the leaders of Iowa, its educational institutions, business and industries, and citizens," he said.

"We all recognize the institute as a big impact initiative—big in the impact it can have on strengthening agriculture, our state's economic foundation. Being a leader in the fundamental plant sciences opens worlds of possibilities," Geoffroy said.

The \$12.75 million facility is named for the Roy J. Carver Charitable Trust

## NSF awards plant genome grants to Iowa State

Iowa State University plant scientists have received five research grants totaling \$5.5 million in the National Science Foundation's Plant Genome Research Program. They are among 24 new grants totaling more than \$71 million that were awarded to 109 researchers at 39 institutions in 27 states. Iowa State faculty lead three of the research projects and are subcontractors on two others.

### PlantGDB—Plant Genome Database and Analysis Tools

*Volker Brendel, professor, zoology and genetics and statistics; \$158,996 for 2 years*

Brendel will develop a database of plant genomic sequences that correspond to fragments of genes that are actively transcribed under particular conditions. The database organizes the sequences into groups that represent unique genes. The fragments are annotated and, whenever possible, linked to their genomic DNA origins. The PlantGDB Web site will include bioinformatics tools that facilitate gene prediction and cross-species comparisons. The database will



Groundbreaking ceremony speakers, from left: Marna Yandean, plant sciences graduate student; Troy Ross, executive administrator, Roy J. Carver Charitable Trust; Lynne Sasmazer, program director, Carver Trust; Gregory Geoffroy, president, Iowa State University; Owen Newlin, president, Board of Regents, State of Iowa; Stephen Howell, director, Plant Sciences Institute; and Thomas Mitchell, president and CEO, Iowa State University Foundation.

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## From the director

It's the season to thank our benefactors and stakeholders for their support of the Plant Sciences Institute. We are beginning to reap the rewards from that investment. We pledged to leverage our funding from the legislature and private donors to raise extramural support of \$20M per year.

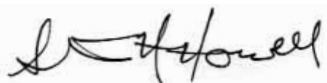


We're overjoyed to announce that we have reached that goal!

Institute scientists have been extremely successful in securing federal grants and contracts. For example, our scientists led the nation (tying only with Cornell) in landing awards or subawards in the prestigious National Science Foundation Plant Genome Program.

Institute scientists also continue to make important scientific contributions. Roger Wise, USDA scientist in the Center for Plant Responses to Environmental Stresses, cloned a gene in cereal crops that confers resistance to fungal infections. Fungal diseases cause the greatest losses to cereal grain production worldwide! Lee Alekel, Center for Designing Foods to Improve Human Nutrition, found that isoflavones in foods containing soy powder help maintain bone density in mid-life women. Martha James and Alan Myers, Center for Designer Crops, discovered a new gene in corn that is required for starch biosynthesis. They are collaborating with Exseed Genetics LLC (in association with the Center for Crops Utilization Research) toward the discovery of the entire suite of genes required to produce this valuable product.

We are very excited about these accomplishments! With your support, the institute can continue to produce more great science.



Stephen Howell  
Director

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## Next-generation maize database in development

An Iowa State professor is collaborating with the USDA's Agricultural Research Service to develop a publicly accessible, next-generation maize genome database at Iowa State.

Iowa State is home to the ZmDB, a high-traffic maize genome database on the Web. In this project, ZmDB will be developed further and integrated with MaizeDB, which the University of Missouri hosts.

Volker Brendel leads the USDA/ARS project. A professor of bioinformatics in zoology and genetics and statistics, Brendel is associated with the Laurence H. Baker Center for Bioinformatics and Biological Statistics.

He is involved in the collection, management and visualization of high-throughput genetic and genomic data, and recognizes the need for novel approaches and enhanced capacity to process information.

Brendel will survey current and future bioinformatics needs for the maintenance and analysis of maize genetic and genomic data, including a critical review of the status of existing information resources.

Working closely with technical and user advisory groups, Brendel and his team will identify a suite of genomic software tools that best meets the needs of the maize genetics and genomics community.

"We will integrate these tools into a well-documented and portable package that we hope is useful to other plant genome projects, as well as the USDA/ARS," Brendel said.

"Within the first year, we expect to develop a new middleware and front-end system for managing and viewing maize genome data," Brendel said. "We also expect this database to be a model for data integration and database architecture for other species."

## NSF awards plant genome grants/CONTINUED

provide snapshots of the current knowledge of plant gene composition and facilitate our understanding of plant genetics and evolution.

### **Nested Deletions: A New Tool for Plant Genomics Research**

*Thomas Peterson, associate professor, zoology and genetics and agronomy; \$648,549 for 3 years*

Peterson and his colleagues will create a new genetic technology to delete large portions of DNA in plant genomes. The ability to make large deletions quickly and efficiently will enable researchers to more easily locate a particular gene desired for study. Peterson already has tricked a plant transposon into making the deletions in the chromosomes of a living plant. How the plant is affected identifies the traits controlled by the deleted genes.

### **Establishment of Robust Maize Transformation Systems**

*Kan Wang, director of the Plant Transformation Center; \$4,227,981 for 5 years*

Wang and her colleagues at Purdue, Wisconsin and North Carolina State will establish a robust maize transformation system that will provide researchers in the public sector access to this critical technology. They will develop an Agrobacterium-mediated transformation system; enhance transgene integration and expression; investigate alternative

transformation protocols using non-tissue culture approaches; and expand transformation to more maize inbred lines. They also will provide training for research staff and organize transformation workshops for researchers.

### **Regulation of Inflorescence Architecture in Maize**

*Volker Brendel, professor, zoology and genetics and statistics; subcontract of \$445,247 from the University of California, Berkeley, for 5 years*

Researchers will identify the genes that determine the fates of seed-producing floral meristem and investigate how these genes are controlled. Maize will be the model system and compared with other cereals and grasses. Brendel will lead the computational data management and analysis, involving EST sequence data from the normalized ear and tassel cDNA libraries. Subsequent bioinformatics work will focus on designing and using new tools for the analysis of the microarray data from the research.

### **Activation-Tagged and Deletion Mutants and cDNA Microarrays for Functional Genomics of Rice**

*Patrick Schnable, professor, agronomy and zoology and genetics, subcontract from Kansas State University for 2 years*

Schnable is setting up microarrays to rapidly identify rice genes that are differentially regulated during infection.

## New building under way/CONTINUED

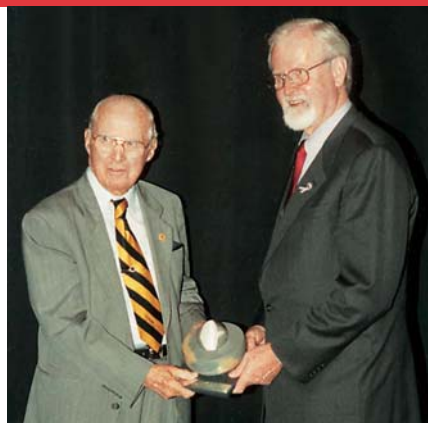
of Muscatine, which gave the lead gift of \$3 million. When completed in the spring of 2003, it will house state-of-the-art laboratories, research space for visiting scientists and small laboratories for business incubators. The three-story, 45,000-square-foot facility will include the Pioneer Hi-Bred Genomics Laboratory—with seed analysis and plant growth chambers—biochemistry laboratory suites, laser laboratories, a computer laboratory and administrative offices.



Sharing a moment on the podium during the groundbreaking ceremony Iowa State president Gregory Geoffroy (left) and Owen Newlin, president of the Board of Regents, State of Iowa.

“The new building will help propel Iowa State to the forefront of plant science research institutions. We are especially grateful to the Carver Trust for making this visionary facility possible,” said Stephen Howell, institute director.

Marna Yandeau, a fourth-year graduate student studying plant genetics, spoke on behalf of the future students who will benefit from the Carver Co-Laboratory. “The creation of the Plant Sciences Institute has further strengthened our plant sciences program at Iowa State through new graduate majors, lecture series and research centers. This state-of-the-art facility will give students hands-on training with even more opportunities for collaboration, scientific exploration



Honored dinner guests were Nobel Peace Prize Laureate and Iowa native Norman Borlaug (left) and Per Pinstrup-Andersen, who received the 2001 World Food Prize. Borlaug, known as the “father of the Green Revolution,” is co-founder of the World Food Prize.

and groundbreaking research.”

The symposium on Friday featured presentations by Roger Beachy, president, Donald Danforth Plant Science Center, St. Louis, and Patrick Schnable, director of Iowa State’s Center for Plant Genomics and Center for Plant

Transformation and Gene Expression. More than 150 faculty, students and visitors attended the symposium, which included research posters from Iowa State plant science graduate students.

On Friday evening, nearly 100 guests from the World Food Prize celebration joined Iowa State faculty and administrators for a dinner marking a new partnership between the World Food Prize and Iowa State.

## News Briefs

### World Food Prize appoints Geoffroy

Iowa State President **Gregory Geoffroy** has been appointed to serve on the council of the World Food Prize, renewing the relationship between the university and the World Food Prize Foundation. Iowa State will host a new lecture series dedicated to Norman Borlaug. Considered the Nobel Prize for food and agriculture, the World Food Prize was created to recognize exceptional achievement in improving the world’s food supply. In addition to Geoffroy, the 12-member council includes former U.S. presidents Jimmy Carter and George Bush.

### Much-deserved honor

For his international contributions to corn breeding over the past 43 years, retired Iowa State researcher

**Arnel Hallauer** received the 2001 Verdant Partners Crop Genetics Award. A \$10,000 agricultural scholarship in Hallauer’s name has been donated to Iowa State’s corn breeding program.

Hallauer, who retired in December, was director of the Raymond F. Baker Center for Plant Breeding and a distinguished professor of agronomy. He is a member of the National Academy of Science and of the USDA Agricultural Research Service’s Science Hall of Fame. His book, *Quantitative Genetics in Maize Breeding*, is a standard textbook for corn breeders.

Verdant Partners, an international crop genetics investment banking and consulting group, established the award, which was presented during the American Seed Trade Association’s December meeting.

### NSF appointment

**Parag Chitnis**, professor of biochemistry, has been appointed a program

officer at the National Science Foundation for 2002. He will administer the Arabidopsis 2010 program, a major federal initiative intended to determine the function of every gene in the Arabidopsis plant within 10 years. Chitnis conducts research in the Center for Plant Genomics.

### Kudos

Food science professor **Pamela White** and biochemistry professor **John Robyt** were honored at the American Association of Cereal Chemists Annual Meeting. White was honored for significant contributions to cereal science and technology. Robyt was recognized for superior contributions to fundamental starch science. Both research in the Center for Crops Utilization Research and the Center for Designing Foods to Improve Nutrition.

## Recent research grants

The following 29 new grants totaling \$9.2 million were awarded recently to plant science researchers at Iowa State.

### Establishment of Robust Maize Transformation Systems

National Science Foundation – \$4,227,981  
(ISU portion – \$1,671,761)  
(K. Wang, agronomy)

### Application of Biotechnology to Control the Soybean Cyst Nematode

United Soybean Board – \$934,746  
(W. Fehr, agronomy)

### Nested Deletions: A New Tool for Plant Genomics Research

National Science Foundation – \$648,549  
(T. Peterson, zoology and genetics)

### Center for Designing Foods to Improve Nutrition

Department of Agriculture – \$441,475  
(D. Birt, food science and human nutrition)

### U.S. Grown Ag-Based Industrial Lubricants Research Program

Department of Agriculture – \$326,674  
(L. Johnson, food science and human nutrition)

### Maize Gene Discovery, Sequencing and Phenotypic Analysis

Stanford University – \$276,221  
(V. Brendel, zoology and genetics)

### CRCD – Chemicals from Biorenewables

National Science Foundation – \$273,339  
(C. Glatz, chemical engineering)

### A New Generation Maize Genome Database

Department of Agriculture – \$185,133  
(V. Brendel, zoology and genetics)

### PlantGDB – Plant Genome Database and Analysis Tools

National Science Foundation – \$158,996  
(V. Brendel, zoology and genetics)

### Novel Approaches to New Soy Protein Ingredients with Enhanced Health Benefits

Department of Agriculture – \$150,000  
(P. Murphy, food science and human nutrition)

### Computational Methods for Functional and Comparative Genomics

National Institutes of Health – \$144,500  
(X. Gu, zoology and genetics)

### A Functional Genomics Program for Soybean

University of Illinois – \$138,745  
(R. Shoemaker, agronomy)

### The Proteome of Photosynthetic Membranes

Department of Agriculture – \$135,000  
(P. Chitnis, biochemistry, biophysics and molecular biology)

### An Integrated Program to Improve the Composition and Value of Iowa Soybeans

Iowa Soybean Promotion Board – \$124,592  
(M. Westgate, agronomy)

### Development of Maturity Group I-IV Varieties for the Better Bean Initiative

United Soybean Board – \$114,710  
(W. Fehr, agronomy)

### Soybean Transformation Program

Iowa Soybean Promotion Board – \$105,022  
(K. Wang, agronomy)

### Modeling Starch Granule Development in a Cyanobacterium

Department of Agriculture – \$100,000  
(M. Spalding, botany)

### A Potentially Cheaper Route to Soy Methyl Ester

United Soybean Board – \$96,910  
(J. Verkade, chemistry)

### Program for Developing a Second Generation of Value-Added Products from Mini-Soybean Mills

Iowa Soybean Promotion Board – \$88,120  
(T. Wong, food science and human nutrition)

### Development of Novel Soy Plastics

Iowa Soybean Promotion Board – \$80,000  
(R. Larock, chemistry)

### Studies of Disease Resistant Varieties of Soybean for Iowa

Iowa Soybean Promotion Board – \$77,493  
(B. Yang, plant pathology)

### Construction of a Soybean Yeast Artificial Chromosome Library

Iowa Soybean Promotion Board – \$50,000  
(K. Bhattacharyya, agronomy)

### Tools for Barley Microarray

CSREES North American Barley Genome/Oregon State University – \$50,000  
(E. Braun, plant pathology)

### Enhanced Database Management of Maize Germplasm Evaluation

Department of Agriculture – \$48,002  
(A. Hallauer, agronomy)

### Microarray Analysis of Rice Deletion Lines

International Rice Research Institute – \$44,000  
(P. Schnable, agronomy)

### Establishment of a Soybean Molecular Marker Laboratory

Iowa Soybean Promotion Board – \$40,000  
(M. Bhattacharyya, agronomy)

### Expanding the Instrumentation Database of the Official Grain Inspection System

Department of Agriculture – \$39,032  
(C. Hurburgh, agricultural and biosystems engineering)

### Gene Targeting and Gene Replacement: Enabling Precise Genetic Modifications in Plants

Phytodyne, Inc. – \$35,000  
(T. Peterson, zoology and genetics)

### Formulating Soy/Melamine-Urea-Formaldehyde Resins and Such Resins Containing Preservatives

Iowa Soybean Promotion Board – \$32,877  
(M. Kuo, forestry)

## Plant Sciences Institute UPDATE

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Prepared by University Relations, Teddi Barron, editor.

The Plant Sciences Institute at Iowa State University is dedicated to becoming one of the world's leading institutes for plant science research, education and unbiased research-based information. Researchers in nine centers of the institute seek fundamental knowledge about the functioning of plants and are developing ways to help feed the growing world population, strengthen human health and nutrition, improve crop quality and yield, foster environmental sustainability and expand the uses of plants for biobased products and bioenergy. The institute is supported through public and private funding. The work of the Plant Sciences Institute is expected to have economic benefits in Iowa and around the world.

On the Web at <http://www.plantsciences.iastate.edu/>

## IOWA STATE UNIVERSITY

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