Biosciences Alliance of Iowa Funds ISU Research

The Biosciences Alliance of Iowa (BAI) has awarded funding to two projects at Iowa State University that are designed to advance the state’s bioscience industry. BAI was formed by the Iowa Department of Economic Development to enhance the state’s efforts in key agricultural and medical areas.

BAI awarded $700,000 to Iowa State to establish the Human Nutrition Wellness Research Center. The center will evaluate the safety and efficacy of new foods, food ingredients or dietary supplements developed by Iowa-based companies. Funding will be used to purchase equipment and complete minor renovations to a building in the ISU Research Park.

“The creation of this center will give ISU researchers and Iowa-based companies focused on food and nutraceutical production an expanded capability to conduct human nutritional research studies and test new foods and supplements,” said Paul Flakoll, the leader of the new center. Flakoll is a professor of food science and human nutrition and director of the Center for Designing Foods to Improve Nutrition.

“Experts in nutrition from the University of Iowa and the University of Northern Iowa will make contributions to the research center, creating a model for collaboration between the three state institutions and industry,” Flakoll said.

The second BAI award is for a joint effort between Iowa State and University of Iowa researchers to create a high-throughput facility for development of animal models of human diseases. The ISU Center for Integrated Animal Genomics (CIAG) received $100,000 of the $500,000 that BAI committed to the project. The center includes faculty from the colleges of Agriculture, Human Sciences, Liberal Arts and Sciences, and Veterinary Medicine.

The research funds to CIAG will focus on potentially blinding eye diseases such as glaucoma and age-related macular degeneration. Iowa State researchers will develop models of ocular disease in large animals, while University of Iowa scientists will create small animal models. Both small and large animal models are needed by pharmaceutical companies interested in producing new therapies for humans.

“Animal models are necessary in order to fully take advantage of the power of the human genome project and other sequencing projects to develop new treatments for human disease,” said Max Rothschild, Charles F. Curtiss Distinguished Professor in Agriculture and director of CIAG. “Any group of corporate or academic institutions that has ready access to such models will have a significant advantage in the development and testing of new treatments.”

The initial funding is for one year. If state funding is available, the grants may be renewable.

In 2003, the state commissioned the Battelle Memorial Institute, Columbus, Ohio, to conduct a study on areas of university research that would provide opportunities for economic growth for Iowans. Their study, published in 2004, emphasized significant promise for Iowa’s dominance in seven areas of plant, animal and human bioscience, and the potential of developing the research into goods and services. BAI — representing science, industry, education, medicine, agriculture, economic development and government — was formed to steer development of the economic potential. BAI will be the focal point for determining priorities for state funding of university bioscience initiatives and will coordinate university and industry approaches to the development of the biosciences specific to economic opportunities.
Iowa State University is one of four institutions on the team selected for a $29.5 million, three-year project to sequence the maize (corn) genome, the most complex genome to be sequenced to date. Sequencing a genome reveals an organism’s genetic blueprint and opens the door for researchers to discover the role each gene plays in the life of the organism. Completion of the corn genome will allow scientists to more efficiently develop corn varieties for specific conditions and uses.

Patrick Schnable, professor of agronomy and director of the Center for Plant Genomics, and Srinivas Aluru, professor of computer and electrical engineering, will lead Iowa State’s effort.

The sequence data will be generated at the Genome Sequencing Center at Washington University School of Medicine, St. Louis. Other institutions on the team are the University of Arizona, Tucson, and Cold Spring Harbor Laboratory, New York. The project is funded by the National Science Foundation (NSF), the U.S. Department of Agriculture (USDA) and the Department of Energy (DOE).

“Being part of this significant federal project is national recognition that Iowa State is a major force in maize genomics. The investments the state, the university and industry have made in the Plant Sciences Institute are being acknowledged at the national level,” Schnable said.

“Using the very detailed map of all corn genes that will be produced by this project, we can begin to truly understand how the genome controls corn growth and development,” Schnable said.

This will allow scientists to more effectively develop corn with traits like enhanced nutrient composition for better food and feed, higher energy content for renewable fuel production, or improved characteristics for use in industrial raw materials. This will create new uses for corn and benefit both farmers and consumers.

NSF also has awarded Iowa State a separate $600,000 grant for equipment, with an additional $300,000 match from ISU’s Laurence H. Baker Center for Bioinformatics and Biological Statistics, to purchase a supercomputer to use in the corn genome sequencing project and other projects in plant genomics and systems biology. The new computer will likely rank among the world’s top 100 for speed and performance.

The National Science Foundation recently awarded $1 million to fund a national research team that will develop a new tool to decipher the functions of plant genes. The team is led by Basil Nikolau, Iowa State professor of biochemistry, biophysics and molecular biology; and director of the Center for Designer Crops and the W. M. Keck Metabolomics Research Laboratory. Other Iowa State researchers involved on the project are Julie Dickerson, associate professor of electrical and computer engineering; Philip Dixon, professor of statistics; George Kraus, University Professor of chemistry; Nicola Pohl, assistant professor of chemistry; and Eve Wurtele, professor of genetics, development and cell biology. Their work could define new ways to improve oils, starches and proteins from corn and soybeans.

Researchers from seven institutions will test the feasibility of using metabolomics to uncover the biological function of genes in Arabidopsis, a plant used as a model organism in research. The Arabidopsis genome was the first plant genome completely sequenced, an accomplishment that has proven invaluable to understanding plant biology -- including the biology of corn and soybeans. However, the functions of about one-third of the 25,000 genes in the Arabidopsis genome are still unknown.

“When we understand in detail how genes function to regulate biological processes in plants, we can develop foods and animal feeds that have better nutritional quality and crop-based sources for energy or industrial chemicals,” Nikolau said. “The grant builds upon Iowa State’s leadership and success in metabolomics.”

Last year, the university opened its $1.8 million W. M. Keck Metabolomics Research Laboratory. The laboratory is home to highly sophisticated separation and detection equipment to analyze a wide variety of metabolites and make it possible for researchers to conduct high-throughput microanalysis of metabolites in plant tissues.

Iowa State University will boost commercialization of campus research by using state economic development money to support promising projects and enhance the university’s technology transfer efforts. State lawmakers agreed last spring to appropriate $5 million per year for 10 years to Iowa’s three regent universities. The money is to be matched by the universities and used to grow Iowa’s economy. Iowa State’s share is $1.925 million for each of the 10 years. The Board of Regents, State of Iowa, approved Iowa State’s plan for the money in September.
“Iowa State University researchers have a record of turning campus innovations into businesses and commercial applications,” said John Brighton, Iowa State’s vice provost for research. “This funding demonstrates the state’s and Iowa State’s commitment to doing more to strengthen Iowa’s economy by generating and supporting high-tech industries.”

Iowa State’s plan for the economic development appropriation includes three programs:

• A one-year, $500,000 program to support short-term projects at six companies connected with Iowa State faculty and technologies. The money is designed to accelerate technology development and generate new economic activity within 12 months. Those companies are: Metabolic Technologies, Ames; BiOva, a joint venture of Glycon Technologies of Ames and partners in the poultry industry; Infiscape, Ames; CombiSep, Ames; CMNet, Ames; and Industrial Hard-facing Inc., Lamoni, Iowa.

• A commercialization program that will award grants to university projects with high potential for commercialization. In the first year, $825,000 in grants will be awarded. In years two through 10, funding for the grants will increase to $1.325 million. Grants will likely range from $25,000 to $200,000. There will be two competitions for the grants every year. Proposals for the first round of grants were due to Iowa State colleges by December 1. Award decisions will be made no later than January 31, 2006.

• Support for Iowa State offices that provide technology transfer services. The plan calls for $600,000 in extra support for technology transfer for each of the next 10 years. The money is designed to increase the capacity of Iowa State’s technology transfer efforts and promote an entrepreneurial culture on campus. The funding will support staff to assist faculty, work with Iowa industry and encourage entrepreneurship. It will also provide new commercialization tools, market research and private sector consultants.

“This is a significant new source of funds to support research and commercialization at Iowa State,” said Steve Carter, the director of Iowa State’s research park and Pappajohn Center. “For the state of Iowa, it is the first source of funds to encourage research with commercial applications. This is a great opportunity for the university and the state of Iowa.”

Lyric Bartholomay, assistant professor of entomology, was previously at the University of Wisconsin-Madison, where she earned her Ph.D. (2004) and worked as a post-doctoral fellow on mosquito-parasite interactions. Her current work at Iowa State continues investigation of these interrelationships, with focus on arthropod-borne viruses (arboviruses). Arboviruses such as Dengue and Yellow Fever viruses have a significant impact on global public health and economics and have recently entered the limelight in the United States with the emergence of West Nile virus. Dr. Bartholomay’s studies employ microarrays and bioinformatics tools to describe the molecular response within the mosquito that is triggered by infection with a pathogen. The goal of these studies is to better understand the capacity of the mosquito immune response and the capabilities of the pathogen to circumvent that response. Lyric can be reached by phone at 515-294-0594 in her office (442 Science Hall II) or by email at lyricb@iastate.edu.

Jeffrey Essner joins the department of genetics, development and cell biology as an assistant professor. He received his Ph.D. from the University of Minnesota where he began using the zebrafish model system to understand the cellular roles of proto-oncogenes. He did postdoctoral training at the Scripps Research Institute in La Jolla, California, followed by a research faculty appointment at the Huntsman Cancer Institute at the University of Utah. More recently, Essner was the scientific director at Discovery Genomics, Inc., a biotechnology company that uses zebrafish for high-throughput analysis of gene function.

Essner’s current work at Iowa State University uses zebrafish to model events that are critical to the progression of cancer and to identify genes that are required for these processes. Central to Essner’s research program is an effort to understand the genes that are required for tumor angiogenesis. Angiogenesis represents a specialized type of vascularization whereby new vessels are formed by the budding of endothelial cells from existing vessels. This allows the tumor to receive nourishment for further growth and provides a route for cancer cells to metastasize to other parts of the body. During angiogenesis, endothelial cells must first bud from existing vessels by passing through the vessel basement membrane in a manner similar to invasive cancer cells. By modeling this in zebrafish, Essner and his colleagues have identified several new genes involved in angiogenesis.

Essner’s office is in room 2216 of the Molecular Biology Building. He can be reached by phone at 515-294-7133 or email at jessner@iastate.edu

**Upcoming Events**

**January 6, 2006** — Bioethics Retreat. Scheman Building, Iowa State Campus. “Ethics, Science and Politics.” Information and registration are available online at www.bioethics.iastate.edu/retreat.html
The following are a subset of the grants recently awarded for biotechnology-related research at ISU. For more information about establishing research relationships with ISU biotechnology researchers, please contact Lisa Lorenzen at llorenze@iastate.edu.

Aluru, S. Electrical and Computer Engineering. CREST: Center of Research Excellence in Bioinformatics and Computational Biology. New Mexico State University.


Fei, S. Horticulture. Identification of Cold Regulated Genes in Ryegrass. US Department of Agriculture, ARS.


Rice, M. Entomology. Evaluation of Transgenic Corn for Control of Corn Pests. Syngenta.