UA-Led Research Team Awarded $50 Million to Solve Plant Biology's Grand Challenges

Contacts: Deborah Daun, BIO5 Office 520-626-2059 / Cell 520-247-7440 / Email ddaun@email.arizona.edu
Johnny Cruz, UANews, Office 520-621-1679 / Cell 520-307-3362 / Email cruzj@email.arizona.edu
Lisa Joy Zgorsky, National Science Foundation, Office (703) 292-8311 / Cell 202-285-7396 /Email lzgorski@nsf.gov

(Tucson, AZ -- Jan. 30, 2008) -- The National Science Foundation (NSF) has awarded a University of Arizona–led team $50 million dollars to create a global center and computer cyberinfrastructure within which to answer plant biology's grand challenge questions, which no single research entity in the world currently has the capacity to address. The project will unite plant scientists, computer scientists and information scientists from around the world for the first time ever to provide answers to questions of global importance and advance all of these fields.

The five-year project, dubbed the iPlant Collaborative, potentially is renewable for a second five years for a total of $100 million.

"This global center is going to change the way we do science," says UA plant sciences professor and BIO5 member Richard Jorgenson, PhD, who is the lead investigator and director of the iPlant Collaborative. "We're bringing many different types of scientists together who rarely had opportunities to talk to one another before. In so doing, we'll create the kind of multidisciplinary environment that is necessary to crack the toughest problems in modern biology."

Other institutions working with The University of Arizona (UA) include Cold Spring Harbor Laboratory (CSHL) in New York, Arizona State University (ASU), the University of North Carolina at Wilmington (UNCW) and Purdue University. The project's board of directors will be chaired by Robert Last, PhD, from Michigan State University.

About 79 percent of the grant will stay at the UA, with CSHL receiving approximately 16 percent, ASU four percent, and UNCW and Purdue a combined one percent.

UA participants in the iPlant Collaborative include BIO5, the College of Agriculture and Life Sciences' Department of Plant Sciences, the College of Science's Departments of Computer Science, Mathematics, and Ecology and Evolutionary Biology, the Eller College of Management's Department of Management Information Systems, the College of Engineering's Department of Electrical and Computer Engineering, the Arizona Research Lab's Biotechnology Computing Facility, and University Information Technology Services.

The iPlant center will be located in the UA's BIO5 Institute in Tucson and will be administered by BIO5, the UA's premier biotechnology center. BIO5 was founded to encourage collaboration across scientific disciplines, accelerate the pace of scientific discovery and develop innovative solutions to society's most complex biological challenges.

Welcome News to Arizona Leaders

The award—one of the largest NSF grants ever to an Arizona entity—came as welcome news to Arizona's leaders, who have been working to build the state's bioscience capacities in research and economic development.

"Today's announcement is proof that our investment in higher education is paying off," Arizona Gov. Janet Napolitano said at an Arizona state capitol news conference. "Arizona's future lies in innovation in areas like the biosciences, and we are tremendously proud that the National Science Foundation has chosen Arizona to chart a new course in plant science research."

"This is the sort of big return on investment that the UA has promised the State of Arizona since the BIO5 Institute was opened and housed with critical state investments," said UA President Robert N. Shelton. "BIO5 is ideally suited to house the iPlant Collaborative. Its work will span scientific disciplines and bring together plant biologists of all kinds to examine plant life across its entire continuum, from individual plant cells to entire ecosystems."

"This remarkable grant recognizes the great work being done every day by the researchers and students of The University of Arizona, particularly in the field of bioscience research. The UA has emerged as a leader in bioscience research and education, and I appreciate the National Science Foundation for recognizing their capabilities. Their achievement under this grant will benefit the people of Southern Arizona as well as all Americans," says Congressman Raul Grijalva.

“The iPlant team,” said Joann Roskoski, PhD, executive officer of the NSF Directorate for Biological Sciences, “has a compelling vision for an organization by, for and of the community, that will bring to bear the power of cyberinfrastructure to enable scientists everywhere to take on some of the most important questions in plant science.”

The iPlant Collaborative will create both a physical center and a virtual computing space where researchers can communicate and work together as they share, analyze and manipulate data, all while seeking answers to plant biology’s greatest unsolved mysteries—its grand-challenge questions.

Solving grand challenges is crucial, Jorgensen says, because plants affect every aspect of our lives. “Everything’s connected,” he explains. “As our climate changes and our environment changes we need to have a deep understanding of the biology of plants from the molecular to the ecosystem level in order to understand and mitigate the problems that will arise—to adapt as best we can and to focus our efforts on saving the organisms and ecosystems that are most important to save.”

The collaborative is designed so that any research team from any consortium of institutions or disciplines can propose a grand-challenge question. iPlant will facilitate the identification of such questions by the plant biology community (two to four the first year) and develop the iPlant cyberinfrastructure to help scientists answer those questions.

The cyberinfrastructure and the researchers will rely heavily on computational thinking, a form of problem-solving that assigns computers the jobs they’re most efficient at, and in doing so frees up humans to spend more time on the creative tasks that humans do best. The iPlant cyberinfrastructure will serve as a model for solving problems in fields outside of plant biology, too.

One feature of iPlant that will be developed is the ability to map the full expanse of plant biology research in much the way that Google Earth physically maps our planet. Like users of Google Earth, users of iPlant may one day be able to “zoom” in and out among various levels of plant biology, from the molecular to the organismic to the ecosystem level. For example, a researcher might “zoom in” to analyze the carbon fixed, oxygen produced and water utilized by individual leaves, then “zoom out” to analyze how all of these might affect large-scale changes in ecosystems and how that could in turn affect air quality and climate.

Because collaboration among disciplines is central to iPlant’s mission, the cyberinfrastructure also will have a strong social networking component for both facilitating communication among researchers from different fields as they work and for researching the effectiveness of social networking in iPlant and in the plant and computer and information sciences generally.

All iPlant projects will have K–12, undergraduate and graduate education components as well, which are co-funded by NSF, BIO5 and Science Foundation Arizona. Students, teachers and the public will all have access to iPlant’s resources and data, as well as to educational tools designed to help them understand that data and develop inquiry-based learning modules for K–12, undergraduate and graduate science education.

“The learning activities that will evolve from the iPlant collaborative will bring the challenges of real-world problem-solving and discovery to the classroom for both students and teachers. Science Foundation Arizona’s investment will ensure that Arizona students are engaged from day one,” says William C. Harris, PhD, president and CEO, Science Foundation Arizona.

BIO5 Director Vicki Chandler, PhD, also a principal investigator, explains, “Because of the internet and cyberinfrastructure, this is the first time in the history of science that everyone can access the same data at the same time using the same tools as the researchers generating that data. The exciting challenge is to produce tools that students and teachers can readily access.,”

Each proposed grand-challenge question will have practical applications and societal implications. For a field like plant biology, those implications are many and far-reaching. “Human existence on this planet is absolutely dependent on plants,” Chandler says. “Our houses, our food, our atmosphere—everything about the quality of human life depends on plants.”

###