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Award Abstract #1428148

MRI: Development of an ENVIRATRON - an accelerator for climate change research

NSF Org:	DBI Div Of Biological Infrastructure
Initial Amendment Date:	August 25, 2014
Latest Amendment Date:	August 25, 2014
Award Number:	1428148
Award Instrument:	Standard Grant
Program Manager:	Robert Fleischmann DBI Div Of Biological Infrastructure BIO Direct For Biological Sciences
Start Date:	September 1, 2014
End Date:	August 31, 2017 (Estimated)
Awarded Amount to Date:	$929,773.00
Investigator(s):	Steven Whitham swhitham@iastate.edu (Principal Investigator) Thomas Lubberstedt (Co-Principal Investigator) Stephen Howell (Co-Principal Investigator) Lie Tang (Co-Principal Investigator) Carolyn Lawrence-Dill (Co-Principal Investigator)
Sponsor:	Iowa State University 1138 Pearson AMES, IA 50011-2207 (515)294-5225
NSF Program(s):	MAJOR RESEARCH INSTRUMENTATION
Program Reference Code(s):	9150
Program Element Code(s):	1189

ABSTRACT

An award is made to Iowa State University to develop and construct an Enviratron, a facility to test and evaluate the performance of plants under variable environmental conditions. To date most research on the performance of plants under different environmental conditions has been conducted with a limited number of differences, such as a single environmental stress versus control (unstressed) conditions. The Enviratron will permit researchers to incrementally alter multiple critical variables to better simulate changing conditions that will be faced in the future. The Enviratron will be an important research and training tool for students in the plant sciences, particularly for underrepresented minorities who will participate in the project through the George Washington Carver Summer Research Internship Program. It will provide them with the experience of simulating different environmental conditions or different climates of the world and the opportunity to study and improve the performance of plants under those conditions. It will also inspire engineering students to learn how to work hand in hand with plant scientists. The Enviratron will also be a demonstration centerpiece open to farmers and other visitors to promote appreciation and a better understanding of agricultural research.

Understanding how organisms in the biosphere can adapt to climate change is one of the grand scientific challenges of these times. This project creates a phenomics platform that will enable researchers to non-destructively monitor the performance of plants throughout their lifecycle under variable environmental conditions. The Enviratron represents a revolutionary new design in plant phenomics facilities. It consists of an array of plant growth chambers to create different environmental conditions. Unlike commercial plant phenomics systems, plants will not be conveyed out of the growth chambers to monitor their growth performance, rather a rover with a robotically controlled arm will periodically visit each chamber to image and analyze the plants. In addition to more standard visible light, fluorescence, near infrared and infrared imaging, sensors on the rover will be capable of imaging and conducting analyses not available on commercial systems such as hyperspectral and holographic imaging and Raman spectroscopy. The robot-assisted sensing approach will enable precise location-specific data acquisition, resulting in improved sampling strategies and data quality. The Enviratron will be used for research as well as graduate and undergraduate student training and will be located in a facility where it can be used to educate the public about climate change research.

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