**Award Abstract #1545453**

**NRT-DESE: P3 -- Predictive Phonemics of Plants**

**NSF Org:** DGE Division Of Graduate Education

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**Program Manager:** Richard Tankersley
DGO Division Of Graduate Education
EMR Direct For Education and Human Resources

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**NSF Program(s):** NSF Research Traineeship (RT)

**Program Reference Code(s):** 9115, 9179, DRET

**Program Element Code(s):** 1997

**ABSTRACT**

NRT- DESE: Predictive Phonemics of Plants (P3)

New methods to increase crop productivity are required to meet anticipated demands for food, feed, fiber, and fuel. Using modern sensors and data analysis techniques, it is now feasible to develop methods to predict plant growth and productivity based on information about their genome and environment. However, doing so requires expertise in plant sciences as well as computational sciences and engineering. This National Science Foundation Research Traineeship (NRT) award to Iowa State University will bring together students with diverse backgrounds, including plant sciences, statistics, and engineering, and provide them with data-enabled science and engineering training. The collaborative spirit required for students to thrive in this unique intellectual environment will be strengthened through the establishment of a community of practice to support collective learning. This traineeship anticipates preparing four- to five-year (PhD) master’s and doctoral students, including twenty-eight (28) funded doctoral students, with the understanding and tools to design and construct crops with desired traits that can thrive in a changing environment.

Understanding how particular genetic traits result in given plant characteristics under specific environmental conditions is a core goal of modern biology that will facilitate the efficient development of crops with commercially useful characteristics. Plant characteristics are influenced by genetics and a wide range of environmental factors, including, for example, rainfall, temperatures and soil types. Developing methods to effectively integrate these diverse inputs that take advantage of existing biological, statistical, and engineering knowledge will be a key area in this research and training program that will bring together faculty from eight departments. Trainees will engage in cutting-edge research and development areas involving direct data collection and analysis from living plants, including sensor development, high throughput robotic technology, and biological feature extraction through image analysis. This traineeship will use the training model to provide students with training across a broad range of disciplines while developing a deep technical expertise in one area. This expertise, in combination with software skills development, will enable the trainees to work across organizational and cultural boundaries as well as scientific disciplines. To develop understanding of how to share knowledge with diverse groups, the program will provide students with training beyond traditional coursework and research through activities that will develop advanced communication and entrepreneurship skills. Additionally, internship opportunities in industry, national labs, and other settings will equipping trainees to choose among diverse career paths available to scientists and engineers.

The NSF Research Traineeship (RT) Program is designed to encourage the development and implementation of bold, new, potentially transformative, and scalable models for STEM graduate education training. The Traineeship Track is dedicated to effective training of STEM graduate students in high priority interdisciplinary research areas through the comprehensive traineeship model that is innovative, evidence-based, and aligned with changing workplace and research needs. Please report errors in award information by writing to awardsearch@nsf.gov.