Opportunity Title: Establishing a Cross-Kingdom Gene Regulation Capability to Enhance Fungal Nutrient Uptake
Opportunity Reference Code: ORNL-HBCU-MEI-2019-0003

Organization Oak Ridge National Laboratory (ORNL)

Reference Code ORNL-HBCU-MEI-2019-0003

How to Apply All documents must be submitted via Zintellect. All application components **must** be completed and received in the system in order to be considered.

Application deadline January 11, 2019 at 11:59 pm EST.

For questions, please contact HBCUMEI@orau.org.

Application Deadline 1/14/2019 11:59:00 PM Eastern Time Zone

Description ORNL is the largest science and energy laboratory in the Department of Energy system. Areas of research include materials, neutron sciences, energy, high-performance computing, systems biology and national security. Visit http://www.youtube.com/watch?v=NSCdUJ8cavw to discover some exciting reasons why ORNL offers a great internship experience!

Benefits:

- Selected faculty spend 10 weeks (Summer Term) at Oak Ridge National Laboratory (ORNL) engaged in a research project under the guidance of a laboratory scientist.
- Faculty members build collaborative relationships with ORNL research scientists, become familiar with ORNL sponsored research programs, scientific user facilities, and potential funding opportunities.
- ORNL may provide laboratory tours, scientific lectures and seminars, workshops on accessing ORNL scientific user facilities.
- Host laboratories provide all required site specific training.

Project:

Nitrogen (N) and phosphorus (P) are the two most important limiting plant nutrients. Ectomycorrhizal fungi *Laccaria bicolor* and *Paxillus involutus* can import N and P, respectively, from soil and then export them to the roots of bioenergy crop poplar. However, the molecular mechanism regulating N and P acquisition in these fungi remains elusive and it is not clear whether plants can regulate fungal genes associated with nutrient uptake. This project tests the hypothesis that plant-secreted effector proteins (SEPs) can be utilized to deliver regulatory proteins into fungal nuclei to enhance nutrient acquisition. We will identify poplar SEPs that move from roots to fungal nuclei, followed by identification of protein domains responsible for SEP movement from plants to fungi. Also, we will identify genes regulating nutrient uptake in fungi through analysis of fungal gene expression in response to nutrient deficiency. Finally, a *novel cross-kingdom gene regulation capability* will be established to enhance nutrient uptake, which can be over-expressed in plants and specifically designed to control activities in fungal nuclei. This novel capability for remote reprograming of microbial gene expression from the plant host is essential for ORNL's proposed BER biomolecular facility, enabling leadership in bioenergy, environmental sustainability, health and food safety.

Faculty Mentor/Point of Contact (email address): Xiaohan Yang (yangx@ornl.gov)

Qualifications **Applicant must be a faculty member at a HBCU/MEI at the time of application.**

Background in molecular biology, genetics, microbiology, cell biology or biotechnology.

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Eligibility Requirements

- **Citizenship:** LPR or U.S. Citizen
- **Degree:** Any degree .
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12 👁)
  - **Engineering** (1 👁)
  - **Environmental and Marine Sciences** (1 👁)
  - **Life Health and Medical Sciences** (45 👁)

Affirmation I am a faculty member at one of the nationally recognized HBCU or MEI institutions. I can provide certification of my faculty position, if requested.