**GENERAL INFORMATION**

**Program sponsor:** Princeton Environmental Institute  
**Position number:** W1ZH6  
**Project title:** Evaluating the role of unusual nitrogen input enzymes in the global nitrogen cycle  
**Organization/research group:** Zhang Lab  
**Primary location(s) of internship:** Princeton University  
**Additional cities and/or countries to be visited (if applicable):** n/a

**Note:** If this internship is located in a country with an International SOS risk rating of High or Extreme, final candidates must participate in a travel review process overseen by the Travel Oversight Group (TOG), and obtain safety guidance prior to departure. The University reserves the right to revoke support and funding for travel at any time there has been a significant deterioration in the safety and security conditions surrounding travel arrangements, or in the sector of the country, or countries, where travel is to occur.

**FACULTY SPONSOR(s)/HOST INFORMATION**

**Name(s):** Xinning Zhang  
**University Department(s):** GEO  
**E-mail:** xinningz@princeton.edu  
**Website:** https://scholar.princeton.edu/xinningz/

**INTERNERSHIP/RESEARCH PROJECT INFORMATION**

**Internship/project description:**

Over the past century, humans have been adding enormous amounts of industrially produced nitrogen fertilizer to the environment, altering ecosystem structures and creating eutrophication and “dead zones” in many bodies of water. One strategy to counteract nitrogen pollution is to replace industrial fertilizers with techniques to enhance natural nitrogen inputs, like the microbial conversion of nitrogen gas into ammonium (“biological nitrogen fixation”). Achieving this longterm goal will require a thorough understanding of the variables that control when, where and how this natural process occurs. In this project, the intern will get to participate in our search to figure out what controls the activity of different forms of the enzyme (called nitrogenase) that catalyze this process. Their project will center around a novel method, ISARA, which uses isotopic measurements to distinguish these enzymes. Depending on the student’s interests, this project has the potential to go in several directions, such as laboratory cultures with model microorganisms, work with field samples, or bioinformatics work to study differences between organisms with different forms of nitrogenase.

**Student’s role and responsibilities:**

The student will inoculate, maintain, sample, and harvest cultures or environmental samples of microbes. They will measure the rate of nitrogen fixation in these samples, and collect and analyze samples to determine the fraction of nitrogen fixed by the different forms of nitrogenase.
Internship/project learning objectives:
The student will learn sterile culturing techniques, sample preparation for carbon and nitrogen isotopic analysis, and the acetylene reduction assay (ARA) to measure the rate of nitrogen fixation. They will learn how to work with gas and liquid samples, and get to use instruments including gas chromatography flame ionization detector (GCFID), gas chromatography thermal conductivity detector (GCTCD), and gas chromatography mass spectrometry (GCMS). More broadly, our goal is for the intern to develop an appreciation for the immense role that microbial physiology plays in the global nitrogen cycle.

PROGRAM REQUIREMENTS

Academic background and any course pre-requisites:
None, although some knowledge of chemistry and / or microbiology would be useful

Technical skills:
None, although some chemistry or biology lab course experience would be useful.

Additional training(s):
The student will need to take the university lab safety training and non-user radioisotope training.

Equipment:
None

Physical demands:
Ability to stand up in lab for several hours

Language abilities/competencies (if applicable): None

Additional information about the internship/project:
Selected student(s) will need to complete lab safety and radiation safety trainings prior to the start of the internship.

INTERNATIONAL TRAVEL REQUIREMENTS (if applicable)

Visa(s) required? Yes [ ] No [ ]
Research permit/pass required? Yes [ ] No [ ]
Immunizations required? Yes [ ] No [ ]

INTERNSHIP/PROJECT SUPERVISOR(S)

Name and title of primary supervisor: Xinning Zhang
Email: xinningz@princeton.edu
Phone:

Name and title of additional supervisor, if applicable: Katja Luxem
Email: kluxem@princeton
Phone:

PROGRAM DATES AND FUNDING INFORMATION

Weekly Stipend: $500
Number of Positions Available: 1-2
Tentative Start Date (mm/dd/yyyy): flexible
Number of Weeks: 8-10
Tentative End Date (mm/dd/yyyy): flexible

Note: PEI funding is for full-time work, 35 hours per week minimum, and for a period of at least 8 continuous weeks.

Application Deadline: January 11, 2019