**GENERAL INFORMATION**

Program sponsor: Princeton Environmental Institute  
Position number: C1SIG  
Project title: Reconstruction of Southern Ocean Surface Nutrient Conditions during Previous Interglacial Periods  
Organization/research group: Sigman Group  
Primary location(s) of internship: Princeton University, Guyot Hall  
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): Daniel Sigman  
University Department(s): Department of Geosciences  
E-mail: sigman@princeton.edu  
Website:  
Phone: 

**INTERNSHIP/RESEARCH PROJECT INFORMATION**

Internship/project description:

Anthropogenic carbon emissions are beginning to alter global climate. The deep ocean is a vast carbon reservoir, and at the same time one of the largest natural sinks of anthropogenic CO2. The rate of Southern Ocean overturning, the circulation that connects the surface ocean to the deep ocean, strongly modulates the efficiency with which CO2 is sequestered in the deep ocean.

How does climate impact the rate of Southern Ocean overturning and its role in the global carbon cycle? To answer this question, we will measure the nitrogen isotopic ratio of organic matter preserved in the microfossil of marine phytoplankton to reconstruct nutrient conditions in the Southern Ocean surface during the current interglacial period (the "Holocene") and three prior warm periods.

**Student's role and responsibilities:**

In the laboratory work, the student intern will be responsible for the sample preparation processes prior to final isotopic analysis, which includes separation of diatom microfossils from marine sediments and cleaning of microfossils.

In terms of data analysis and scientific discussion, the student will put together the record, identify the rough time period and come up with preliminary interpretation of the data.
**Internship/project learning objectives:**

Upon completing this project, the student should have a hands-on familiarity with deep sea sediment cores as archives of information about past environmental conditions, with some specialized knowledge about diatoms, "the grass of the sea." The student should have acquired basic laboratory skills of conducting geochemical analysis and know the principles of isotopic analysis. The student should also know the basics of ocean circulation, the nitrogen and carbon cycle in the ocean, and the role of ocean in climate changes. From data compilation and analysis, the student should be able to use Excel and Matlab to make plots and communicate the results.

**PROGRAM REQUIREMENTS**

**Academic background and any course pre-requisites:**

Basic knowledge in chemistry and physics.

**Technical skills:**

Basic chemistry laboratory skills preferred.

**Additional training(s):**

The student will complete lab safety training before beginning any lab work.

**Equipment:**

The student should bring a laptop.

**Physical demands:**

n/a

**Language abilities/competencies (if applicable):** n/a

**Additional Information about the internship/project:**

Selected students will need complete lab safety training prior to the start of the internship.

**INTERNATIONAL TRAVEL REQUIREMENTS (if applicable)**

<table>
<thead>
<tr>
<th>Visa(s) required?</th>
<th>Research permit/pass required?</th>
<th>Immunizations required?</th>
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<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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**INTERNSHIP/PROJECT SUPERVISOR(S)**

**Name and title of primary supervisor:** Xuyuan (Ellen) Ai

**Email:** xuyuana@princeton.edu  
**Phone:** 609-480-1436

**Name and title of additional supervisor, if applicable:** n/a

**E-mail:** Phone:

**PROGRAM DATES AND FUNDING INFORMATION**

<table>
<thead>
<tr>
<th>Weekly Stipend: $500</th>
<th>Number of Positions Available: 1</th>
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<tbody>
<tr>
<td>Tentative Start Date (mm/dd/yyyy): 06/03/2019</td>
<td>Number of Weeks: 11</td>
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<tr>
<td>Tentative End Date (mm/dd/yyyy): 08/16/2019</td>
<td>Note: PEI funding is for full-time work, 35 hours per week minimum, and for a period of at least 8 continuous weeks.</td>
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**Application Deadline:** January 11, 2019