**GENERAL INFORMATION**

Program sponsor: Princeton Environmental Institute

Position number: W1MYN

Project title: Assessing Exposure of Children to Waterborne Pollutants Using their Deciduous Teeth

Organization/research group: Myneni Group

Primary location(s) of internship: Princeton University

Additional cities and/or countries to be visited (if applicable): May involve travel to Hawaii/Iceland/India.

**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): Satish Myneni

University Department(s): Geosciences

E-mail: smyneni@princeton.edu  
Phone: 8-5848

Website: myneni.princeton.edu

**INTERNSHIP/RESEARCH PROJECT INFORMATION**

Internship/project description:

Human exposure to the environmental milieu is a key factor in the development of brain. Because human brain development is more than 80% complete by the age of 3, assessing children’s exposure to environmental toxins during early years is central to understanding the neurological development of children living in regions where water is highly polluted. While children’s blood analyses have been used to assess their exposure to toxins, deciduous teeth, on the other hand, offer clues to the long-term exposure levels. Deciduous teeth are made up of stable mineral, apatite, Ca5(PO4)3OH, and a variety of pollutants, such as lead, arsenic and fluoride, can substitute in its structure. Similarly, organic contaminants, such as insecticides and antibiotics, can become part of dentine and also stay in the inter-granular spaces of apatite. Slow and long-term exposure of humans to low levels of water contamination is more common in the world, and this study can provide valuable clues where commonly used blood analysis fails.

The hypothesis that will be tested in this study is the level of pollutant substitution in children’s deciduous teeth is directly related to pollutant levels in blood (and potable water), and microscale variations in pollutant concentrations in teeth are related to the systematic time-dependent variations in exposure levels. Creating a tool to assess environmental toxins in teeth would provide a new, more cost-effective and faster way to monitor intensity of water contamination in both developed and under developed countries.

**Student’s role and responsibilities:**

Using sampling of deciduous teeth of children for selected water pollutants (arsenic and fluoride) in affected and control areas in NJ, and if possible in India, and laboratory simulations on contaminant partitioning in teeth, we propose to develop a robust assessment tool for long-term children’s exposure to environmental toxins. Students are expected to help with sample collection in association with local school districts, compile contaminant exposure information and if necessary potable water analysis, and conduct in-depth analysis of deciduous teeth using X-ray and mass-spectrometers. In addition, students are also expected to conduct in-vitro laboratory simulations for assessing level of substitution of contaminants in teeth.
**Internship/project learning objectives:**

Students will learn how to collect samples for human pollutant exposure analysis and related research, and learn different techniques related to chemical analyses.

**PROGRAM REQUIREMENTS**

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

Chemistry background (CHM201, CHM202) is essential. Background in advanced inorganic chemistry and organic chemistry are helpful but not necessary.

**Technical skills:**

Laboratory skills from introductory CHM courses is essential.

**Additional training(s):**

n/a

**Equipment:**

n/a

**Physical demands:**

Some hiking is needed, but not very strenuous.

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

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

Selected student will be required to complete lab safety, protecting human research participants (IRB), radiation safety and workplace safety trainings prior to the start of the internship. If travel is required, selected student should consult UHS for travel medical information. Visas may be required for int'l travel.

**INTERNATIONAL TRAVEL REQUIREMENTS (if applicable)**

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<th>Visa(s) required?</th>
<th>Research permit/pass required?</th>
<th>Immunizations required?</th>
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**INTERNSHIP/PROJECT SUPERVISOR(S)**

**Name and title of primary supervisor:** Satish Myneni

**Email:** smyneni@princeton.edu **Phone:**

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

**E-mail:** Phone:

**PROGRAM DATES AND FUNDING INFORMATION**

**Weekly Stipend:** $500 (plus int'l travel award, if applicable) **Number of Positions Available:** 1

**Tentative Start Date (mm/dd/yyyy):** 06/09/2019 **Number of Weeks:** 10-12

**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