GENERAL INFORMATION

Program sponsor: Princeton Environmental Institute

Position number: E1SMI2

Project title: Helmholtz Resonators as a Small, Lightweight, and Versatile Wind Energy Harvesting Device

Organization/research group: Smits Fluid Mechanics 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): Prof. Alexander Smits, Dr. Tyler Van Buren

University Department(s): MAE

E-mail: asmits@princeton.edu Phone: (609) 258-5117

Website:

INTERNERNSHIP/RESEARCH PROJECT INFORMATION

Internship/project description:

Through past research funded by the Andlinger center and PEI, we have tested and confirmed the feasibility of an innovative device for generating power from the wind. The device couples a piezoelectric element to a Helmholtz resonator to create an efficient wind energy collection device. Recent experiments have shown that we can successfully generate up to 8 W/m^2, exceeding typical wind farm outputs. We envision these could be used in urban areas, where high wind exist but turbines can not, or can be used to power devices in remote locations. We hope to continue to optimize performance and improve design. Specifically, we are looking to improve upon the complex interplay between the electronic and acoustic aspects of the device through circuit design modification.

Student's role and responsibilities:

The students on the project will have the following role/tasks:

(1) Improve upon the design of our Helmholtz resonator and test facilities.

(2) Design and test custom circuits to optimize the power output of the device, as well as consider energy storage possibilities.

(3) With a research engineer, conduct experiments that can assess the ability for us to harvest wind energy, with the project culminating in a field test with real wind.

(4) Analyze and interpret the findings.
Internship/project learning objectives:

By the end of the project, the students should have enhanced their abilities in:

1. Model design and fabrication
2. Mechanical design, construction, and operation of testing facilities.
3. Scientific data acquisition and analysis
4. Interpretation, communication, and dissemination of their scientific findings.

PROGRAM REQUIREMENTS

Academic background and any course pre-requisites:
Preferred: engineering, science, electronics

Technical skills:
Preferred: Matlab, CAD, circuit design

Additional training(s):
Lab safety and laser safety training are required.

Equipment:
n/a

Physical demands:
n/a

Language abilities/competencies (if applicable):

Additional information about the internship/project:
Selected student(s) will need to complete lab safety training 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 ☐

INTERNERNSHIP/PROJECT SUPERVISOR(S)

Name and title of primary supervisor: Alexander Smits
Email: asmits@princeton.edu Phone: (609) 258-5117

Name and title of additional supervisor, if applicable: Tyler Van Buren
Email: tburen@princeton.edu Phone: (518) 867-9093

PROGRAM DATES AND FUNDING INFORMATION

Weekly Stipend: $500
Tentative Start Date (mm/dd/yyyy): 6/11/2019
Tentative End Date (mm/dd/yyyy): 08/31/2019

Number of Positions Available: 2
Number of Weeks: 8-10

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