Opportunity Title: Monitoring the Structural Integrity of Legacy Radioactive Facilities
Opportunity Reference Code: DOE-MSIPP-16-06-LANL

Organization U.S. Department of Energy (DOE)

Reference Code DOE-MSIPP-16-06-LANL

How to Apply A complete application must include the following to be considered:

- Completion of all required fields in the application
- Undergraduate transcripts
- One Recommendation (minimum)

If you have questions, send an email to Elizabeth Nelson at Elizabeth.Nelson@orau.org . Please include the reference code for this opportunity in your email.

Application Deadline 3/16/2016 11:59:00 PM Eastern Time Zone

Description The Minority Serving Institutions Partnership Program (MSIPP) Internships is a new program to promote the education and development of the next generation workforce in critical science, engineering, technology, and math (STEM) related disciplines that complement current and future missions of DOE national laboratories. The MSIPP Internship program is designed to provide an enhanced training environment for next generation scientists and engineers by exposing them to research challenges unique to our industry.

MSIPP Interns will be given the opportunity to complete Summer Internships aligned with ongoing U.S. Department of Energy Office of Environmental Management (DOE-EM) research under the direction of a host national laboratory. The internship will be performed at the host national laboratory, utilizing their facilities and equipment under the guidance of a research staff member.

Minority Serving Institutions are institutions of higher education enrolling populations with significant percentages of undergraduate minority students.

Background: Monitoring the structural integrity of legacy radioactive infrastructure presents a particularly daunting challenge to facility managers and is of significant environmental concern. These facilities typically face very harsh radioactive, temperature, chemical and corrosive loads that can cause infrastructure to be damaged and lead to environmental degradation. Furthermore, the dangers associated with these facilities precludes the use of human inspectors. Currently a variety of robotic techniques have been developed to facilitate the structural inspection of radioactive infrastructure. These robotic solutions often rely on visual and ultrasonic techniques. These techniques have seen some success but significant hurdles remain. Two of the biggest challenges not addressed by current techniques are the inspection of very narrow, deep (~5 cm X 5 cm X tens of meters) channels as well as the inspection of the bottom of tanks covered in tens of centimeters of salt and other debris. To further complicate the problem of inspecting the narrow, deep channels, it is also not uncommon that these channels are obstructed by debris and mud.

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These challenges are particularly acute when inspecting the waste storage tanks at the Hanford site. The nature of these challenges suggest that a robotic device with a worm-like profile may be appropriate to facilitate these inspections. A number of robotic, worm-like robots have been developed over the years, but none of them are designed in such a way that they would be rugged enough for operations in underground environments at timescales useful for structural inspections. The LANL Engineering Institute has been exploring an alternative approach that takes inspiration from the fruitful work done for surgical steerable needles. Steerable needles made from superelastic nitinol wire with a beveled tip have been investigated for surgical applications for more than 10 years.

Scope of Work: This project will focus on building a demonstration of the steerable needle concept. The demonstration of the concept will be made by creating a 3D maze made from clear plastic tubing and guiding the steerable needle through this maze to a goal point. The maze will also feature mud and other debris in order to demonstrate the ability of the needle to pass through these obstacles. We have already done some experiments manually guiding a superelastic nitinol wire through a simple PVC 3D maze. We have identified the need for the ability to enable bi-directional bending of the needle time to facilitate navigating passageways. We believe this can be achieved by adding shape memory alloy actuators to the needle tip. The steerable needle itself will be propelled forward though the maze using a roller-drive system.

Qualifications The successful candidate should be studying electrical or mechanical engineering. Previous experience with CAD, mechatronics and fabrication is required.

Eligibility Requirements:

1. Be currently enrolled as a full-time undergraduate or graduate student at an accredited Minority Serving Institution *see criteria for Minority Serving Institutions here http://srnl.doe.gov/msipp/internships.htm
2. Be working towards a science, technology, engineering, or mathematics (STEM) degree
3. Have an undergraduate cumulative minimum Grade Point Average (GPA) of 3.0 on a 4.0 scale
4. Be a United States citizen
5. Pass a drug test upon selection to participate in the MSIPP *The process and timing for drug testing varies from lab to lab. Use of Marijuana/Cannabis or its derivatives if prescribed is legal in some states. However, having these drugs in your system is NOT legal at United States Federal Contractor sites and National Laboratories.
6. Reference must be received by March 6, 2016 at 11:59 PM ET

For more information about The Minority Serving Institutions Partnership Program (MSIPP) Internships, please visit http://srnl.doe.gov/msipp/internships.htm

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To see all MSIPP position postings visit: www.orise.orau.gov/MSIPP

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Bachelor's Degree or Master's Degree.
- **Overall GPA:** 3.00
- **Academic Level(s):** Graduate Students, Post-Bachelor's, or Undergraduate Students.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12)
  - **Computer, Information, and Data Sciences** (16)
  - **Earth and Geosciences** (21)
  - **Engineering** (27)
  - **Environmental and Marine Sciences** (14)
  - **Life Health and Medical Sciences** (45)
  - **Mathematics and Statistics** (10)
  - **Physics** (16)
  - **Science & Engineering-related** (1)

Affirmation I certify that I am pursuing or have completed coursework towards a degree in science, technology, engineering, mathematics, or a related field.