

Opportunity Title: ARL-North East: Topological Materials and Interfacial Coupling
for Electronic Device Application

Opportunity Reference Code: ARL-R-SEDD-300009

Organization DEVCOM Army Research Laboratory

Reference Code ARL-R-SEDD-300009

Description About the Research

The U.S. Army Research Laboratory (ARL) seeks a highly motivated, well informed, cross-disciplinary and skilled postdoctoral fellow with experience in the synthesis and fabrication of high quality topological, magnetic materials and heterostructures, and in electrical and magnetic characterization techniques. This postdoctoral fellow will investigate controls for physical processes that underlie theoretical descriptions of concept topological electronic devices (TEDs) for efficient electronics, sensors, and/or radio frequency (RF) technologies and demonstrate them. This postdoctoral fellow will shepherd the interface between government and academia, stationed in the laboratory of Dr. Jagadeesh Moodera at MIT and collaborate with other ARL researchers pursuing similar goals.

ARL is accelerating a strategic initiative to move the physics of topological materials to the engineering of emerging electronic devices that may solve future battlefield challenges with ultra-efficient electronics and RF technology, and equivalently may advance related civilian technology. Theorists have model a number of diverse device concepts that numerically promise to far exceed today's state of the art for things such as sensing, sub-threshold switching with markedly reduced energy consumption, energy harvesting and radio frequency or even THz electronics. Many of these opportunities can take advantage of topological surface currents and spin-orbit coupling at room temperature even with today's imperfect materials. This fellowship is a unique opportunity to take full advantage of ARL's strategic intra-extramural reach with a seamless collaboration among ARL laboratories, extended campuses and leading academic scientists. Success will be defined by demonstrating underlying phenomena above cryogenic temperatures revealing that theoretically proposed concepts are viable.

Currently, the gap between today's knowledge and tomorrow's technology in this area lies in the device physics that spans the fundamental physics and the electronics engineering. Extramural research has established the opportunity theoretically and some nascent experimental efforts have begun. This postdoctoral fellow will take advantage of years of expertise developed in Dr. Moodera's laboratory to build, test and study nascent conceptual device designs.

Keywords: Condensed matter physics, magnetism, interfacial phenomena, topological materials, electronic devices

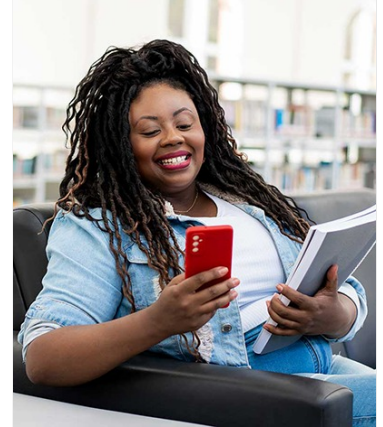
ARL Advisor: Charles Rong

ARL Advisor Email: charles.c.rong.civ@mail.mil

About SEDD



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The Sensors and Electron Devices Directorate (SEDD) is the Army's principal center for research and development in the exploration and exploitation of the electromagnetic spectrum, which includes radio frequency, microwave, millimeter-wave, infrared (IR), visible, and audio regions. SEDD is responsible for advances in laser sources, RF sources, IR sensors, signature detection and decoding, target imaging and its interpretation, fusion of data derived from several sensors, and electromagnetic protection.

In addition, SEDD is responsible for improving the technology base for electron devices and materials related to sensors and power devices. Research is conducted in related aspects of physics, electrical engineering, computer science, solid-state physics, chemical engineering, material sciences, and electrochemistry.

About ARL-RAP

The [Army Research Laboratory Research Associateship Program](#) (ARL-RAP) is designed to significantly increase the involvement of creative and highly trained scientists and engineers from academia and industry in scientific and technical areas of interest and relevance to the Army. Scientists and Engineers at the CCDC Army Research Laboratory (ARL) help shape and execute the Army's program for meeting the challenge of developing technologies that will support Army forces in meeting future operational needs by pursuing scientific research and technological developments in diverse fields such as: applied mathematics, atmospheric characterization, simulation and human modeling, digital/optical signal processing, nanotechnology, material science and technology, multifunctional technology, combustion processes, propulsion and flight physics, communication and networking, and computational and information sciences.

A complete application includes:

- **Curriculum Vitae or Resume**
- **Three References Forms**
 - An email with a link to the reference form will be available in Zintellect to the applicant upon completion of the on-line application. Please send this email to persons you have selected to complete a reference.
 - References should be from persons familiar with your educational and professional qualifications (include your thesis or dissertation advisor, if applicable)
- **Transcripts**
 - Transcript verifying receipt of degree must be submitted with the application. Student/unofficial copy is acceptable

If selected by an advisor the participant will also be required to write a **research proposal** to submit to the ARL-RAP review panel for :

- Research topic should relate to a specific opportunity at ARL (see [Research Areas](#))

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- The objective of the research topic should be clear and have a defined outcome
- Explain the direction you plan to pursue
- Include expected period for completing the study
- Include a brief background such as preparation and motivation for the research
- References of published efforts may be used to improve the proposal

A link to upload the proposal will be provided to the applicant once the advisor has made their selection.

Questions about this opportunity? Please email
ARLFellowship@orau.org

- Eligibility Requirements**

 - **Citizenship:** U.S. Citizen Only
 - **Degree:** Doctoral Degree.
 - **Academic Level(s):** Any academic level.
 - **Discipline(s):**
 - **Engineering** ([27](#) 👁)
 - **Physics** ([16](#) 👁)
 - **Age:** Must be 18 years of age