**Opportunity Title:** Advanced Short-Term Research Opportunity (ASTRO)
**Opportunity Reference Code:** ORNL-ASTRO

**Organization** Oak Ridge National Laboratory (ORNL)

**Reference Code** ORNL-ASTRO

**How to Apply** Last updated: January 12, 2021.

Due to health and safety concerns over the COVID-19 outbreak, Oak Ridge National Laboratory is restricting visitor access to campus and has temporarily suspended new internship appointments. You may continue to apply to this opportunity, but appointment offers will vary by program and will only be issued once it is deemed safe to do so.

For the latest information and guidance, please visit these COVID-19 resources:

- Centers for Disease Control & Prevention: https://www.cdc.gov/coronavirus/2019-nCoV/summary.html
- State Department: https://travel.state.gov/content/travel/en/traveladvisories/ea/r coronavirus-hubei-province--china.html
- Department of Energy: https://www.energy.gov/coronavirus-hub

If you have any questions, please contact us at ORNLedu@orau.org.

To submit your application, you will need to answer the following four short-answer questions:

1. **Goals and Interest Areas**
   The Goals and Interest Areas is your opportunity to highlight the specific research topics you're interested in. We recommend identifying a broad-level topic (e.g., modeling and simulation; see "Program Topics" section) in addition to any specific projects or topics that are particularly relevant to your interests. Mentors primarily find applications for initial review based on keywords present in their application.
2. **Experience**
3. **Skills**
4. **Program Participation** (if you have previously participated in an ORISE program)

You will also need to provide

1. **Official English-language verification of your graduate education history and status -- all of the following that apply:**
   - Previous official transcript showing enrollment in previous graduate program if left without degree completion
   - Current official transcript showing enrollment in graduate program when appointment begins OR Proof of current enrollment when appointment begins if not shown on official transcript
   - Verification of MS degree completion (official transcript or degree certificate) -- *NOTE: if you have previously completed a Master's degree or equivalency, we require proof of that degree even if you're currently enrolled in another graduate program*
2. **Contact information for two individuals to provide**

**recommendations**
Recommendation letter writers should be professional contacts who can speak to your research capability and ability to conduct yourself in a professional manner.

3. **Current resume**
4. **Abstract/reprint** -- at least one of the following:
    1. a reprint of a journal article you have authored
    2. an abstract of a journal article you have authored
    3. an abstract of a conference presentation you have authored
    4. an abstract of your current research, even if unpublished

Once your application is submitted and complete (including all attachments and recommendations), your application will be available to ORNL researchers to view for consideration. Your application will remain active for 12 months after submission. When the twelve month mark is approaching, you will receive a notification that your application is expiring should you wish to resubmit it. This opportunity does not close to applications at any point in the year, so you will not receive a notice that your application was rejected. You may view your application status (including status of recommendations) at any time by logging in to Zintellect.com.

**Description**

The ORNL Advanced Short-Term Research Opportunity Program is a highly selective and offers challenging short-term (3 to 12 months) research opportunities to students enrolled in a graduate program (for a MS or PhD degree). ASTRO participants conduct research in areas that support ORNL missions in the basic and applied sciences, energy, and environment.

**Program Goals**

The program’s goals are to:

- Advance the participant's scientific skills and knowledge in areas of critical national need
- Provide research opportunities for outstanding scientists
- Promote the influx of new ideas and skills into the laboratory
- Enhance interactions with the wider academic and research communities

The emphasis on a research mentoring approach allows ASTRO appointees to become integral members of ORNL research and development teams. The appointees gain exposure to current national issues in science and technology, have opportunities to share and exchange innovative ideas and techniques, and make significant contributions to ORNL programs. Depending on the nature of the research and availability of funding, participants are encouraged to publish and present research findings and write funding proposals as part of a research team to enhance their own professional development. The interaction of ideas, skills, approaches, and technologies will be of mutual benefit to the fellow and ORNL.

The ASTRO program is administered by the STEM Workforce

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Development Unit of the Oak Ridge Institute for Science and Education (ORISE), which is managed by Oak Ridge Associated Universities (ORAU) for the U.S. Department of Energy.

**Program Topics**

Researchers from any of Oak Ridge National Laboratory's mission areas may review ASTRO applications and issue an appointment offer. Information on ORNL's ongoing research topics may be found by browsing https://www.ornl.gov/. Many research groups are cross-disciplinary and are supported by multiple Divisions and Directorates. Current research topics include (but are not limited to):

1. Advanced Materials
    - Alloy behavior and design
    - Carbon and composites
    - Chemical separations
    - Chemistry and physics at interfaces
    - Computational science
    - Condensed matter theory
    - Correlated electron materials
    - Corrosion science and technology
    - Deposition science and technology
    - Energy dissipation to defect evolution
    - Energy storage and membrane materials
    - Experimental astrophysics
    - Fluid interface reaction, structure, and transport
    - Functional materials for energy
    - Fundamentals of radiation effects
    - Geochemistry and interfacial sciences
    - Heavy ion reactions
    - Heterogeneities in quantum materials
    - Hierarchical assembly of nanophase materials
    - Hysteretic nanomaterials
    - Low energy nuclear physics
    - Mass spectrometry and laster spectroscopy
    - Materials chemistry
    - Materials theory and simulation
    - Materials under extremes
    - Nanomaterials chemistry
    - Neutrinos
    - Neutrons
    - Nuclear analytical chemistry and isotropics laboratory
    - Nuclear structural materials
    - Quantum heterostructures
    - Scattering and thermophysics
    - Soft materials
    - Superheavy element discovery
    - Surface chemistry and catalysis
    - Theoretical physics

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2. Clean Energy
    - Additive manufacturing
    - Advanced vehicle systems
    - Bioenergy technologies
    - Biological and environmental research information systems
    - Biological and nanoscale systems
    - Biosciences
    - Building envelope
    - Building equipment technologies
    - Building systems integration
    - Buildings-to-grid
    - Carbon fiber composites
    - Computational biology and bioinformatics
    - Critical materials
    - Electrical and electronics systems research
    - Energy and transportation science
    - Energy security
    - Energy storage
    - Environmental sciences
    - Fossil energy
    - Fuel cell technologies
    - Fuels, engines, and emissions
    - Geothermal energy
    - Grid monitoring, modeling, and analysis
    - Hydropower
    - Lightweight metals
    - Metabolomics and bioconversion
    - Microbial ecology and physiology
    - Molecular biophysics
    - Power electronics & electric machinery
    - Plant systems biology
    - Propulsion materials
    - Solar and wind power
    - Sustainable electricity & system integration
    - Sustainable transportation
    - Systems genetics
    - Transportation analysis
3. National Security
    - Cyber & applied data analytics
    - National security emerging technologies
    - Nuclear nonproliferation
4. Neutron Science
    - Biological materials and systems
    - Catalysis and interfacial chemistry
    - Computing, modeling, and data analyics
    - High pressure science and technology
    - Materials and engineering
    - Neutron scattering
    - Nuclear irradiation

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- Quantum materials
- Soft matter and polymers

5. Nuclear Science
   - Advanced reactor engineering
   - Consortium for advanced simulation of light water reactors (CASL)
   - Enrichment technology
   - Fusion energy & remote systems
   - Medical, industrial, and research isotopes
   - Nonreactor nuclear facilities
   - Nuclear and radiochemistry
   - Nuclear data and criticality safety
   - Nuclear experiments and irradiation testing
   - Nuclear fuel materials
   - Process engineering research
   - Radiation detection and imaging
   - Radiation safety information
   - Radiation transport
   - Radiochemical science and engineering
   - Reactor and nuclear systems
   - Reactor physics
   - Used fuel systems
6. Supercomputing
   - Adversarial training for privacy-preserving deep learning model distribution
   - Biomedical analytics
   - Combinatorial optimization and graph theory
   - Computational geometry and mesh generation
   - Computational kinetic theory, computational fluid dynamics and turbulence
   - Data management
   - Discrete computing systems
   - File and storage systems
   - High-dimensional approximation theory
   - High-performance computing
   - Information extraction
   - Large-scale modeling and simulation
   - Large-scale data analytics and architectures
   - Machine learning and artificial intelligence
   - Networking
   - Non-volatile memory
   - Operational efficiency
   - Probability theory
   - Quantum computing, neuromorphic computing, cluster and cloud computing
   - System architecture
   - Visualization of extreme-scale data

*For more information, visit Science Education Programs at ORNL or contact ASTRO@orau.org.*

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**Qualifications** Applicants must be enrolled in a master's or doctoral degree program at an accredited institution. Applicants also must be at least 18 years old before starting the program.

**Citizenship**

The ASTRO program does not have citizenship requirements, although specific research projects may have additional restrictions. If a selected applicant is not a U.S. citizen, they must obtain and show proof of a valid visa status allowing us to pay them a stipend. Once an offer has been made, the ORISE Immigration Office may guide the process of obtaining appropriate immigration documents. Participants who are foreign nationals must also receive approval and clearance from the U.S. Department of Energy; this process is initiated by ORNL and could take more than ten weeks.

**Time Commitment**

Appointments involve a full-time commitment to the research program at ORNL, and the ASTRO participant must be in residence at ORNL during the entire period of the appointment. The participant's research must be conducted in a manner and according to a time schedule that meets the overall research needs of ORNL. The program accepts applications at any time, with flexible appointment start and end dates. Appointments are for a minimum of three months up to twelve months. Renewals may be possible, depending on continued eligibility of the student, availability of funding, and other considerations.

**Deliverables**

To document the effectiveness of the program, participants are required to submit to ORISE a report when they renew or end their program tenure. These reports should summarize their research and include a copy of any publications resulting from their appointment. If future papers are published as a result of research they performed at ORNL, copies should be sent to ORISE.

**Contingencies**

ASTRO participants are required to have coverage under a health insurance plan and must provide proof of such coverage. It is your responsibility to secure insurance coverage before arriving at the appointment site.

All other contingencies of an appointment offer must be met before the applicant can begin an appointment.

**Stipend**

Participants receive a competitive monthly stipend based on their educational level, research area, and experience. The stipend is taxable.

**Eligibility**

- **Degree:** Currently pursuing a Master's Degree or Doctoral Degree.

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**Requirements**

- **Academic Level(s):** Graduate 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 👁)
  - **Social and Behavioral Sciences** (3 👁)

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