

**Opportunity Title:** USFS Electrical Engineering Support for Wildland Fire Research

**Opportunity Reference Code:** USDA-USFS-RMRS-2024-0010A

**Organization** U.S. Department of Agriculture (USDA)

**Reference Code** USDA-USFS-RMRS-2024-0010A

**How to Apply** *Connect with ORISE...on the GO!* Download the new ORISE GO mobile app in the [Apple App Store](#) or [Google Play Store](#) to help you stay engaged, connected, and informed during your ORISE experience and beyond!

A complete application package consists of:

- An application
- Transcript(s) – For this opportunity, an unofficial transcript or copy of the student academic records printed by the applicant or by academic advisors from internal institution systems may be submitted. Selected candidate must provide proof of completion of the degree before the appointment can start. Click [Here](#) for detailed information about acceptable transcripts.
- A current resume/CV
- Two educational or professional recommendations. At least one recommendation must be submitted in order for the mentor to view your application.

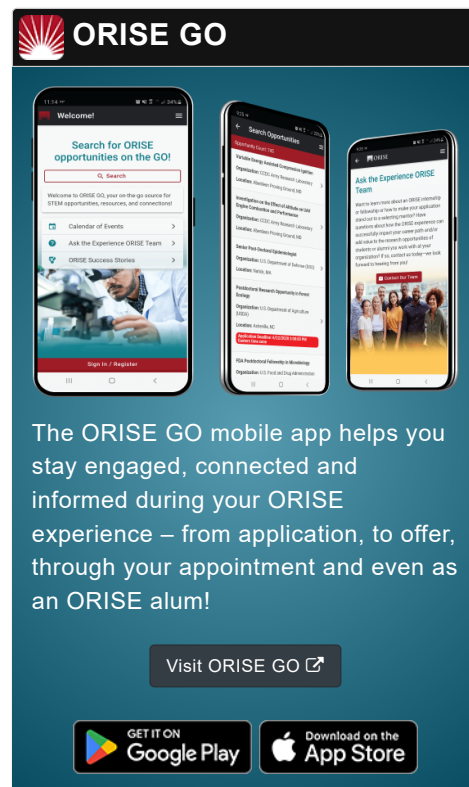
All documents must be in English or include an official English translation.

**Description** **Applications will be reviewed on a rolling-basis.**

**USFS Office/Lab and Location:** A fellowship opportunity is available with the US Department of Agriculture (USDA) Forest Service (USFS) within the Rocky Mountain Research Station (RMRS), located in Missoula, Montana.

The Missoula Fire Science Lab (firelab) has a long-standing role and reputation for science innovation and technology transfer that directly applies to fire management, operations, and firefighter safety. Research scientists accomplish the research mission through fundamental and applied research. Their work provides decision support tools for pre-fire planning, fire management, fire suppression, post-fire analysis and prescribed fire planning and operations. Many of the products from the unit have been adopted as the models or tools of choice by national and international land management organizations.

At the heart of the U.S. Forest Service's mission is their purpose. Everything they do is intended to help sustain forests and grasslands for present and future generations. Why? Because their stewardship work supports nature in sustaining life. This is the purpose that drives the agency's mission and motivates their work across the agency. It's been there from the agency's very beginning, and it still drives them. To advance the mission and serve their purpose, the U.S. Forest Service balances the short and long-term needs of people and nature by: working in collaboration with communities and our partners; providing access to resources and experiences that promote economic, ecological, and social vitality; connecting people to the land and



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one another; and delivering world-class science, technology and land management.

**Research Project:** Scientists plan and conduct research on several themes that are broadly focused on the fundamental physical processes of wildland fire. Wildland fire activity is driven by complex interactions between fuels, weather, and topography, and these interactions often lead to drastic impacts of fire behavior on the landscape. Researchers leverage field studies, modern computing, modeling, and remote sensing data to explore these interactions. Highly technical skills are required among the scientists and support staff to develop, design, and build sensor technology needed to acquire data within the wildland firescape.

Researchers at the firelab conduct field and laboratory experiments on wildland fire that require designing and building custom instrumentation. This instrumentation is specific and oftentimes unique and must be assembled from individual components as instrument packages that sense and record measurements specific to the fire environment. These packages require highly specialized electronics engineering knowledge to design circuit boards, connect and synchronize specialized sensors, create custom data logging packages, and understand calibration and conversion of raw electrical signals into meaningful numbers. The kinds of instruments are highly varied but include different types of thermocouples, radiometers (gas purged and water cooled), infrared sensors, acoustic sensors, pressure transducers, anemometers (hot wire, hot film, sonic), pitot tubes, LIDAR and lasers, ionization sensors, various gas sensors (O<sub>2</sub>, CO<sub>2</sub>, CO) and unmanned aerial systems (UASs).

The nature of this research will be to assist with designing, developing and maintaining unique high-fidelity sensors and data acquisitions systems specific to the demands of the wildland fire environment. We are seeking an electronical engineering professional interested in sensor design, data acquisition interfacing, circuit design structure, mechanistic heat transfer and hands-on build experience. Ideal applicants will be proficient with fundamental heat transfer concepts as well as applied electronical engineering theory. The ORISE participant will be involved in a variety of ongoing research related projects and sensor applications specific to supporting wildland fire research activities.

**Learning Objectives:** Opportunities will include:

- Build and calibrate autonomous infrared/radio frequency remote sensed radiate energy sensor, antenna array, circuit boards, power supply, gimble control and weather-proof box for containing the setup
- Build and calibrate new fire behavior packages (FBPs)

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equipped with radiate and total heat flux sensors, narrow angle radiometers, fine wire thermocouples, three dimensional mass flow Keil probes, data loggers, circuit boards, power supply and fire-proof box for containing the setup

- Calibrate and integrate CO2 and CO and particulate monitoring equipment into the control software for the new combustion facility
- Participate in prescribed and wildland fire field campaigns to assist with sensor deployment, data collection and UAS operations

**Mentor:** The mentor for this opportunity is Daniel Jimenez ([dan.jimenez@usda.gov](mailto:dan.jimenez@usda.gov)). If you have questions about the nature of the research, please contact the mentor.

**Anticipated Appointment Start Date: 2024.** Start date is flexible and will depend on a variety of factors.

**Appointment Length:** The appointment will initially be for one year but may be extended upon recommendation of USFS and is contingent on the availability of funds.

**Level of Participation:** The appointment is full time.

**Participant Stipend:** The participant will receive a monthly stipend commensurate with educational level and experience.

**Citizenship Requirements:** This opportunity is available to U.S. citizens, Lawful Permanent Residents (LPR), and foreign nationals. Non-U.S. citizen applicants should refer to the [Guidelines for Non-U.S. Citizens Details page](#) of the program website for information about the valid immigration statuses that are acceptable for program participation.

**ORISE Information:** This program, administered by ORAU through its contract with the U.S. Department of Energy (DOE) to manage the Oak Ridge Institute for Science and Education (ORISE), was established through an interagency agreement between DOE and USFS. Participants do not become employees of USDA, USFS, DOE or the program administrator, and there are no employment-related benefits. Proof of health insurance is required for participation in this program. Health insurance can be obtained through ORISE.

**Questions:** Please visit our [Program Website](#). After reading, if you have additional questions about the application process please email [ORISE.USFS.RMRS@oraui.org](mailto:ORISE.USFS.RMRS@oraui.org) and include the reference code for this opportunity.

**Qualifications** The qualified candidate should be currently pursuing or have received a bachelor's, master's, or doctoral degree in the one of

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the relevant fields.

**Preferred skills:**

- A strong background in sensor principles and applications with knowledge of sensor signals and interfacing, calibration, error correction, and reliability.
- Knowledge of thermal (TC, thermistor, solid state), radiation (IR, UV ), mechanical (displacement, velocity and flow, acceleration, force, pressure, strain, and mass), magnetic (Hall), and chemical (metal oxide and organic gas sensors) based sensors.
- A strong background in:
  - Analog and Digital signal processing
  - Analog and Digital control systems
  - Electronic design
  - Power electronics
  - RF electronics and principles
  - Probability and statistics
  - Numerical analysis
  - Engineering thermodynamics
  - Engineering mechanics, statics and dynamics
  - Engineering materials

**Eligibility Requirements**

- **Degree:** Bachelor's Degree, Master's Degree, or Doctoral Degree.
- **Academic Level(s):** Post-Bachelor's, Postdoctoral, Post-Master's, or Undergraduate Students.
- **Discipline(s):**
  - **Computer, Information, and Data Sciences** (17 👁)
  - **Engineering** (27 👁)
  - **Physics** (16 👁)