



# USGS NSF GRIP, GSP Opportunity

● <b>Point of Contact Name:</b>	JoAnn Holloway
● <b>Point of Contact Email:</b>	jholloway@usgs.gov
● <b>USGS Center:</b>	Crustal Geophysics and Geochemistry Science Center
● <b>Project Title:</b>	Yellowstone National Park Integrated Studies
● <b>Summary:</b>	The subsurface structure and mineralogy of Yellowstone thermal areas is not well understood. The goal of the project supported by the internship is to evaluate mineral assemblages in drill hole core collected from Yellowstone National Park using spectral methods, determine subsurface structures using electromagnetic methods, and to evaluate the distribution of rare earth elements and other trace metals associated with minerals using scanning electron microscopy and electron microprobe. Ultimately, these approaches will be integrated with water chemistry data to develop a more complete understanding of water-rock interactions in Yellowstone National Park. The intern may participate in any combination of these efforts consistent with their background and interests.
● <b>Project Hypothesis or Objectives:</b>	The objective of this internship is to determine surface and subsurface variations in mineralogy and geochemistry geologic materials from Yellowstone National Park. This study will use drill hole core obtained from the Park by USGS scientists in the early 1970s. These rocks provide a unique view of the Yellowstone hydrothermal system with respect to the mineralogy, geochemistry and structural framework that underlies the geysers and hot springs. The intern may support this study using skills in mineralogy, geochemistry, remote sensing, or applied mathematics.
● <b>Duration:</b>	Up to 12 months
● <b>Internship Location:</b>	Denver, CO
● <b>Field(s) of Study:</b>	Chemistry, Engineering, Geoscience
● <b>Applicable NSF Division:</b>	AGS Atmospheric and Geospace Sciences, EAR Earth Sciences, EFMA Office of Emerging Frontiers and Multidisciplinary Activities,

AST Astronomical Sciences, CHE Chemistry, DMR Materials Research, DMS Mathematical Sciences, PHY Physics

- Intern Type Preference:** Either Type of Intern
  - Keywords:** mineralogy, spectral, remote sensing, Yellowstone, hydrothermal
  - Expected Outcome:** The project will provide the intern with a unique opportunity to work with mineralogy and water-rock interaction associated with this world class hydrothermal system. The student may use this opportunity to develop a thesis topic that will continue collaboration with USGS scientists working in Yellowstone. The USGS study will benefit from having a junior colleague who can contribute their emerging skill sets and curiosity towards the larger study.
  - Special skills/training Required:** The intern's specific involvement will be determined by their skill set and academic interests. Computational skills would be useful for georeferencing data sets. A working knowledge of mineralogy would be applicable to working with the electron microprobe and/or scanning electron microscope to obtain data on trace metal associations. A working knowledge of geochemical thermodynamics would help bridge the chemistry data from the rocks with the geochemistry of geothermal fluids that produced alteration.
  - Duties/Responsibilities:** The intern will be trained to use spectroscopic and/or microanalytical instrument facilities available in the Mineral Resources Program centers in Lakewood, Colorado. The intern will support ongoing work by assisting with sample preparation and analytical measurements under supervision of the lead scientist on the project. There is potential for field work in the backcountry of Yellowstone National Park during the "shoulder season" in May, September and October.
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