

Sarah R. Black

sblack@psi.edu

EDUCATION

- Ph.D. University of Colorado Boulder**, Boulder, Colorado
May 2018; Department of Geological Sciences
Supervisor: Dr. Brian Hynek
Areas of interest: Planetary science, volcanology, geochemistry, mineralogy/petrology, analog studies, geologic mapping, geomorphology
- M.S. State University of New York at Buffalo**, Buffalo, New York
September 2006; Department of Geology
Supervisor: Dr. Tracy Gregg
Areas of interest: Planetary geology, volcanology, geomorphology
- B.A. State University of New York at Buffalo**, Buffalo, New York
May 2004; Department of Geology
Summa Cum Laude, Phi Beta Kappa, University at Buffalo Honors Scholar

EXPERIENCE

Planetary Science Institute 1700 East Fort Lowell, Suite 106, Tucson, Arizona 85719

Research Scientist, June 2025 - present

Conduct advanced research in planetary and space science, specializing in geologic mapping, geomorphology and surface processes, and geospatial database and tool development. Secure and manage external funding through competitive grants from NASA, ensuring ongoing project support and successful delivery of research objectives. Collaborate with interdisciplinary teams to advance scientific understanding and contribute to mission-driven goals.

Associate Research Scientist, September 2019 – June 2020

Participated in ongoing research projects using SHARAD and THEMIS data (Mars). Used the MARSTHERM tool (<https://marstherm.psi.edu/>) to model the surface layers that comprise the dark halo deposits around the rim of Valles Marineris.

United States Geological Survey Astrogeology Science Center 2255 North Gemini Drive, Flagstaff, Arizona 86001

Physical Scientist, April 2023 – May 2025 (Permanent position)

Research Physical Scientist; Tanaka-Greeley Fellow, June 2020 – April 2023 (Term appointment)

Duties include (but are not limited to): Participate in lunar mapping effort to support NASA's Artemis missions (LMAP Alpha team); Project lead for the USGS Astrogeology Mapping, Remote-sensing, Cartography, Technology, and Research (MRCTR) GIS lab. Projects include providing GIS and mapping support to the planetary science community and the Astrogeology Science Center, creating educational materials and resources for the planetary mapping community (e.g., GIS tutorials, workshops, and demo videos), updating and maintaining the Planetary Geologic Mapping (PGM) website and PGM GIS hub page, maintaining the GIS-based PGM map database, including the public-facing map database and map search tools (built and hosted using ArcGIS Online), overseeing and guiding the ongoing production of interactive maps (including supervising multiple team members), creating innovative new planetary map products and GIS tools that provide value to both the planetary science community and the public, and conducting original mapping projects. Additionally, serve as a member of the Planetary Geologic Mapping team, and coordinate and participate in technical reviews of planetary maps submitted for publication as USGS Scientific Investigation Maps

Esri 167 S Taylor Ave Suite 110, Louisville, CO 80027

Solutions Engineer – Imagery & Remote Sensing Team, March 2019 – January 2020

Create and demonstrate prototype mapping and geospatial analytics for clients across a wide range of areas (e.g. oil and gas, insurance, state and local government, emergency management). Requires extensive knowledge of GIS techniques across the entire ArcGIS platform, remote sensing data and processing tools, mapping methods, data management and cloud computing, and strong problem solving and communication skills. Personal focus: synthetic aperture radar, and hyperspectral/multispectral image analysis

Harris Geospatial Solutions (now known as NV5) 385 Interlocken Crescent, Broomfield, Colorado 80021

Applied Image Scientist/Solutions and Software Engineer, July 2018 – March 2019

Position description same as Esri (above) but focusing on ENVI geospatial analysis software.

University of Colorado at Boulder UCB 399, 2200 Colorado Avenue, Boulder, Colorado 80309

June 2014 – June 2018 *Graduate Researcher*, Laboratory for Atmospheric and Space Physics

August 2013 – June 2014 *Graduate Teaching Assistant*, Geology Department

Courses Taught: Geology 1030 Lab: Introduction to Physical Geology; Planetary Field Techniques; Introductory TA Coordinator (Spring 2014)

Spring 2014

Assistant Graduate Researcher, Teaching Institute for Graduate Education and Research

Duties include conducting videotape consultations for graduate TAs, and conducting, organizing, and proctoring training events and workshops for graduate students, faculty, and staff.

Front Range Community College Westminster and Brighton, Colorado

Adjunct Instructor, August 2014 – May 2015

Courses Taught: Introduction to Physical Geology

Skidmore College Department of Geoscience 815 North Broadway, Saratoga Springs, New York 12866

Senior Teaching Associate (full time faculty position), September 2011 – August 2013

Teaching Associate (full time faculty position), September 2008 – August 2011

Courses Taught: GE 101 Lecture/Lab: Earth Systems Science; GE 102 Lab: The History of Earth, Life, and Global Change; GE 112 Lab:

Oceanography; GE 251: Special Topics in Geoscience: Volcanology (*independent study*); GE 371: Independent Study

Additional Responsibilities: Member of two departmental hiring committees, editor of department newsletter, department webmaster, organizing department events, recruiting majors and minors, assisting the officers of the Geology Club, and representing the department at college events.

Malin Space Science Systems P.O. Box 910148, San Diego, California 92191-0148

Assistant Staff Scientist, July 2006 – June 2007

Performed weekly targeting of the Mars Global Surveyor Mars Orbiter Camera and Mars Reconnaissance Orbiter Context Camera. Created maps and other materials for use in present and future missions. Participated in and conducted ongoing research and assisted other science team members with projects.

University at Buffalo Department of Geology 876 Natural Sciences Complex, Buffalo, New York

Graduate Teaching Assistant, August 2004 – June 2006

Courses Taught: Geology 101 Lab: Global Environmental Science, Geology 313 Lab: Surface Processes and Hydrology II

Taught introductory and upper-level Geology labs. Consistently rated higher than average among Geology faculty and the university as a whole. Successful at conveying scientific and technical information to a wide range of people, from both scientific and non-scientific fields.

PUBLICATIONS

PAPERS

Burr, D. M., Skinner, J. A., Jr., Wolak Luna, J., **Black, S. R.**, Buban, H. C., Learner Ponterio, Z., Huff, A., and Maue, A. D. (2024), Planetary Geologic Mapping Curriculum Development and Training in Northern Arizona, *In the Trenches*, National Association of Geoscience Teachers, 14(1), p 4-12. [\[View\]](#)

Black, S. R. (2023), User's Guide to Planetary Image Analysis and Geologic Mapping in ArcGIS Pro, *U.S. Geological Survey Techniques and Methods 11-B14*, 180 p., <https://doi.org/10.3133/tm11B14>. [\[View\]](#)

Skinner, J. A., Jr., Huff, A. E., **Black, S. R.**, Buban, H. C., Fortezzo, C. M., Gaither, T. A., Hare, T. M., and Hunter, M. A. (2022), Planetary Geologic Mapping Protocol – 2022, U.S. Geological Survey Techniques and Methods 11–B13, 28 p., <https://doi.org/10.3133/tm11B13>. [\[View\]](#)

Yingst, R. A., Bartley, J. K., Chidsey, T. J., Cohen, B. A., Curran, N., Hynek, B. M., Kah, L. C., Minitti, M. E., Vanden Berg, M. D., Williams, R. M. E., Gemperline, J., Lotto, M., **Black, S. R.**, Bartley, B. C., and Pearson, T. (2022), Testing Rover Science Protocols to Identify Possible Biosignatures on Mars: Achieving Sampling Goals Under a Highly Constrained Time Line, *Astrobiology*, 22(11), <https://doi.org/10.1089/ast.2021.0177>. [\[View\]](#)

Yingst, R. A., Bartley, J., Chidsey, T., Cohen, B. A., Hynek, B. M., Kah, L. C., Minitti, M. E., Vanden Berg, M., Williams, R. M. E., Adams, M., **Black, S. R.**, El-Maary, M. R., Gemperline, J., Kronyak, R., and Lotto, M., (2020), Is a linear or a walkabout first protocol more efficient for robotic sample selection in a small region of interest?, *Astrobiology*, 20(3), <https://doi.org/10.1089/ast.2019.2090>. [\[View\]](#)

Wolfe, J. D., and **Black, S. R.** (2018), Hyperspectral Analytics in ENVI: Target Detection and Spectral Mapping Methods, L3Harris Geospatial Solutions (*now known as NV5*) white paper. [\[View\]](#)

Black, S. R. and Hynek, B. M. (2018), Characterization of Terrestrial Hydrothermal Alteration products with Mars Analog Instrumentation: Implications for Current and Future Rover Investigations, *Icarus*, 307, 235-259. <https://doi.org/10.1016/j.icarus.2017.10.032>. [\[Request full text\]](#)

Yingst, R. A., Bartley, J., Chidsey, T., Cohen, B. A., Gilleaudeau, G. J., Hynek, B. M., Kah, L. C., Minitti, M. E., Williams, R. M. E., **Black, S. R.**, Gemperline, J., Thomas, R., and Schaufler, R. (2018), Testing the efficiency of rover science protocols for robotic sample selection: A GeoHeuristic Operational Strategies Test, *Acta Astronautica*, 146, 300-315. <https://doi.org/10.1016/j.actaastro.2018.02.029>. [\[View\]](#)

Black, S. R., Yingst, R. A., and Hynek, B. M. (2016), Field-Portable VNIR Spectrometry: Applications for Mars Rover Operational Strategies Testing at Terrestrial Analog Sites, *Spectroscopy*, September 1, 2016. [\[View\]](#)

CONFERENCE ABSTRACTS

2025

Black, S. R., Phippen, S. J., Bogle, S. R., and Fry, R. L. (2025), Constructing a comprehensive database of planetary maps, in Lunar and Planetary Science Conference Abstracts, Abstract #1583. [\[View\]](#)

Williams, D. A., **Black, S. R.**, Byrne, S., Carr, B. B., Hayes, A. G., Hunter, M. A., Nelson, D. M., Phillips, M. S., Ponterio, Z. L., and Sutton, S. (2025), Planetary data training workshops, 2025-2026, in Lunar and Planetary Science Conference Abstracts, Abstract #1225. [\[View\]](#)

Keszthelyi, L., Fassett, C. I., **Black, S.**, Buban, H., Deutsch, A., and Lemelin, M. (2025), Nested geologic maps for the Viper exploration region of Mons Mouton, Luna, in Lunar and Planetary Science Conference Abstracts, Abstract #2586. [\[View\]](#)

2024

Black, S. R., Buban, H. C., Fortezzo, C. M., and Skinner, J. A., Jr. (2024) Formatting Recommendations for the Correlation of Map Units Map Component, in Planetary Geologic Mappers Meeting Abstracts, Abstract #7008. [\[View\]](#)

Black, S. R., Bogle, S. R., Buban, H. C., Fortezzo, C. M., Hunter, M. A., and Skinner, J. A., Jr. (2024), The USGS MRCTR GIS Lab: Mapping Support and Resources for the Planetary Science Community, in Lunar and Planetary Science Conference Abstracts, Abstract #2496. [\[View\]](#)

Bogle, S. R., **Black, S. R.**, and Buban, H. C. (2024), Using Maps to Increase Public Interest and Representation in Planetary Science, in Lunar and Planetary Science Conference Abstracts, Abstract #1272. [\[View\]](#)

Gaither, T. A., **Black, S. R.**, Bogle, S. R., and Skinner, J. A., Jr. (2024), Statistics for IAU-Approved Planetary Nomenclature Help Chart an Effective Strategy for Diversity and Inclusivity, in Lunar and Planetary Science Conference Abstracts, Abstract #2287 [\[View\]](#)

Nelson, D. M., Williams, D. A., **Black, S. R.**, Byrne, S., Carr, B. B., Hamilton, C. W., Hayes, A. G., Hunter, M. A., and Ponterio, Z. L. (2024), Planetary Data Training Workshops in GUS, Photogrammetry, and Planetary Data Management, in Lunar and Planetary Science Conference Abstracts, Abstract #2586. [\[View\]](#)

2023

- Black, S. R.**, Bogle, S. R., Buban, H. C., Day, B. H., Fortezzo, C. M., Hunter, M. A., Kim, R. M., Law, E. S., Lethcoe, H. A., Skinner, J. A., Jr., and Suh, C. (2023), Cultivating Digital Resources and Tools for Planetary Geologic Mappers: A PGM-Treks Collaboration, in Geological Society of America Fall Meeting Abstracts, Abstract #394709. [\[View\]](#)
- Gabriel, T. S. J., and **Black, S. R.** (2023), GIS Tools and Machine Learning Methods to Improve Interpretation and Operational Responsiveness of Active Neutron Data from Mars, in Planetary Data Workshop Abstracts, Abstract #7092. [\[View\]](#)
- Williams, D. A., **Black, S. R.**, Byrne, S., Carr, B. B., Hamilton, C. W., Hayes, A. G., Hunter, M. A., Nelson, D. M., and Ponterio, Z. L. (2023), Planetary Data Training Workshops, 2022-2024, in Planetary Data Workshop Abstracts, Abstract #7002. [\[View\]](#)
- Black, S. R.**, Buban, H. C., Wilber, C. H., and Bogle, S. R. (2023), Cultivating Digital Mapping Resources for the Planetary Science Community: Updates for 2023, in Lunar and Planetary Science Conference Abstracts, Abstract #1675. [\[View\]](#)

2022

- Burr, D. M., Skinner, J. A., Luna, J., **Black, S.**, Buban, H., Ponterio, Z., Huff, A., and Maue, A. (2022), Planetary Geologic Mapping Curriculum Development and Training in Northern Arizona, in Geological Society of America Fall Meeting Abstracts, Abstract #258-2. [\[View\]](#)
- Black, S. R.**, Hunter, M. A., Buban, H. C., and Skinner, J. A. (2022), Improving Accessibility and Digital Mapping Resources for the Planetary Science Community: Updates for 2022, in Planetary Geologic Mappers Meeting Abstracts, Abstract #7023. [\[View\]](#)
- Black, S. R.**, Buban, H. C., and Skinner, J. A. (2022), Recommended Standards for the Correlation of Map Units Map Component: 2022 Updates, in Planetary Geologic Mappers Meeting Abstracts, Abstract #7026. [\[View\]](#)
- Burr, D. M., Skinner, J. A., Buban, H. C., **Black, S. R.**, and Maue, A. D. (2022), Curriculum Development for Teaching Planetary Geologic Mapping: An Example from Northern Arizona University, in Planetary Geologic Mappers Meeting Abstracts, Abstract #7027. [\[View\]](#)
- Black, S. R.**, Skinner, J. A., and Buban, H. C. (2022), Addressing a Community Need: Recommended Standards for the Correlation of Map Units Map Component, in Lunar and Planetary Science Conference Abstracts, Abstract #1416. [\[View\]](#)
- Gullikson A. L., Gaither T. A., Skinner J. A., **Black S. R.**, and Buban H. C. (2022), USGS Astrogeology Terrestrial Analog Sample Collection: 2022 Update, in Lunar and Planetary Science Conference Abstracts, Abstract #1599. [\[View\]](#)

2021

- Black, S. R.**, and Skinner, J. A. (2021), Improving the Accessibility and Functionality of Planetary Maps Through Web-Based Resources, in Planetary Geologic Mappers Meeting Abstracts, Abstract #7037. [\[View\]](#)
- Burr, D. M., Wolak Luna, J., Learner Ponterio, Z. A., Skinner, J. A., and **Black, S. R.** (2021), Status Update on the Inaugural NASA Planetary Geologic Mapping Workshop: Selected for June 2022, in Planetary Geologic Mappers Meeting Abstracts, Abstract #7038. [\[View\]](#)
- Fortezzo, C. M., Edgar, L. A., and **Black, S. R.** (2021), Geologic Map of Southwestern Melas Chasma, Mars, 1:150,000-Scale, in Planetary Geologic Mappers Meeting Abstracts, Abstract #7050. [\[View\]](#)

2018

- Black, S. R.**, Hynek, B. M., McCollom, T. M., and Larsen, J. F. (2018), Hydrothermal acid-sulfate alteration of a synthetic Mars composition basalt: Implications for hydrothermal deposits on Mars, in Lunar and Planetary Science Conference Abstracts, 49. [\[View\]](#)
- Black, S. R.**, Hynek, B. M., McHenry, L. J., Glenister, C., Cameron, B. I., McCollom, T. M., and Ludyan, J. (2018), Bulk mineralogy of surficial hydrothermal acid-sulfate deposits at Námafjall, Þeistareykir Geothermal Field, and Hengill Volcano, Iceland: Implications for the identification and interpretation of hydrothermal deposits on Mars, in Lunar and Planetary Science Conference Abstracts, 49. [\[View\]](#)
- Yingst, R. A., Bartley, J., Chidsey, T., Cohen, B. A., Hynek, B. M., Kah, L. C., Minitti, M. E., Williams, R. M. E., Vanden Berg, M., Adams, M., **Black, S. R.**, El-Maary, M., Gemperline, J., Kronyak, R., and Lotto, M. (2018), Is a linear or a walkabout protocol more efficient for robotic sample selection in a small region of interest?, in Lunar and Planetary Science Conference Abstracts, 49. [\[View\]](#)
- El-Maarry, M. R., **Black, S. R.**, Hynek, B. M., and Yingst, R. A., (2018), Testing operational strategies for the Mars 2020 helicopter using a UAV, in European Planetary Science Congress Abstracts, 12. [\[View\]](#)

2017

- Chojnacki, M., Hynek, B. M., **Black, S. R.**, Thomas, R., Hoover, R., Martin, J. R. (2017), Year 3 Geologic Mapping of Eastern Coprates Chasma (MTM -15057), Mars, in 3rd Planetary Data Workshop and Annual Planetary Geologic Mappers Meeting, Abstract #7104. [\[View\]](#)
- Yingst, R. A., Bartley, J. K., Chidsey, T. C., Cohen, B. A., Gilleaudeau, G. J., Hynek, B. M., Kah, L. C., Minitti, M. E., Williams, R. M. E., **Black, S. R.**, Gemperline, J. D., Schaulfler, R. L., and Thomas, R. J. (2017) Determining Efficient Rover Science Protocols for Robotic Sample Selection: A Geoheuristic Operational Strategies Test in Greater Canyonlands, Utah, US, in Geological Society of America Cordilleran Section Abstracts Abstract #38-4. [\[View\]](#)
- Black, S. R.**, Hynek, B. M., McHenry, L. J., McCollom, T., Cameron, B., Ludyan, J. (2017), Alteration Mineralogy and the Effect of Parent Lithology at Hydrothermal Mars Analog Sites: Initial Results from Hengill and Krafla Volcanoes, Iceland, in Lunar and Planetary Science Conference Abstracts, 48. [\[View\]](#)
- El-Maarry, M. R., **Black, S. R.**, Hynek, B. M., McHenry, L. J. (2017), Mineralogy of Fumarolic Deposits from Iceland as Analogs for Ancient Hydrothermal Systems on Mars: Role of Temperature, in Lunar and Planetary Science Conference Abstracts, 48. [\[View\]](#)
- Yingst, R. A., Bartley, J., Chidsey, T., Cohen, B. A., Gilleaudeau, G., Hynek, B. M., Kah, L. C., Minitti, M. E., Williams, R. M. E., **Black, S.**, Gemperline, J., Helsius, R., Schaulfler, R. (2017), Determining Efficient Rover Science Protocols for Robotic Sample Selection, in Lunar and Planetary Science Conference Abstracts, 48. [\[View\]](#)

2016

- Black, S. R.**, and Hynek, B. M. (2016) Assessing Identification of Terrestrial Hydrothermal Minerals with Mars Analog Instrumentation, in Geological Society of America Annual Meeting Abstracts Abstract #338-2. [\[View\]](#)
- Chojnacki, M., Hynek, B. M., **Black, S. R.**, Hoover, R., Martin, J. R. (2016), Geologic Mapping of the Coprates Chasma (MTM -15057), Mars: Year 2, in Annual Planetary Geologic Mappers Meeting, Abstract #7042. [\[View\]](#)
- Black, S. R.**, Hynek, B. M., Hoover, R., Beckerman, L. G., Alvarado, G. E. (2016), Characterization of Hydrothermal Alteration in Costa Rica: Mineralogy, Methodology, and Implications for Mars, in Lunar and Planetary Science Conference Abstracts, 47, 2546-2547. [\[View\]](#)
- Chojnacki, M., Hynek, B. M., **Black, S. R.**, Hoover, R., Martin, J. R. (2016), Geologic Mapping of the Coprates Chasma (MTM -15057), Mars: Year 2, in Lunar and Planetary Science Conference Abstracts, 47, 2828-2829. [\[View\]](#)
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2015

- Black, S. R.**, Hynek, B. M., Kierein-Young, K. S., Avard, G., and Alvarado, G. E. (2015), Hydrothermal Alteration Mineralogy Characterized Through Multiple Analytical Methods: Implications for Mars, American Geophysical Union Fall Meeting Abstracts, # 82595. [\[View\]](#)
- Hynek, B. M., Chojnacki, M., **Black, S. R.**, and Martin, J. R. (2015), Geologic Mapping of the Coprates Chasma (MTM -15057), Mars: Year 1. Abstracts of the Annual Meeting of Planetary Geologic Mappers, Honolulu, HI, June 22-24, 2015. [\[View\]](#)
- Black, S. R.**, Hynek, B. M., and Alvarado, G. E. (2015), Spectral Identification of Acid Sulfate Alteration Products in Costa Rica Volcanoes: Implications for Early Mars, in Lunar and Planetary Science Conference Abstracts, 46, 2260-2261. [\[View\]](#)
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2011

- Gallant, M., Gravely, D., and **Stelmack, S.** (2011), Constructing an eruptive history: An analysis of the Tekoa Tuff in Island Hills, New Zealand, Geological Society of America Fall Meeting Abstracts. [\[View\]](#)
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2006

- Gregg, T. K., Lopes, R. M., **Black, S. M.** (*sic.*), and Lougen, J. (2006), Ionian Paterae: New Insights from Observations, Numerical Modeling, and Laboratory Simulations, in AGU Fall Meeting Abstracts, vol. 1, p. 105, P23E-1015. [\[View\]](#)
- Black, S. R.**, and Gregg, T. K. P. (2006), The Origin and Evolution of Islands in Ionian Paterae. in Lunar and Planetary Science Conference Abstracts, 37, 2180-2181. [\[View\]](#)
-

LAB MANUALS

- Stelmack, S. R. B.** and Frappier, A. (2010), Oceanography Laboratory Manual, Skidmore College, Saratoga Springs, New York. [\[View\]](#)
- Stelmack, S. R. B.** and Nichols, K. (2009), Earth Systems Science Laboratory Manual, Skidmore College, Saratoga Springs, New York. [\[View\]](#)
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THESES

- Black, S. R.** (2018), Identification and Characterization of Martian Acid-Sulfate Hydrothermal Alteration: An Investigation of Instrumentation Techniques and Geochemical Processes Through Laboratory Experiments and Terrestrial Analog Studies. Doctoral Dissertation. University of Colorado Boulder Department of Geological Sciences. [\[View\]](#)
- Black, S. R.** (2006), The Origin and Evolution of Islands in Ionian Paterae. Masters Thesis. The State University of New York at Buffalo Department of Geology [\[View\]](#)
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GRANTS AND AWARDS

Grants Awarded

Project Title:	Constructing a Comprehensive Database of Planetary Maps
Role:	PI
Source of Support:	Planetary Data, Analysis, Restoration, and Tools Program (NASA)

Other Awards Received

May 2021	USGS STAR Award: Ongoing efforts to support the USGS Astrogeology Science Center
January 2021	USGS STAR Award: Production of interactive map of Jezero crater and Nili Planum, Mars
June 2020	Tanaka-Greeley Fellowship, USGS Astrogeology Science Center
Summer 2016	Lewis and Clark Fund for Exploration and Field Research in Astrobiology
Spring 2016	Geological Society of America Graduate Student Research Grant
Spring 2016	NASA Astrobiology Institute and SETI Institute Lunar and Planetary Science Conference Travel Grant
Fall 2015	University of Colorado Boulder Graduate School Travel Grant
Summer 2015	University of Colorado Boulder Geology Department Graduate Research Shell Grant
Spring 2015	University of Colorado Boulder Geology Department Travel Grant

PROFESSIONAL SERVICE

NASA PDS Geo Node Advisory Panel member (2024 – present)
Mentor: University of Wisconsin, Milwaukee Let's GEO program (2024)
NASA PDS Node Midterm Review Executive Secretary (2022)
Panel member and external reviewer for multiple NASA ROSES review panels (2021 - present)
USGS Bystander Intervention Training Facilitator (2021 – 2022)
NASA Planetary Data Ecosystem Independent Review Board (PDE IRB) Executive Secretary (2020 – 2021)
Women in Planetary Science panel for New Hampshire girl scouts (2021, coordinated & participated)
Communications Mentor: UNAVCO RESESS Research Experience for Undergraduates Program (Summer 2017)

TALKS, WORKSHOPS, AND FIELD EXPERIENCE

Invited Talks, Webinars, and Workshops (lead)

[Introduction to ArcGIS Pro for Planetary Science](#), Taught in conjunction with Cornell University, 2022 – present (multiple offerings)
One day workshop covering the basics of ArcGIS Pro for planetary scientists. Includes working with raster and vector data and creating map layouts.

[Planetary Geologic Mapping Workshop](#), USGS Planetary Geologic Mapping Program & Northern Arizona University, Summer 2022
Week-long intensive workshop introducing participants to the fundamentals of planetary mapping, including ground truthing in the field and GIS basics. Participated in workshop development and implementation, including teaching much of the GIS section (days 3, 4, and 6)

“Working with large-scale multitemporal remote sensing data in ArcGIS,” Planet Explore Conference, October 16, 2019

“Why You’ll Never Have Another Rainy Day With SAR,” ENVI Analytics Symposium hands-on workshop, August 13, 2019

Webinar series on Synthetic Aperture Radar, Harris Geospatial Solutions:

[Part 1: Applications and Benefits of Synthetic Aperture Radar](#), December 7, 2018

[Part 2: SAR: Land and Sea Applications Using SAR](#), January 17, 2019

[Terrestrial Analog Studies and Interpreting the Geochemical Conditions of Ancient Mars](#), ASD Inc. webinar, October 21, 2016

Workshops (participated)

NASA/ESA Summer School in Astrobiology Santander, Spain (July 2016)

Week-long intensive workshop on terrestrial analog investigations and habitability throughout the solar system

Community Surface Dynamics Modeling Systems (CSDMS) Annual Meeting Boulder, Colorado (May 2014)

Four-day workshop focusing on computer modeling in the geosciences, including an all-day Python “software bootcamp”

Field Experience

Volcanology field work Costa Rica (November 2013) and Iceland (August 2016)

Collecting hand samples for laboratory analysis, and in-situ VNIR spectra at Poás, Turrialba, Rincón de la Vieja, Miravalles, Arenal, Tenorio, Krafla, and Hengill volcanoes.

GeoHeuristic Operational Strategies Testing (GHOST) Green River, Utah (April 2016) and Vernal, Utah (October 2017)

Terrestrial analog field testing of Mars rover science protocols. Geological interpretation of Mars analog sites throughout Utah via remotely gathered data. Duties include collection of in-situ VNIR data, VNIR data interpretation, and presenting results to science teams.

NASA Planetary Volcanology Workshop Volcano, Hawaii (August 2005)

Comparing the morphology of Hawaiian basalt flows in the field to remotely sensed images of Martian lava flows and volcanoes. Improved understanding of remote sensing methods and results, as well as interpretation of orbital images.

Geological Field Methods: Southern Utah University Department of Geology Cedar City, Utah (Summer 2005)

Five-week, six-credit field camp in Southwest Utah: Basin-and-Range and Colorado Plateau Regions

Improved field identification skills, map reading and interpretation. Became familiar with a range of field methods. Creating maps and determining orientation and relationships between units improved analytical thinking skills and problem solving ability.

SKILLS

Software	<i>Geographic Information Systems:</i>	The Esri ArcGIS Suite and Geospatial Cloud, JMARS, ENVI, SARscape
	<i>Website content management:</i>	Drupal, ArcGIS Hub, HTML, markdown
	<i>Video production:</i>	Camtasia
	<i>Geochemical modeling:</i>	Geochemist’s Workbench, Visual MINTEQ
	<i>X-Ray diffraction data processing:</i>	X-Powder
	<i>Raman data processing:</i>	LabSpec6, KnowItAll
Programming	Python (includes Notebooks for ArcGIS Pro and ArcGIS API for Python)	
Equipment	JEOL JXA-8230 Superprobe Electron Probe Microanalyzer (EPMA) with Wavelength-Dispersive Spectrometer (WDS)	
	Vacuum and Environmental Scanning Electron Microscopes (SEM) with Energy-Dispersive Spectrometer (EDS)	
	TerraSpec 4 High Resolution and TerraSpec HALO Gun Portable Visible Near-Infrared (VNIR) Spectrometers	
	Horiba LabRAM HR Evolution Raman Microscope-Spectrometer	
	Terra Portable X-Ray Diffraction (XRD) Analyzer	
Languages	Conversational Spanish	