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Engineering & Scientific Consulting

Kate Murdock, Ph.D., P.G.

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Professional Profile

Dr. Murdock is a geologist with experience in geophysics, mineralogy, soil and rock-related construction failures, landslides, environmental geology, and site characterization by means of field mapping, aerial photo analysis, and subsurface investigations. She has technical experience in geophysical methods used in various investigations including mining exploration and resource assessments, temperature estimations, and natural hazard mapping. She is also experienced with optical and petrographical methods of rock and mineral identification, cross section and geologic map preparation and analysis, and surveying sites using aerial photographs, aeromagnetic maps, and gravitational anomaly maps.

While at Exponent, Dr. Murdock has worked on projects related to infrastructure, including commercial and residential properties, oil and gas incidents, roadways, and construction issues. She has also worked on contamination issues, thermal incidents, and natural hazards. She is licensed as a Professional Geologist in four states.

Dr. Murdock has used ground penetrating radar and electrical resistivity for near-surface investigations, as well as interpreted geochemical data for rock, sediment, and soil analysis. She also has expertise in rock magnetism as a nondestructive tool for mineral identification, including its application to geologic reconstructions of past environments, variations in sediment transport, climatic changes, and tectonic events. Her doctoral work focused on using rock magnetic measurements to determine changes in mineralogy of Arctic lakes that could be used to determine environmental and climatic shifts in the region over the past million years. Additional areas of interest for Dr. Murdock include rock mechanics, ore and mineral quality assessment, oil and gas recovery and transport, and the evaluation of landslides.

Academic Credentials & Professional Honors

Ph.D., Geosciences, University of Massachusetts, Amherst, 2013

M.S., Geosciences, University of Massachusetts, Amherst, 2009

B.S., Geological Sciences, Salem State University, 2006

AGU Voices for Science Fellow 2024-2025

Licenses and Certifications

Licensed Professional Geologist (TX)

Licensed Professional Geologist (NH)

Licensed Professional Geologist (GA)

Licensed Professional Geologist (PA)

Academic Appointments

Visiting Lecturer, Department of Geological Sciences, Salem State University (2013-2018)

Visiting Lecturer, Environmental Sciences Program, Stonehill College (2014-2018)

Visiting Lecturer, Environmental Science Program, Endicott College (2017)

Professional Affiliations

American Geophysical Union (AGU)

Geological Society of America (GSA)

Association of Environmental and Engineering Geologists (AEG)

Women in Mining (WIM)

Prospectors & Developers Association of Canada (PDAC)

Society for Mining, Metallurgy & Exploration (SME)

Publications

Murdock, K.J. A Thermomagnetic Study of a Flare Field Fire. AGU Annual Meeting, Washington, D.C. December 9-13, 2024.

Murdock, K.J., Scott Burns, Roy Shlemon, Robert Snydor, and Jennifer Nocerino (conveners). Beyond the Degree: Making an Impact with Geology & Twenty-Five Years of GSA Mentoring Programs. GSA Connects 2024, Anaheim, CA. September 22-25, 2024.

Murdock, K.J., and Mia Painter (conveners). Technical Session #3: Karst Symposium. AEG Annual Meeting, Philadelphia, PA. September 10-14, 2024

Murdock, K.J. (convener). Technical Session #3: Geophysical Techniques and Investigations Relevant to Dams and Levees Symposium. AEG Annual Meeting, Portland, OR. September 19-23, 2023.

Murdock, K.J. Iron Sulfides and Concrete: How a Common Mineral Can Be a Geohazard for Construction and Infrastructure. AGU Annual Meeting, Chicago, IL. December 12-16, 2022.

Murdock, K.J. Iron Sulfides and Concrete Degradation. AIPG Annual Meeting, Marquette, MI. August 6-9, 2022.

Murdock, K.J. Magnetic Methods as a Hazard Assessment Tool: Detecting, delineating, and monitoring underground and surface fires. AEG Annual Meeting, Las Vegas, NV. September 12-17, 2022.

Murdock, K.J. Pyrite and Construction: Evaluating Pre- and Post-Failure. AEG Annual Meeting, San Antonio, TX. September 18-26, 2021.

Murdock, K.J. Pyrite, Marcasite, and Pyrrhotite: Potential Construction Hazards in New England and Beyond. GSA Connects, Portland, OR. October 10-13, 2021.

Murdock, K.J. and Laurie L. Brown. Revisiting the Saddleback Basalt: The Mars Mojave Simulant as a Terrestrial Martian Magnetic Analog. GSA 2019, Phoenix, AZ. September 22-25, 2019.

Murdock, K. J. and L. L. Brown. Saddleback Basalt as a Terrestrial Analog to Highly Magnetized Martian Crustal Rocks. AGU Joint Assembly, Montreal. May 3-7, 2015.

Murdock, K. J. Arctic Lake Sediments as Records of Climate Change Using Rock Magnetic Properties and Paleomagnetic Data. Ph.D. dissertation, University of Massachusetts Amherst, Amherst, MA, 2013. https://scholarworks.umass.edu/dissertations_1/475/

Murdock, K. J., L. L. Brown, K. M. Wilkie. Rock magnetic properties, magnetic susceptibility, and organic geochemistry comparison in core LZ1029-7 Lake El'gygytgyn, Northeast Siberia, Russia, Climate of the Past 2013; 9: 467-479. https://doi.org/10.5194/cp-9-467-2013

Minyuk, P.S., T.V. Subbotnikova, L. L. Brown, and K. J. Murdock. Thermomagnetic properties of vivianite nodules, Lake El'gygytgyn, Northeast Russia, Climate of the Past 2013; 9: 433-446. https://doi.org/10.5194/cp-9-433-2013

Murdock, K. J. and L. L. Brown. Magnetic investigation of the mid-Holocene aged coastal lake Heimerdalsvatnet in the Lofoten Islands, northern Norway. AGU Fall Meeting, San Francisco. December 3-7, 2012.

Murdock, K. J and L. L. Brown. Rock Magnetic Properties of Lake El'gygytgyn: Implications for Paleoclimatic Reconstruction. AGU Fall Meeting Invited Talk, San Francisco. December 5-9, 2011

Murdock, K. J. and L. L. Brown. Initial Results of a Rock Magnetic Study from Core LZ-1029, Lake El'gygytgyn, Northeast Siberia; AGU Fall Meeting, San Francisco. December 13-17, 2010.

Murdock, K. J. Possible Terrestrial Basaltic Analogs for Highly Magnetized Martian Crustal Rocks. M.S. thesis, University of Massachusetts Amherst, Amherst, MA, 2009. https://scholarworks.umass.edu/theses/342/

Murdock, K. J. and L. L. Brown. Possible Terrestrial Basaltic Analogs for Highly Magnetized Martian Crustal Rocks. AGU Joint Assembly, Ft. Lauderdale. May 27-30, 2008.

Peer Reviews

Geochemistry, Geophysics, Geosystems (G-Cubed)