

## **ELISABETH (LIBBY) HAUSRATH**

Professor

Department of Geoscience  
University of Nevada, Las Vegas  
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### **EDUCATION**

**The Pennsylvania State University**, University Park, PA 2002 to 2007  
Dual-Title Ph.D. Degree Program in Geosciences and Astrobiology  
NSF Graduate Research Fellow  
NSF-Penn State BRIE Fellow (Penn State Biogeochemical Research Initiative for Education)  
Advisor: Dr. Susan Brantley  
Thesis title: Basalt weathering on Earth and on Mars

**Brown University**, Providence, RI 1996 to 2000  
Sc.B Geology-Chemistry, Honors, Magna Cum Laude

### **TEACHING EXPERIENCE**

**University of Nevada, Las Vegas**, Las Vegas, NV  
Geog 103 Physical Geography of Earth's Environment  
Geol 100 Natural Disasters  
Geol 110 Global Warming  
Geol 330 Introduction to Geochemistry  
Geol 425/625 Principles of Geochemistry  
Geol 478/678 Hydrogeochemistry  
Geol 796 Aqueous Biogeochemistry  
Geol 703 Topics in Advanced Geochemistry

**The Pennsylvania State University**, University Park, PA  
*Teaching Assistant* Geosc 40 (The Sea Around Us)  
*Teaching Assistant* Geosc 413 (Techniques in Environmental Geochemistry)

**Boise State University**, Boise, Idaho  
*Adjunct Faculty* Math 025 (Elementary Algebra)

**Brown University**, Providence, RI  
*Laboratory Teaching Assistant* Chem 21 (Introductory Chemistry)  
*Undergraduate Laboratory Teaching Assistant* Geo 23 (Geochemistry)

### **MISSION AND PROFESSIONAL EXPERIENCE**

**Mars 2020 Mission *Perseverance* Returned Sample Science PS** 2019-present  
**MSL *Curiosity* Participating Scientist** 2022 – present

**Member of the Steering Committee of NASA's Network for Life Detection (NFOLD)** 2022-present  
**Member of the Measurement Definition Team for Mars Sample Return** 2023-present

**Department of Geoscience, University of Nevada, Las Vegas** 2021-present  
*Professor*

**Department of Geoscience, University of Nevada, Las Vegas** 2015-2021

Associate Professor

**Department of Geoscience, University of Nevada, Las Vegas**  
Assistant Professor

2009-2015

**NASA Postdoctoral Program NASA Johnson Space Center**

NASA Postdoctoral Fellow

2007- 2008

Supervisor: Dr. Douglas Ming

**Department of Geosciences, Penn State University, University Park, PA**

2002- 2007

Graduate Fellow

Advisor: Dr. Susan Brantley

#### **PEER-REVIEWED JOURNAL ARTICLES:**

\* Indicates Hausrath-advised student author # indicates Hausrath-advised postdoctoral author

Hausrath, E.M., Liermann, L.J., House, C.H., Ferry, J.G., and Brantley, S.L. (2007) The effect of methanogen growth on mineral substrates: will Ni markers of methanogen-based communities be detectable in the rock record? *Geobiology*, v. 5, p. 49-61.

Liermann, L.J., Hausrath, E.M., Anbar, A.D. and Brantley, S.L. (2007). Assimilatory and dissimilatory processes of microorganisms affecting metals in the environment. *J. Anal. At. Spectrom.* 2007, v. 22, p. 867 - 877.

Hausrath, E.M., Navarre-Sitchler, A.K., Sak, P., Steefel, C. and Brantley, S.L. (2008) Basalt weathering rates on Earth and the duration of liquid water on the plains of Gusev Crater, Mars. *Geology*, v. 36, p. 67-70.

Hausrath, E.M., Treiman, A.H., Vicenzi, E., Bish, D.L., Blake, D., Sarrazin, P., Hoehler, T., Midtkandl, I., Steele, A., and Brantley, S.L. (2008) Short- and long-term olivine weathering in Svalbard: Implications for Mars. *Astrobiology*, v. 8 (6), p. 1079-1092.

Hausrath, E.M., Neaman, A., Brantley, S.L. (2009) Elemental release rates from dissolving basalt and granite with and without organic ligands. *American Journal of Science*, v. 309, p. 633-660.

Hausrath, E.M. and Brantley, S.L. (2010) Basalt and olivine dissolution under cold, salty, and acidic conditions: What can we learn about recent aqueous weathering on Mars? *J. Geophys. Res.*, 115(E12): E12001.

Hausrath, E.M., Navarre-Sitchler, A.K., Sak, P.B., Williams, J.Z. and Brantley, S.L., (2011). Soil profiles as indicators of mineral weathering rates and organic interactions on a Pennsylvania diabase *Chemical Geology* v. 290 p. 89-100.

Hausrath, E.M. and A.A. Olsen (2013) Using the chemical composition of carbonate rocks on Mars as a record of previous interaction with liquid water. *American Mineralogist* v. 98 p. 897-906. This paper was selected by the editors of *American Mineralogist* as a “notable paper”.

Hausrath, E.M., D.C. Golden, R.V. Morris, D.G. Agresti, and D.W. Ming (2013) Acid sulfate alteration of fluorapatite, basaltic glass and olivine by hydrothermal vapors and fluids: Implications for fumarolic activity and secondary phosphate phases in sulfate-rich Paso Robles soil at Gusev Crater, Mars *J. Geophys. Res.* 118 (1): 1-13.

Hausrath, E.M. and O. Tschauner (2013) Natural fumarolic alteration of fluorapatite, olivine, and basaltic glass, and implications for habitable environments on Mars *Astrobiology* 13 (11): 1049-1064.

\*Adcock, C.T., E.M. Hausrath, Forster, P. (2013) Readily available phosphate from minerals in aqueous environments on early Mars *Nature Geoscience* 6: 824-827. This paper was featured in the News and Views section of *Nature Geoscience* and attracted considerable popular press.

\*Gainey, S.R., Hausrath, E.M., Hurowitz, J. A. and R.E. Milliken. (2014) Nontronite dissolution rates and implications for Mars *Geochimica et Cosmochimica Acta* 126: 192-211.

Devitt, D.A., L.E. Wright, S.A. Shanahan and E. Hausrath (2014) Fate of selenium in a small urban watershed *Environmental Monitoring and Assessment* DOI:10.1007/s10661-013-3609-1.

\*Tu, V.M., Hausrath, E.M., Tschauner, O., Iota, V. and Egeland, G.W. (2014) Dissolution rates of amorphous Al- and Fe-phosphates and their relevance to phosphate mobility on Mars. *American Mineralogist* 99:1206-1215. This paper was selected by the editors of *American Mineralogist* as a “notable paper”.

\*Adcock, C.T., Hausrath, E.M., Forster, P.M. and \*Sefein, K.J. (2014) Synthesis and characterization of the Mars-relevant phosphate minerals Fe/Mg-whitlockite and merrillite and a proposed mechanism for whitlockite to merrillite transformation. *American Mineralogist* 99:1221-1232.

Olsen, A., Hausrath, E.M., and J.D. Rimstidt (2015) Forsterite dissolution rates in Mg-sulfate-rich Mars-analog brines, and implications for the aqueous history of Mars, *JGR Planets* 120, doi:10.1002/2014JE004664.

\*Baumeister, J. L., E. M. Hausrath, A. Olsen, O. Tschauner, \*C.T. Adcock, and R. V. Metcalf (2015). Biogeochemical weathering of serpentinites: An examination of incipient dissolution affecting serpentine soil formation, *Applied Geochemistry* 54: 74-84.

Yesavage, T., Thompson, A., Hausrath, E.M., Liermann, L.J. and Brantley, S.L., (2015), Basalt weathering in an arctic Mars analog site. *Icarus*. doi:10.1016/j.icarus.2015.03.011.

Dixon, E., Elwood Madden, M.E., Madden, A., and Hausrath, E.M. (2015) Assessing hydrodynamic effects on jarosite dissolution rates, reaction products, and preservation on Mars, *JGR Planets*, 120, doi:10.1002/2014JE004779.

\*Adcock, C.T., and Hausrath, E.M. (2015) Weathering profiles in high-P rocks at Gusev Crater, Mars, suggest dissolution of phosphate minerals into near-neutral waters *Astrobiology*, 15(12), 1060-1075.

\*Steiner, M.H., E.M. Hausrath, M.E. Elwood Madden, O. Tschauner, B.L. Ehlmann, A.A. Olsen, S.R. Gainey, and J.S. Smith (2016) Dissolution of nontronite in chloride brines and implications for the aqueous history of Mars *Geochimica et Cosmochimica Acta* 10.1016/j.gca.2016.08.035

Marsac, K.E., Burnley, P.C., Adcock, C.T., Haber, D.A., Malchow, R.L., and Hausrath, E.M. (2016) "Modeling background radiation using geochemical data: A case study in and around Cameron, Arizona." *Journal of Environmental Radioactivity*, 165, 68-85.

Schieber, J., Bish, D., Coleman, M., Reed, M., Hausrath, E. M., Cosgrove, J., Gupta, S., Minitti, M. E., Edgett, K. S. and Malin, M. (2017), Encounters with an unearthy mudstone: Understanding the first mudstone found on Mars. *Sedimentology*, 64: 311–358. doi:10.1111/sed.12318.

Adcock, C.T. °, Tschauner, O. °, Hausrath, E.M. °, Udry, A., Luo, S.N., Cai, Y., Ren, M., Lanzirotti, A., Newville, M., Kunz, M., and Lin, C. (2017) Shock-transformation of whitlockite to merrillite and the implications for meteoritic phosphate. *Nature Communications*, 8, 14667. °Equally contributing authors.

Haber, D., Burnley, P.C., Malchow, R.C., Adcock, C.T., Marsac, K.E., and Hausrath, E.M. (2017) Modeling background radiation in Southern Nevada, *Journal of Environmental Radioactivity*. 171:41-64.

\* Gainey, S.R., Hausrath, E.M., Adcock, C.T., Tschauner, O., Hurowitz, J.A., Ehlmann, B.L., Xiao, Y., and Bartlett, C.L. (2017) Clay mineral formation under oxidized conditions and implications for paleoenvironments and organic preservation on Mars. *Nature Communications*, 8(1), 1230.

Hays, L.R., Graham, H.V., Des Marais, D.J., Hausrath, E. M., Horgany, B., McCollom, T. M., Parenteau, M.N., Potter-McIntyre, S.L., Williams, A. J., and Lynch, K.L. (2017) Biosignature preservation and detection in Mars analog environments *Astrobiology* 17: 4 DOI: 10.1089/ast.2016.1627 This paper was the 10<sup>th</sup> most downloaded paper from *Astrobiology* in 2017.

\*Christopher T. Adcock, Arya Udry, Elisabeth M. Hausrath, Oliver Tschauner (2018) Craters of the Moon National Monument basalts as unshocked compositional and weathering analogs for martian rocks and meteorites. *American Mineralogist* ; 103 (4): 502–516. doi: <https://doi.org/10.2138/am-2018-6193>.

#Z. R. Harrold, E. M. Hausrath, A. H. Garcia, A. E. Murray, O. Tschauner, J. Raymond and S. Huang (2018) Bioavailability of mineral-bound iron to a snow algae-bacteria co-culture and implications for albedo-altering snow algae blooms *Applied and Environmental Microbiology* 84 (7).

Hausrath, E. M. , D. W. Ming, T. Peretyazhko, and E. B. Rampe (2018) Reactive transport and mass balance modeling of the Stimson sedimentary formation and altered fracture zones constrain diagenetic conditions at Gale crater, Mars *Earth and Planetary Science Letters*, 491, 1-10.

\*Bartlett, C. L, E. M. Hausrath, C. T. Adcock, S. Huang, #Z. R. Harrold, and Arya Udry (2018) Effects of organic compounds on dissolution of the phosphate minerals chlorapatite, whitlockite, merrillite and fluorapatite: Implications for interpreting past signatures of organic compounds in rocks, soils and sediments *Astrobiology Journal* 18 (12) DOI: 10.1089/ast.2017.1739

Francis McCubbin, Brian Phillips, Christopher Adcock, Kimberly Tait, Andrew Steele, John Vaughn, Marc Fries, Viorel Atudorei, Kathleen Vander Kaaden, and Elisabeth Hausrath (2018) Discreditation of bobdownsite and the establishment of criteria for the identification of minerals with essential monofluorophosphate ( $\text{PO}_3\text{F}^{2-}$ ) *American Mineralogist* 103 (8): 1319-1328.

Charity M. Phillips-Lander, Andrew S. Elwood Madden, Elisabeth M. Hausrath, and Megan Elwood Madden (2019) Aqueous alteration of pyroxene in sulfate and chloride brines: Implications for post-Noachian aqueous alteration on Mars *Geochimica et Cosmochimica Acta* 257, 336-353.

David Beaty, Victoria Hipkin, Christy Caudill, R. Hansen, Elisabeth Hausrath, Catherine Maggiori, Ryan McCoubrey, Joseph Parrish, SJ Ralston (2019) Geological Evaluation of the MSRAD Field Site by a Human Field Party: Implications for Rover-based Exploration Operations and for the Future Human Exploration of Mars *Planetary Space Science* 171 34-49

Christopher Adcock, Daniel Haber, Pamela Burnley, Russell Malchow, Elisabeth Hausrath (2019) Modeling Gamma Radiation Exposure Rates Using Geologic and Remote Sensing Data to Locate Radiogenic Anomalies. *Journal of Environmental Radioactivity* 201-209: 106038.

D. W. Beaty and 71 others including Hausrath (2019) The Potential Science and Engineering Value of Samples Delivered to Earth by Mars Sample Return: International MSR Objectives and Samples Team (iMOST). *Meteoritics and Planetary Science* 54: S31-S152

#Phillips-Lander, C.M.°, #Harrold, Z.° Hausrath, E.M., Lanzirotti, A. Newville, M. Adcock, C., Raymond, J., Huang, S., Tschauner, O., and Sanchez, A. (2020) Snow algae preferentially grow on Fe-containing minerals and contribute to the formation of Fe phases. *Geomicrobiology* doi.org/10.1080/01490451.2020.1739176. °Equally contributing authors

Cristina García-Florentino, Leticia Gomez-Nubla , Jennifer Huidobro, Imanol Torre-Fdez, Patricia Ruíz-Galende , Julene Aramendia, Elisabeth M. Hausrath, Kepa Castro, Gorka Arana and Juan Manuel Madariaga (2021) Interrelationships in the gypsum-syngenite-gorgeyite system to describe their possible formation on Mars *Astrobiology* 21 (3): 332-344

Hausrath, E. M., Ming, D. W., Rampe, E. B., Pereyazhko, T. (2021) Reactive transport modeling of aqueous alteration in the Murray formation, Gale crater, Mars. ACS Earth and Space Chemistry 5 (3): 424-435

\*Ralston, S.J., Hausrath, E.M., Tschauner, O., Rampe, E., Peretyazhko, T., Christoffersen, R., DeFelice, C., and Lee, H. (2021) Dissolution rates of Fe-free allophane, Fe-poor allophane and Fe-rich allophane: Implications for aqueous alteration on Mars and the analysis of returned martian samples. Clays and Clay Minerals DOI: 10.1007/s42860-021-00124-x

#L. M. Cyclic, E.M. Hausrath, D. W. Ming, C.T. Adcock, J. Raymond, D. Remias, W. Rummel (2021). Investigating the growth of algae under low atmospheric pressures for potential food and oxygen production on Mars. Frontiers in Microbiology DOI: 10.3389/fmicb.2021.733244

\*Gainey, S. R., Hausrath, E. M., Hurowitz, J. A. (2022) Thermodynamic and kinetic analysis of transitions in clay mineral chemistry on Mars Icarus 372:114733

Anderson, R.B., and 61 others, including Hausrath, E.M. (2022) Post-landing major element quantification using SuperCam laser induced breakdown spectroscopy Spectrochimica Acta Part B: Atomic Spectroscopy 2022 Vol. 188 Pages 106347 DOI: <https://doi.org/10.1016/j.sab.2021.106347>

Farley, K.A. and 113 others, including Hausrath (2022) Aqueously altered igneous rocks sampled on the floor of Jezero crater, Mars Science DOI: doi:10.1126/science.abo2196

Wiens and 92 others, including Hausrath (2022) Compositionally and density stratified igneous terrain in Jezero crater, Mars Science Advances DOI: 10.1126/sciadv.abo3399

Olsen, A.A., Bodkin, M.A., Hausrath, E.M., 2023. Quantifying early mineral weathering reactions in serpentinite bedrock. Applied Geochemistry 148, 105543.

Hausrath and 46 others (2023) An Examination of Soil Crusts on the Floor of Jezero crater, Mars JGR Planets <https://doi.org/10.1029/2022JE007433>

Paar and 18 others, including Hausrath (2023) Three-dimensional data preparation and immersive mission-spanning visualization and analysis of Mars 2020 Mastcam-Z stereo image sequences ESS <https://doi.org/10.1029/2022EA002532>

Simon and 66 others, including Hausrath (2023) Samples Collected from the Floor of Jezero Crater with the Mars 2020 Perseverance Rover JGR Planets <https://doi.org/10.1029/2022JE007474>

Nathalie Turenne, Sahejpal Sidhu, Daniel M. Applin, Edward A. Cloutis, Z. U. Wolf Stanley A. Mertzman· Elisabeth M. Hausrath, Teresa Fornaro and Adrian Brown (2023) Spectral properties of Nontronite under Earth surface conditions, Mars-like surface conditions, and (impact) heating events: Implications for instrument detections on Mars Icarus <https://doi.org/10.1016/j.icarus.2023.115448>

Vaughan and 24 others, including Hausrath (2023) Regolith of the crater floor units, Jezero crater, Mars: Textures, composition and implications for provenance. JGR Planets <https://doi.org/10.1029/2022JE007437>

Adcock, C.T., Hausrath, E.M., Rampe, E.B., Yang, H., Downs, R.T. (2023) The Crystal Structure and Chemistry of Natural Giniite and Implications for Mars American Mineralogist <https://doi.org/10.2138/am-2022-8138>

Huidobro, J., J. Aramendia, G. Arana, E.M. Hausrath, J.M. Mardariaga (2023) The effect of low temperature on the Raman spectra of calcium-rich sulfates on Mars Annals of Glaciology <https://doi.org/10.1017/aog.2023.29>

Chipera, S. J and 24 others, including Hausrath (2023). Mineralogical investigation of Mg-sulfate at the Canaima drill site, Gale crater, Mars. *Journal of Geophysical Research: Planets*, 128, e2023JE008041. <https://doi.org/10.1029/2023JE008041>

Hausrath, E.M.; Adcock, C.T.; Berger, J.A.; Cyclic, L.M.; Kizovski, T.V.; McCubbin, F.M.; Schmidt, M.E.; Tu, V.M.; VanBommel, S.J.; Treiman, A.H.; et al. (2024) Phosphates on Mars and Their Importance as Igneous, Aqueous, and Astrobiological Indicators. *Minerals* 2024, 14, 591. <https://doi.org/10.3390/min14060591>

\*Feldman AD, Hausrath EM, Burnley P, Rampe EB, Morris RV, Munoz J, Uyeda GH, Seward G (2024). Incipient Dissolution of Emplaced Forsterite and Fayalite Records the Effects of Climate, Mineral Composition, and Crystallographic Orientation. *Geochimica et Cosmochimica Acta*, 372, 214-236.

Zorzano, MP and 26 others, including Hausrath (2024) Present-day thermal and water activity environment of the Mars Sample Return collection. *Sci Rep* 14, 7175 (2024). <https://doi.org/10.1038/s41598-024-57458-4>

Taylor, A.R.; Olsen, A.A.; Hausrath, E.M.; Olsen, B.J.; Cardace, D. The Role of Sulfuric Acid, Abiotic–Organic Acids, and Biotic Acids on Serpentinite Dissolution and Trace Metal Release. *Minerals* 2024, 14, 256. <https://doi.org/10.3390/min14030256>

Blake, D.; and 41 others, including Hausrath (2024) The Chemistry and Mineralogy (CheMin) X-ray Diffractometer on the MSL Curiosity Rover: A Decade of Mineralogy from Gale Crater, Mars. *Minerals* 2024, 14, 568. <https://doi.org/10.3390/min14060568>

\*Feldman, A.D., Hausrath, E.M., Rampe, E.B. et al. Fe-rich X-ray amorphous material records past climate and persistence of water on Mars. *Commun Earth Environ* 5, 364 (2024). <https://doi.org/10.1038/s43247-024-01495-4>

#### **BOOK CHAPTER, APPENDIX, REVIEW, REPORTS:**

Bandstra J.Z., Buss H.L., Campen R.K., Liermann L.J., Moore J., Hausrath E.M., Navarre-Sitchler A.K., Jang J-H. and Brantley S.L. Appendix: Compilation of Mineral Dissolution Rates. In *Kinetics of Water-Rock Interaction* (eds. S. L. Brantley, J. D. Kubicki and A. F. White). Springer, New York. 2008.

Brantley, S. L., Lebedeva, M., and Hausrath, E. M. (2012) A geobiological view of weathering and erosion. In: *Fundamentals of Geobiology* (eds. A. H. Knoll, D.E. Canfield, and K. Konhauser) Blackwell Publishing Limited, 2012

#### **EXTENDED ABSTRACTS:**

\* Indicates Hausrath-advised student author # indicates Hausrath-advised postdoctoral author

Hausrath, E.M., Sullivan, R., Goreva, Y., Zorzano, M.P., Cardarelli, E., Vaughan, A., Cousin, A., Siljestrom, S., Shumway, A., VanBommel, S., Martinez, G., Johnson, J., Bechtold, A., Paar, G., Poulet, F., Herd, C.D.K., Benison, K., Sephton, M., Madariaga, J.M., Lasue, J., Wiens, R.C., Martinez-Frias, J., Bell, J.F.I., Czaja, A.D., Adcock, C.T., Randazzo, N., 2023. The First Regolith Samples from Mars, 54th Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #2379.

Adcock, C.T., Hausrath, E.M., Rampe, E.B., Steinberg, S.M., 2023. Hydrogen Production from Sulfide Minerals as a Potential Resource on Mars, 54th Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #1756.

#Cyclic, L.C., Hausrath, E.M., Raymond, J., Ming, D.W., Adcock, C.T., Rummelle, W.P., Petereit, J., Vasquez-Gross, H.A., 2023. Transcriptome-Based Expression Analysis and O<sub>2</sub> Generation of Algae Growing Under Mars-Relevant Low Pressure and Variable Light Intensities and Wavelengths, 54th Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #2797.

\*Feldman, A.D., Hausrath, E.M., Rampe, E.B., Sharp, T., Tschauer, O., Newville, M., Lanzirrotti, A., 2023. Cold Conditions Promote Mg and Si Incorporation in Fe/Si-Rich and Al-Poor X-Ray Amorphous Material in Mars-Relevant Field Environments, 54th Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #2456.

Herd, C.D.K., Bosak, T., Farley, K.A., Stack, K.M., Benison, K.C., Cohen, B.A., Czaja, A.D., Debaille, V., Goreva, Y., Hausrath, E.M., Hickman-Lewis, K., Mansbach, E.N., Mayhew, L.E., Sephton, M.A., Randazzo, N., Shuster, D.L., Siljeström, S., Simon, J.I., Wadhwa, M., Weiss, B.P., Zorzano, M.-P., Brown, A.J., 2023. Sampling by the NASA Perseverance Rover for Mars Sample Return, 54th Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #2185.

\*Valdúeza, J.E., Hausrath, E.M., Bristow, T.F., Rampe, E.B., 2023. Testing Destruction of Clay Minerals by Silica-Poor Brines in Gale Crater, Mars Using Laboratory and Field Experiments, 54th Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #2562.

Hausrath, E.M., Adcock, C.T., Bechtold, A., Beck, P., Brown, A., Cardarelli, E.L., \*Carman, N.A., Cousin, A., Forni, O., Gabriel, T.S.J., Gomez, F., Goreva, Y., Lasue, J., Legett, C.I., Madariaga, J.M., Mandon, L., Martinez, G., Martínez-Frías, J., McConnochie, T., Meslin, P.-Y., Zorzano Mier, M.-P., Minitti, M.E., Paar, G., Siljeström, S., Schmidt, M.E., Schroeder, S., Sephton, M., Shkolyar, S., Sharma, S.K., Steele, A., Sullivan, R., Udry, A., Vaughan, A., Wiens, R.C., Team, S., Group, R.W., 2022. Examining Soil Crusts at Jezero Crater, Mars, 53rd Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #1604.

Adcock, C.T., Hausrath, E.M., Rampe, E.B., \*Cruz, V., Wright, L., 2022. Perchlorate Recovery by Dissolution from Martian Soil Simulants: Implications for Human Exploration of Mars, 53rd Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #1667.

#Cycil, L.M., Hausrath, E.M., Ming, D.W., Raymond, J., Adcock, C.T., Ruemmele, W.P., \*Cruz, V., 2022. Examining the Photosynthetic Activity and Adaptations of Algae Growing Under Mars-Relevant Low Pressure and Low Light Conditions for Human Exploration of Mars, 53rd Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #2318.

\*Feldman, A.D., Hausrath, E.M., Rampe, E.B., Peretyazhko, T., Burnley, P., Tschauer, O., Lanzirrotti, T., Newville, M., 2022. Olivine Dissolution and Formation of Secondary Phases in Ultramafic Soils, 53rd Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #2278.

Hickman-Lewis, K., Benison, K., Bosak, T., Cohen, B.A., Czaja, A.D., Debaille, V., Hausrath, E.M., Herd, C.D.K., Mayhew, L.E., Sephton, M.A., Shuster, D.L., Siljeström, S., Simon, J.I., Weiss, B.P., Zorzano, M.P., Shkolyar, S., Bell, J.F.I., Kah, L.C., Madariaga, J.M., Wadhwa, M., Hand, K.P., Sun, V.Z., 2022. Perseverance Rover Sampling Activities at South Séítah, Jezero Crater, 53rd Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #1965.

Simon, J.I., Amundsen, H.E.F., Beegle, L.W., Bell, J., Benison, K.C., Berger, E.L., Bosak, T., Casademont, T.M., Czaja, A.D., Cohen, B.A., Debaille, V., Fairen, A.G., Farley, K.A., Fox, A.C., Goreva, Y., Hand, K., Hamran, S.-E., Hausrath, E.M., Herd, C.D.K., Horgan, B., Hurowitz, J., Lee, C.H., Mandon, L., Maurice, S., Madariaga, J.M., Mayhew, L.E., McLennan, S., Moeller, R.C., Scheller, E.L., Sharma, S., Siljeström, S., Sun, V.Z., Shuster, D.L., Stack, K.M., Udry, A., VanBommel, S., Wadhwa, M., Weiss, B.P., Wiens, R.C., Williams, A., Willis, P.A., Zorzano, M.-P., Team, M., 2022. Sampling of Jezero Crater Mááz Formation by Mars 2020 Perseverance Rover, 53rd Lunar and Planetary Science Conference. Lunar and Planetary Institute, Houston, Abstract #1294.

Hausrath, E.M., Rampe, E.B., Ming, D.W., Archer, P.D., and Millan, M (2021) Reactive transport modeling to interpret environmental conditions that may preserve organic molecules on Mars. *52<sup>nd</sup> Lunar and Planetary Science Conference*. Houston, Lunar and Planetary Institute

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### INVITED TALKS

- “Weathering on Earth and on Mars” The Smithsonian Institution, Washington, DC September 2007
- “Interpreting Phosphate Mobility on Mars” The Geological Society of Nevada, Southern Chapter, Las Vegas, NV January 2010
- “Biogeochemical weathering of serpentine minerals from bedrock to soil” Critical Zone Observatories All Hands Meeting, Tucson, AZ May 2011
- “Interpreting signatures of aqueous alteration on Earth and on Mars” Michigan State University, November 2011
- “Interpreting signatures of aqueous alteration on Earth and on Mars” UNLV Chemistry Department, November 2011
- “Interpreting aqueous alteration on Earth and on Mars” University of Oklahoma, August 2012
- “Interpreting aqueous alteration on Earth and on Mars” University of Nevada, Reno 2012
- “Biogeochemical weathering of serpentinites: An examination of the first reactions controlling serpentine soil formation”. E.M Hausrath (presenter) A.A. Olsen, J.L.\* Baumeister, E. Yardley, M. Bodkin, K. Negrich Soil Science Society of America Meeting, Cincinnati, OH, October 21-24 2012.
- “Laboratory experiments on Mars-relevant clay and phosphate minerals yield insights into the aqueous history and potential for habitability on Mars”. E.M. Hausrath (presenter) C.T. \*Adcock, S. \*Gainey, J. \*Hurowitz, V. \*Tu. The American Geophysical Union, San Francisco, CA Dec 3-7 2012.
- “Evidence for widespread aqueous alteration and abundant phosphorus release on Mars” University of South Florida, April 2014
- “Interpreting phosphate mobility in early, potentially habitable environments on Mars” Pardee Keynote Symposia GSA, Vancouver, BC October 2014
- “Interpreting aqueous alteration on Earth and on Mars using field analyses, laboratory experiments and modeling” GSA, Vancouver, BC October 2014
- “Interactions of snow algae, microorganisms and minerals in snowy environments” Nevada Native Plant Society, Henderson, Nevada September, 2016
- “Interactions of snow algae, microorganisms, and minerals in snowpack: Implications for Earth’s albedo and potential biosignature formation” American Chemical Society National Meeting April 2017
- “Investigating weathering of basaltic materials in Gale Crater, Mars: A combined laboratory, modeling, and terrestrial field approach, GSA, Seattle WA, October 2017
- “Weathering profiles in soils and rocks on Earth and Mars” The American Geophysical Union, New Orleans, LA Dec 2017
- “What causes pink snow?: Interactions of snow algae, minerals and microorganisms in low-nutrient snowy environments Science Café, Las Vegas, Nevada, March 2018
- “Interactions of snow algae, microorganisms, and minerals in snowpack: Implications for Earth’s albedo and potential biosignature formation” University of Texas, El Paso, April 2018
- “Porosity formation and weathering products in young serpentine soils” SSSA, San Diego, CA January 2019
- “Rock, Soil, and Water on Mars: Understanding Mars' Past and Planning for the Future” UNLV College of Sciences 50<sup>th</sup> anniversary Lecture Oct. 2019
- “Examining formation and dissolution of Fe-rich incipient weathering products using field, laboratory, and reactive transport modeling approaches”, Goldschmidt Conference, Virtual, 2020
- “What are the most important measurements, analyses, and modeling to better understand early Mars?” The National Academies of Sciences, Engineering, and Medicine Division on Engineering and Physical Sciences Space Studies Board Planetary Science Decadal Survey 2022-2032 Panel on Mars Virtual Meeting February 2021
- “UNLV goes to the Red Planet” UNLV Geoscience Department January 2022
- “Exploring Mars: Understanding the rock, soil, and potential for past habitability on another planet” Russell Frank Astronomy Lecture Series, March 2022
- “Interpreting evidence of water-rock interactions on Mars” Stony Brook University, April 2022
- “An Examination of Soil Crusts at Jezero crater, Mars” SSSA, Baltimore, MD, Nov 2022

## AWARDS

Barrick Scholar Award	2015
Regents' Rising Researcher Award	2016
College of Sciences Distinguished Researcher	2017
Penn State 125 <sup>th</sup> Anniversary Fellow	2021
Barrick Distinguished Scholar Award	2024

## SCIENTIFIC SESSIONS AND CONFERENCES ORGANIZED

D. Beaty, B. Carrier, S. Diniega, B. Ehlmann, M. Meyer, R. Zurek (convenors) S. Atreya, A. Bhardwaj, J. Bishop, D. Brain, W. Calvin, A.C. Vandaele, A. Cousin, J. Crisp, I. Daubar, C. Edwards, J. Filiberto, F. Forget, A. Fraeman, S. Gupta, E. Hauber, E. Hausrath, B. Horgan, M. Kahre, O. Korablev, M. Lapotre, D. Ming, M. Mischna, P. Niles, T. Putzig, R. Ramirez, E. Rampe, C. Smith, I. Smith, K. Stack-Morgan, J. Stern, S. Stewart Johnson, T. Usui, J. Vago. 9<sup>th</sup> International Conference on Mars Pasadena, CA, July 22-25, 2019

Alive or not? New strategies and techniques for recognizing biological signatures from the abiotic noise Dragos George Zaharescu, Jorge I Núñez, Jennifer B Glass, Rebecca Lybrand, Elisabeth Hausrath, Steffen Buessecker, Kathleen Craft Astrobiology Science Conference, Seattle, WA, 2019

P Cycling in Soils: From the Molecular to the Field Scale Organizers: James Kubicki, Lixin Jin, Deb Jaisi, Andrew Margenot, John Regan, Moderators: Ben Brunner, Elisabeth Hausrath, Mengqiang Soil Science Society of America National Meeting 2019 San Diego, CA

Audrey Bouvier, Carolyn Crow, James Darling, Christopher Glein, Elisabeth Hausrath, Larry Nittler, Tanya Peretyazhko, Steve Vance "Geochemists infiltrate the Solar System: the Geological Evolution of Small Bodies, Moons and Planets, at the Goldschmidt Conference Boston, MA, 2018

L. Hays, D. Beaty, M. Voytek, M. Meyer (convenors) A. Allwood, N. Cabrol, W. Calvin, D. Des Marais, J. Farmer, E. Hausrath, B. Horgan, R. Leveille, A.-L. Reysenbach (scientific organizing committee) "Biosignature preservation and detection in Mars-analog environments" Lake Tahoe, NV May 16-19, 2016

E. Marin-Spiotta, J. Chorover, C. Rasmussen, L. Jin, A. Olsen, E. Hausrath (organizers) "Organo-Mineral Interactions in the Critical Zone: Mineral Weathering and Carbon Stabilization in Soil" at the Goldschmidt Conference, Knoxville, TN 2010

Brantley, S.L., Michalski, J., Hausrath, E. (organizers) "Chemical and physical weathering of basalt on the Earth, Moon and Mars" at the Goldschmidt Conference, Cologne, Germany, 2007

Eigenbrode, J., Fries, M., Hausrath, E. (organizers) "Interdisciplinary research in cold Mars-analogue environments" at the Astrobiology Science Conference, Washington, DC, 2006

## CONTRIBUTIONS TO THE UNIVERSITY AND THE PROFESSION

**Member:** Returned Sample Science Board for the Mars 2020 mission 2015-2018

**Member:** Mars Sample Return Measurement Definition Team (2023 to present)

**Reviewer for:** Nature, Science Advances, Nature Geoscience, Nature Communications, Geochimica et Cosmochimica Acta, Earth and Planetary Science Letters, Chemical Geology, Geochemical Journal, Arctic, Antarctic and Alpine Research, Chemical and Engineering Science, Icarus, The Soil Society of America Journal, JGR Planets, NSF, Mars Fundamental Research Program, Mars Data Analysis Program, NASA Earth and Space Science Fellowship Program, NASA Postdoc Program, Nevada NASA Space Grant Consortium, NASA Astrobiology: Exobiology and Evolutionary Biology Program, NASA Astrobiology Institute

**Funding review panels:** I have served as a panel reviewer on seven NASA funding review panels, and chaired one NASA review panel.

**University service:** I served as the Graduate Admissions Coordinator for the Geoscience Department (2016- 2019) managing two admissions cycles per year, chairing the Graduate Admissions committee, and chairing the Graduate College Awards sub-committee. I served as Undergraduate Coordinator (2012-2015) for the up to ~200 students in the Geoscience Department. I have also served as a McNair Faculty Mentor in the McNair Scholars Institute, which has the goal of encouraging and preparing undergraduate students who are members of underrepresented groups to pursue doctoral studies and I also served on the Advisory Board of the Multicultural Program at UNLV (2013-2014), which has the goal of increasing the number of minority and underrepresented groups in the STEM and health related sciences. I have served on the Sabbatical Committee (2009-2014), 5 Geoscience Department faculty search committees, chaired one Geoscience Department faculty search committee, the Geoscience Undergraduate Assessment Committee (2013 – 2015), the College of Science Undergraduate Curriculum Committee (2012 – 2015), the Geoscience Department Listening to Departments Committee (chaired Spring 2013, member Spring 2011), the Geoscience Department Graduate Admissions Committee, (2009-2012 and 2019 to present), on the Geoscience Department Personnel committee (2016- present) and as chair of the Geoscience Department Curriculum Committee (2012- 2015). I am currently serving as a member of the Personnel committee, the scholarship committee, and a hiring search committee. I have also mentored > twenty undergraduate students working in my laboratory while at UNLV.

**Outreach:** We have received funding for two outreach programs, which reached ~350 students. I have spoken at multiple additional outreach events, and my research has been covered in the media by NBC News, CBS news, New Scientist, Las Vegas Guardian Express, Fox News, The Oregon Herald, the Las Vegas Review Journal, KNPR, The Reno Gazette Journal and others – please see list at: <https://www.unlv.edu/news/expert/elisabeth-libby-hausrath>

### **SUMMARY OF RESEARCH INTERESTS**

Water-rock-life interactions on Earth and on Mars; sample science; astrobiology; geomicrobiology; soil-forming processes; kinetics of mineral dissolution and precipitation; biological impacts on weathering; mineral biosignatures; reactive transport modeling; the effect of climate on weathering

### **GRADUATE AND POSTDOCTORAL ADVISEES**

Eduardo Martinez – PhD in progress at UNLV

Baylee Colburn – PhD in progress at UNLV

Nancy Carman – MS in progress at UNLV

Anthony Feldman – PhD 2023 – employed at DRI

Leena Cycil – Postdoctoral Scholar at UNLV 2019-2023 – employed as an assistant research professor

S.J. Ralston – MS 2018 – employed by Jacobs at NASA Johnson Space Center

Charity Phillips-Lander – Postdoctoral scholar 2017-2018 –employed at SWRRI

Courtney Bartlett – MS 2017 – employed by the Arizona State Park system

Zoe Harrold – Postdoctoral scholar 2016-2017 – working at Clear Horizons Consulting

Seth Gainey – (PhD 2015 UNLV Outstanding Dissertation) employed by the USGS

Christopher Adcock – (PhD 2014 College of Science Outstanding Dissertation), postdoctoral scholar 2014-2015, employed as an assistant research professor

Michael Steiner – (MS 2015 UNLV Outstanding Thesis) – employed at the USGS

Valerie Tu – (MS 2013) – employed by Jacobs at NASA Johnson Space Center.

Brittany (Myers) Downs (MS 2012) – employed at a state environmental agency

Julie Baumeister (MS 2012) – employed at an environmental consulting company