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Curriculum Vitae

EDUCATION:

2012 **Ph.D. in Geological Sciences**, School of Earth and Space Exploration, Arizona State University, Tempe, AZ

2009 **M.S. in Geological Sciences**, School of Earth and Space Exploration, Arizona State University, Tempe, AZ

2007 **B.S. in Geological Sciences**, Summa Cum Laude, Department of Geological Sciences, Arizona State University, Tempe, AZ

POSITIONS HELD:

2021- **Associate Professor,** Department of Astronomy and Planetary Science, Northern Arizona University

2016-2021 **Assistant Professor,** Department of Astronomy and Planetary Science, Northern Arizona University

2015-2016 **Research Physical Scientist,** Astrogeology Science Center, United States Geological Survey

2012-2015 **Planetary Science Postdoctoral Fellow**, Department of Geological and Planetary Sciences, California Institute of Technology

2002-2007 **Research Assistant,** Mars Space Flight Facility, Department of Geological Sciences, Arizona State University

2007-2012 **Graduate Research Associate**, Mars Space Flight Facility School of Earth and Space Exploration, Arizona State University

MISSION EXPERIENCE:

2021- **Associate Director, Northern Arizona University**, NASA Space Grant

2019- **Lunar Trailblazer Team Co-I***, NASA/SIMPLEX*

2018- **THEMIS Science Team Co-I**, Thermal Emission Imaging System*, NASA/2001 Mars Odyssey*

2016- **MSL Participating Scientist** Mars Science Laboratory – Curiosity*, NASA/Jet Propulsion Laboratory*

2014- **EMIRS Instrument Scientist**, Emirates Mars InfraRed Spectrometer, *UAE Emirates Mars Mission*

2014- **RIS4E and RISE2 Science Team Collaborator,** Remote In Situ and Synchrotron Studies for Science and Exploration, *NASA/Solar System Exploration Research Virtual Institute (SSERVI)*

2012- **CRISM Science Team Collaborator,** Compact Reconnaissance Imaging Spectrometer for Mars, *NASA/Mars Reconnaissance Orbiter*

2003-2018 **THEMIS Science Team Collaborator**, Thermal Emission Imaging System, *NASA/2001 Mars Odyssey*

2003-2015 **Mini-TES Science Team Collaborator**, Mini-Thermal Emission Spectrometer *NASA/Mars Exploration Rovers – Spirit & Opportunity*

2013-2016 **MSL Science Team Member,** Mars Science Laboratory – Curiosity, *NASA/Jet Propulsion Laboratory*

2003-2006 **TES Science Team Member,** Thermal Emission Spectrometer, *NASA/Mars Global Surveyor*

REFEREED PUBLICATIONS:

Manuscripts In Preparation

68) ***Edwards C. S.**, S. Piqueux, P. R. Christensen et al., The Thermophysical Properties of Phobos, *Nature Astronomy*

67) *Tai Udovicic, C., **C. S. Edwards**, J. L. Bandfield, Validating the Roughness Based M3 Thermal Correction*, Icarus*

66) Rodriguez, K., J. Laura, **C. S. Edwards,** et al., Spatial registration and alignment of images using automated methods, *IEEE Remote Sensing*

65) *Zigo, H., **C. S. Edwards**, et al., Identification and Mapping of an Ancient Martian Valley Network, *Geophysical Research Letters*

64) *Powell, K., **C. S. Edwards,** et al., Thermal inertia of Jezero Crater as Derived by CRISM, *Journal of Geophysical Research*

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63) *Payre, V., Salvatore, M. R., & **Edwards, C. S**. (submitted, 2022). An Evolved Early Crust Exposed on Mars Revealed through Spectroscopy. *Geophysical Research Letters*.

62) Bapst, J., Piqueux, S., **Edwards, C. S.,** Wolfe, C., Hayne, P., Kass, D., & Kleinboehl, A. (submitted, 2022). Surface Dust Redistribution on Mars from Interannual Differences in Temperature and Albedo. *J. Geophys. Res: Planets*.

61) McKeeby, B. E., Ramsey, M., Tai Udovicic, C. J., Haberle, C., & **Edwards, C. S**. (submitted, 2002). Quantifying Sub-Meter Surface Heterogeneity on Mars Using Off-Axis Thermal Emission Imaging System (THEMIS) Data *J. Geophys. Res: Planets*.

60) Ehlmann, B. L., Klima, R. L., Seybold, C. C., Klesh, A. T., Au, M. H., Bender, H. A., Bennett, C. L., Blaney, D. L., Bowles, N., Calcutt, S., Copley-Woods, D., Dickson, J. L., Djotni, K., Hanna, K. D., **Edwards, C. S.,** Evans, R., Felder, E., Fogg, R., Green, R. O., Hawkins, G., House, M., Islas, S., Lantoine, G., Linch, S., McCaa, T., McKinley, I., Merkley, T. F., Miura, J. K., Pieters, C. M., Santiago, W., Scire, E., Sherwood, R., Shirley, K., Smith, C., Sondheim, M., Sullivan, P., Temple, J., Thompson, D. R., Waldorff, K. I., Williamson, W. R., Warren, T. J., Wood, J. L., & Zareh, S. (2022). NASA's Lunar Trailblazer Mission: A Pioneering Small Satellite for Lunar Water and Lunar Geology. *IEEE Aerospace*.

Published Manuscripts

60) Lange, L., Piqueux, S., & Edwards, C. S. (2022). Gardening of the Martian Regolith by Diurnal CO2 Frost and the Formation of Slope Streaks. *Journal of Geophysical Research-Planets, 127*(4),

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59) Farrand, W. H., **Edwards, C. S.,** & Udovicic, C. T. (2022). Spectral evidence for a pyroclastic mantle over the Tacquet formation and Menelaus domes of southwest Mare Serenitatis. *Icarus*, 115021. doi: 10.1016/j.icarus.2022.115021

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57) *Pan, C., **Edwards, C. S**., & Rogers, A. D. (2021). Evaluating Flat-Crater Floor Fill Compositions and Morphologies: Insight Into Formation Processes. *Journal of Geophysical Research: Planets, 126*(11), e2021JE006919. doi: 10.1029/2021JE006919

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51) *Ahern, A. A., Rogers, A. D., **Edwards, C. S.**, & Piqueux, S. (2021). Thermophysical Properties and Surface Heterogeneity of Landing Sites on Mars From Overlapping Thermal Emission Imaging System (THEMIS) Observations. *Journal of Geophysical Research: Planets, 126*(6), e2020JE006713. doi: 10.1029/2020JE006713

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38) Nowicki, S. A., R. D. Inman, T. C. Esque, K. E. Nussear, and **C. S. Edwards** (2019), Spatially Consistent High-Resolution Land Surface Temperature Mosaics for Thermophysical Mapping of the Mojave Desert, *Sensors*, *19*(12), 2669, doi: 10.3390/s19122669.

37) Bohon, W., K. V. Hodges, A. Tripathy-Lang, J. R. Arrowsmith, and **C. S. Edwards** (2018), Structural relationship between the Karakoram and Longmu Co fault systems, southwestern Tibetan Plateau, revealed by ASTER remote sensing, *Geosphere*, doi: 10.1130/ges01515.1.

36) **Edwards, C. S.,** S. Piqueux, V. E. Hamilton, R. L. Fergason, K. E. Herkenhoff, A. R. Vasavada, K. A. Bennett, L. Sacks, K. W. Lewis, and M. D. Smith (2018), The Thermophysical Properties of the Bagnold Dunes, Mars: Ground-Truthing Orbital Data, *Journal of Geophysical Research: Planets*, *123*(5), 1307-1326, doi: 10.1029/2017je005501.

35) Glotch, T. D., **C. S. Edwards**, M. Yesiltas, K. A. Shirley, D. S. McDougall, A. M. Kling, J. L. Bandfield, and C. D. K. Herd (2018), MGS-TES Spectra Suggest a Basaltic Component in the Regolith of Phobos, *Journal of Geophysical Research: Planets*, doi: 10.1029/2018je005647.

Press Coverage: AGU; Space.com; Astronomy Magazine

34) Huang, J., M. R. Salvatore, C. S. Edwards, R. L. Harris, and P. R. Christensen (2018), A Complex Fluviolacustrine Environment on Early Mars and Its Astrobiological Potentials, *Astrobiology*, *18*(8), 1081-1091, doi: 10.1089/ast.2017.1757.

33) Ito, G., A. D. Rogers, K. E. Young, J. E. Bleacher, **C. S. Edwards**, J. Hinrichs, C. I. Honniball, P. G. Lucey, D. Piquero, B. Wolfe, and T. D. Glotch (2018), Incorporation of portable infrared spectral imaging into planetary geological field work: Analog studies at Kīlauea Volcano, Hawaii and Potrillo Volcanic Field, New Mexico, *Earth and Space Science*, doi: 10.1029/2018ea000375.

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31) Jakosky, B. M., and **C. S. Edwards** (2018), Inventory of CO2 available for terraforming Mars, *Nature Astronomy*, *2*(8), 634-639, doi: 10.1038/s41550-018-0529-6.

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6) **Edwards, C. S.,** P. R. Christensen, and J. Hill (2011), Mosaicking of global planetary image datasets: 2. Modeling of wind streak thicknesses observed in Thermal Emission Imaging System (THEMIS) daytime and nighttime infrared data, *J. Geophys. Res.,* 116, E10005, doi:10.1029/2011JE003857.

5) Bandfield, J. L., A. D. Rogers, and **C. S. Edwards** (2011), The Role of Aqueous Alteration in the Formation of Martian Soils, *Icarus*, 211(1), 157-171, doi: 10.1016/j.icarus.2010.08.028.

4) **Edwards, C. S.**, J. L. Bandfield, P. R. Christensen, and R. L. Fergason (2009), Global distribution of bedrock exposures on Mars using THEMIS high-resolution thermal inertia, *J. Geophys. Res.*, 114(E11001), doi:10.1029/2009JE003363.

3) **Edwards, C. S.**, P. R. Christensen, and V. E. Hamilton (2008), Evidence for extensive olivine-rich basalt bedrock outcrops in Ganges and Eos chasmas, Mars, *J. Geophys. Res,* 113(E11003), doi:10.1029/2008JE003091.

2) Piqueux, S., **C. S. Edwards**, and P. R. Christensen (2008), Distribution of the ices exposed near the south pole of Mars using Thermal Emission Imaging System (THEMIS) temperature measurements, *J. Geophys. Res*, 113(E8), doi: 10.1029/2007JE003055.

1) Bandfield, J. L., and **C. S. Edwards** (2008), Derivation of martian surface slope characteristics from directional thermal infrared radiometry, *Icarus*, 193(1), 139-157, doi:10.1016/j.icarus.2007.08.028.

GRANTS AND FELLOWSHIPS:

Current and Pending Grants – See Separate Document

Past Funded Grants

2020-2021 **PI, USGS/Cooperative Agreement,** Testing Field Guides for Use in Planetary Science Analog Research

2020 **PI, NAU/Small-Research Equipment Acquisition Program,** Handheld XRF for In Situ Planetary Analog Investigations

2016-2021 **Co-I, NASA/Lunar Data Analysis Program (LDAP),** Investigation of the Effect of Surface Roughness on Lunar Infrared Spectra, PI: J. Bandfield

2016-2019 **Co-I, NASA/Planetary Data Archiving, Restoration, and Tools (PDART)**, Improving Thermal Model Capability for the Planetary Science Community. PI: S. Piqueux

2015-2020 **PI, UAE/Emirate Mars Mission:** Emirates Mars Mission Task Order Apprenticeship

2015-2019 **Co-I, NASA/Solar System Workings (SSW),** Low Temperature Calorimetry for Improved Martian Thermal Modeling: Application to Sedimentary Materials, PI: S. Piqueux

2015-2018 **Co-I, NASA/Solar System Workings (SSW)**, Identifying and Quantifying Phyllosilicate-Bearing Materials on Solar System Bodies. PI: B. L. Ehlmann

2015-2019 **Co-I, NASA/Mars Data Analysis Program (MDAP)**, Inter-seasonal and inter-annual Surface Dust Fluxes on Mars. PI: S. Piqueux

2015-2019 **Co-I, NASA/Solar System Exploration Research Virtual Institute (SSERVI)**, Remote In Situ and Synchrotron Studies for Science and Exploration. PI: T. D. Glotch,

2014-2020 **PI, UAE/Emirates Mars Mission:** EMIRS: Emirates Mars Infrared Spectrometer Instrument Development for the Emirates Mars Mission – Phase A-D

2014-2019 **Co-I, NASA/Mars Data Analysis Program (MDAP)**, Coordinated spectral, photogeologic, and morphometric studies of rock-dominated units on Mars. PI: A. D. Rogers

2012-2014	**Co-I, JPL/Caltech/President and Director's Fund**, Surface-Based Hyperspectral Imaging for Advanced Planetary and Terrestrial Applications. Co-PIs: Bethany L. Ehlmann/Diana Blaney*, FTEs: 0.5*
2011-2015	**Collaborator, NASA/Mars Data Analysis Program (MDAP)**, Martian sediment production: An investigation into the relative roles of chemical and mechanical weathering. PI: Victoria E. Hamilton.
2012-2013	**PI, Planetary Science Postdoctoral Fellowship**, California Institute of Technology, Division of Geological and Planetary Sciences.
2010-2013	**Collaborator, NASA/Mars Data Analysis Program (MDAP)**, Integrated Analyses of Martian Surface Compositions Using Near-Infrared through Thermal Infrared Spectroscopic Data. PI: Joshua L. Bandfield.
2012-2013	**Co-I, JPL/Mars Critical Data Products for Future Landing Site Characterization**, Land-On Science at the Nili Fossae Carbonate Plains: Aqueous Alteration of Ultramafic Rocks and Clay-Carbonate Stratigraphy. PI: Bethany L. Ehlmann
2008-2011	**Collaborator, NASA/Planetary Geology and Geophysics (PG&G)**, Laboratory Vibrational Spectroscopy for the Analysis of Planetary Surfaces. PI: Philip R. Christensen. Role: *Graduate Student*
2008-2011	**Collaborator, NASA/Mars Instrument Development Program (MIDP)**, Development of a Microscopic Analysis Thermal Emission Spectrometer (MicroTES) for Planetary Landed Missions. PI: Philip R. Christensen. Role: *Graduate Student*

AWARDS AND HONORS:

2019	**NAU Most Promising Research Scholar**
2017	**NASA Group Achievement Award,** Mars Science Laboratory Extended Mission 1
2015	**Outstanding Reviewer, Icarus**
2012	**Outstanding Graduate Mentor, Inaugural Recipient**, Graduate College, Graduate and Professional Student Association, Arizona State University
2012	**Outstanding Geology Graduate Student**, School of Earth and Space Exploration, Arizona State University
2011	**Scholarship Recipient,** NASA/NAI/UIMP Summer School
2010	**Scholarship Recipient,** NASA/PG&G Planetary Volcanology Field Workshop

TEACHING:

Sp2022	**AST499/AST599: Planetary Instrument Development**, Northern Arizona University
Sp2022	**AST455/AST555: Planetary Applications of Remote Sensing,** Northern Arizona University
Sp2021	**AST530: Spectroscopy,** Northern Arizona University
Sp2020	**AST555: Planetary Applications of Remote Sensing,** Northern Arizona University
F2019	**AST599: Planetary Field Analogs,** Northern Arizona University

Sp2019	**AST530: Applications of Modern Physics – Spectroscopy,** Northern Arizona University
Sp2019	**AST599: Planetary Field Analogs,** Northern Arizona University
F2018	**AST599: Planetary Field Analogs,** Northern Arizona University
F2017	**AST180: Introduction to Astronomy,** Northern Arizona University
Sp2017	**PHY530: Applications of Modern Physics – Spectroscopy,** Northern Arizona University
Sp2017	**AST499: Instrument Development 2**, Northern Arizona University
2011	**GLG599: Advanced Remote Sensing**, Arizona State University, *Co-Instructor*
2008	**GLG490/590: Remote Sensing,** Arizona State University, *Teaching Assistant*
2007	**SES100: Introduction to Exploration,** Arizona State University, *Teaching Assistant*
2004-2010	**National Remote Sensing Educator Workshop**, *Field Instructor*

MENTORSHIP

Postdoctoral Scholars

2022-	Dr. Aurelien Stcherbinine
2021-	Dr. Cheng Ye
2020-	Dr. Christopher Haberle
2020-	Dr. Valerie Payre
2018-2021	Dr. Jennifer Buz
2018-2021	Dr. Kathryn Powell
2017-2021	Dr. Cong Pan
2017-2019	Dr. Jean-Francois Smekens
2016-2018	Dr. Kristen Bennett

Graduate Students

2020-	**Ph.D. Student,** Helen Eiffert (Co-Advisor)
2018-	**Ph.D. Student,** Chrisitan Tai Udovicic
2018-	**Ph.D. Student,** Ari Koeppel
2018-	**Ph.D. Student,** Chris Wolfe
2017-	**Ph.D. Student,** Lori Glaspie (Co-Advisor)
2016-	**Ph.D. Student,** Aaron Weintraub
2016-2018	**M.S. Student,** Nathan Smith

Undergraduate Students

2022-	Loren Larrieu
2021-	Hope Wetzstein
2020-2021	Shaye Fording
2020-2021	Juan Ruiz
2020-2021	Johnelle Gonzolez
2018-2020	Tabatha Trigler
2017-2019	Heshani Pieris
2017-2020	Gabriel Carillo
2017-2018	Kayla Wood
2017-2019	Janus Kozdon

2016-2018	Daniel Krollman
2016-2020	Hannah Zigo
2014	K. Bielow (REU)
2013	J. Bishop (REU)
2012	M. Bhada
2011-2012	S. Dunn
2009-2010	J. Kaminski
2008-2009	J. Friedman

ORAL PRESENTATIONS:

Invited Talks

2021 The Ancient Rocky surface of Mars, University of Pittsburg, Pittsburg PA, December 2.

2020 Robotic Martians: Orbiters, Landers, Rovers and a Half Century of Unmanned Exploration, Widener University, Chester, PA, October 6.

2020 The Ancient Rocky surface of Mars, Space Science Institute, Boulder, CO, September 30.

2019 The Ancient Rocky surface of Mars, University of Colorado, Boulder, Astronomy and Planetary Science, Boulder, CO, April 15.

2019 The Ancient Rocky surface of Mars, University of Nevada, Department of Geology, Las Vegas, NV, April 10.

2016 The Ancient Rocky surface of Mars, Northern Arizona University, Department of Physics and Astronomy Colloquium, Flagstaff, AZ, January 21.

2013 Impact Induced Decompression Melting of the Martian Mantle: The Formation of Widespread Infilled Craters and Inter-Crater Plains, Mars Science Seminar, Jet Propulsion Laboratory, Pasadena, CA, April 26.

2013 The Ancient Rocky Surfaces of Mars: Insights from Orbital Spacecraft Data and New Laboratory Instrumentation, Planetary Seminar Series, Georgia Institute of Technology, Atlanta, GA, January 22.

2012 300 Years of Explorations: What Have We Learned About Our Closest Planet Neighbor Mars?, Arizona Science Center, Phoenix, AZ, July 6.

2010 Volcanic Origin of Flat Floored, Bedrock Containing Craters on Mars, USGS Astrogeology Colloquium Series, Flagstaff, AZ, April 28.

Conference Talks

2021 The Surface of Mars as observed by the Emirates Mars Infrared Spectrometer, American Geophysical Union, New Orleans, 2021

2021 The Thermophysical Properties of Phobos as viewed by the Thermal Emission Imaging System, Geological Society of America, Portland, 2021

2019 The Water Content of Recurring Slope Lineae on Mars, 9th International Conference on Mars, Pasadena, CA.

2018 Carbon Sequestration on Mars: constraints from the Morphology, Composition, and Thermophysical Properties of the Nili Fossae Carbonate Plains, GSA Cordilleran Section Meeting, Flagstaff, AZ.

2018	A Novel Thermal Infrared Spectral Model for Testing the Uncertainties in Remote Mineral Abundance Retrievals: Implications for Remote Sensing Investigations, Lunar and Planetary Science Conference, Houston, TX
2017	The Thermophysical Properties of the Bagnold Dunes, Mars: Ground Truthing Orbital Data, American Geophysical Union, New Orleans, LA.
2015	Carbon Sequestration on Mars: Insights from the Nili Fossae Carbonate Plains, American Geophysical Union, San Francisco, CA.
2015	Processing and Visualizing Planetary Data using Davinci: Updates for Portability and Scriptable Execution, Planetary Data Users Workshop, Flagstaff, AZ
2015	The Water Content of Recurring Slope Lineae on Mars, 46th Lunar and Planetary Science Conference, The Woodlands, TX, March 17.
2014	An Examination of the Impact-Induced Decompression Melting Formation Hypothesis for the Rocky, Mafic Crater Floors of Mars, 8th International Conference on Mars, Pasadena, CA, July 14.
2014	Testing the Impact-Induced Decompression Melting Hypothesis for Rocky, Mafic, Infilled Crater Floors on Mars, 45th Lunar and Planetary Science Conference, The Woodlands, TX, March 19.
2013	Removal of Salt-and-Pepper Noise in THEMIS Infrared Radiance and Emissivity Spectral Data of the Martian Surface, IEEE-Whispers, Gainesville, FL, June 26.
2013	Impact Induced Decompression Melting of the Martian Mantle: The Formation of Widespread Infilled Craters and Inter-Crater Plains, 44th Lunar and Planetary Science Conference, The Woodlands, TX, March 18.
2012	Using Davinci and JMARS for Processing and Visualization of Thermal Emission Spectrometer (TES) and Thermal Emission Imaging System (THEMIS) Data of Mars , Planetary Data Users Workshop, Flagstaff, AZ, June 25.
2011	Evidence for a Widespread Olivine-Rich Layer on Mars: Identification of a Global Impact Ejecta Deposit?, 42nd Lunar and Planetary Science Conference, The Woodlands, TX, March 11.
2007	Evidence For Extensive Olivine-Rich Basalt Bedrock Outcrops in Ganges and Eos Chasma on Mars, 7th International Conference on Mars, Pasadena, CA
2006-2011	THEMIS Science Team Meetings (February 2011, April 2010, October 2009, May 2009, October 2008, October 2007, October 2006)

TEACHING EXPERIENCE:

Courses Taught

Sp2022	**Planetary Applications of Remote Sensing** Northern Arizona University
Sp2021	**Applications of Modern Physics – Spectroscopy,** Northern Arizona University
Sp2020	**Planetary Applications of Remote Sensing,** Northern Arizona University
F2019	**Planetary Field Analogs,** Northern Arizona University
Sp2019	**Applications of Modern Physics – Spectroscopy,** Northern Arizona University
Sp2019	**Planetary Field Analogs,** Northern Arizona University
F2018	**Planetary Field Analogs,** Northern Arizona University
F2017	**Introduction to Astronomy,** Northern Arizona University

Sp2017 **Applications of Modern Physics – Spectroscopy,** Northern Arizona University

Sp2017 **Instrument Development 2**, Northern Arizona University

2011 **Advanced Remote Sensing**, Arizona State University, *Co-Instructor*

2008 **Remote Sensing,** Arizona State University, *Teaching Assistant*

2007 **Introduction to Exploration,** Arizona State University, *Teaching Assistant*

2004-2010 **National Remote Sensing Educator Workshop**, *Field Instructor*

Education Public Outreach

2005-2014 **Guest Instructor**, Mars Student Imaging Project (msip.mars.asu.edu), Arizona State University

2005-2012 **Representative of ASU Mars Space Flight Facility**, Present Mars related science to local schools and science centers

2004-2006 **Team Member**, Rock Around the World (ratw.mars.asu.edu), Arizona State University, Mars Space Flight Facility

RESEARCH EXPERIENCE:

Instrument Development

2014- **Emirates Mars InfraRed Spectrometer (Flight)**, Lead requirements definition, instrument performance characterization, and science traceability in the roles of Instrument Scientist, System Engineer and Integration and Test Scientist. This instrument and mission are developed in collaboration with the United Arab Emirates-MBRSC, the University of Colorado Boulder-LASP, and Arizona State University-SESE.

2008-2011 **Microscopic Emission Spectrometer (Proto-Flight),** Assist with design, characterization, and calibration of NASA/Mars Instrument Development Program Micro-TES prototype flight instrument.

2008-2011 **Microscopic Emission Spectrometer (Laboratory),** Led design, assembly, characterization, and calibration of NASA/Planetary Geology & Geophysics funded Micro-Emission spectrometer laboratory instrument.

Field Experience

2018- **Development of a novel ground station for UAV-based remote sensing,** Desert southwest of the United States.

2013 **Instrument Field Testing in the Mojave Desert.** Worked with JPL engineering model instrument and engineers to test the real-world performance of a flight-precursor instrument in the China Ranch area.

2011 **Ground Truthing ASTER Remote Sensing Data of the Himalaya,** Western Bhutan. Worked closely with tectonic geologists to map and characterize the geology of the Jomolhari region using ground based measurements and remote sensing data.

2011 **NASA/NAI/UIMP Astrobiology Summer School**, Santander, Spain. A weeklong course with an emphasis aimed at assessing Mars habitability and Exploration, by Bruce Runnegar

2010	**NASA/PG&G Planetary Volcanology Field Workshop**, Hilo, HI. A weeklong course with an emphasis on planetary volcanology analogues, by Scott Rowland
2009	**NASA/ASU Astrobiology Institute Data Collection Trip,** Yellowstone National Park, WY. Excursion to collect infrared spectra of Martian analogue sinter deposits
2009	**Advanced Field Geology**, Arizona State University, AZ. A 4-weekend course with an emphasis on planetary aeolian analogues, by Ronald Greeley
2008	**Advanced Field Geology,** Arizona State University, AZ. A 4-weekend course with an emphasis on mapping various grades of metamorphic rocks, by Steven Reynolds
2006	**Field Course**, Western Ireland Geology and Environmental Science, James Madison University, by Steven Whitmeyer

PROFESSIONAL SERVICE:

2012-	**Panel Member**, NASA Planetary Science R&A, Instrument, Mission
2011-	**External Reviewer**, NASA Planetary Science R&A
2010-	**Reviewer** – Icarus; Journal of Geophysical Research – Planets; Applied Optics; Icarus, Earth and Space Science, Geophysical Research Letters
2012	**AGU Session Convener/Chair**, Laboratory Investigations Supporting the Analysis of Datasets from Mars, the Moon, and Other Planetary Bodies. Co-conveners: Bethany Ehlmann, Timothy Glotch
2011	**AGU Session Convener/Chair**, Practical Applications of Visible and Infrared Spectroscopy to Terrestrial Geologic Studies. Co-convener: Frances Cooper
2010	**Graduate Student Panel Member**, NASA/Planetary Geology and Geophysics (PG&G)
2010	**Graduate Student Panel Member**, Faculty Search Committee, Arizona State University, School of Earth and Space Exploration (SESE)

PROFESSIONAL AFFILIATIONS:

American Geophysical Union

SOFTWARE AND OPERATING SYSTEM EXPERIENCE:

Proficient in: Mac, Windows and Linux (CentOS/RedHat, Ubuntu/Debian) systems

Well versed in scientific software: davinci (davinci.asu.edu, code base maintainer), LabView, ISIS (Integrated Software for Imaging Spectrometers), MySQL, PostgresSQL, OpenFOAM, SolidWorks, GnuPlot, MATLAB, MathCAD, IDL/ENVI, JMARS (jmars.asu.edu), ArcGIS, QGIS, GDAL, OMNIC

Able to program in: scripting languages (e.g. davinci, Python, IDL, MATLAB, Bash-/C-shell, etc.), C, FORTRAN, Java, PHP, HTML, JavaScript, Flash

Expert user of: Microsoft Office Suite (Word, Excel, PowerPoint), Adobe Suite (Photoshop, Illustrator, InDesign, Acrobat), EndNote, Final Cut Pro/Express

Capable with engineering development focused software: IBM Rational DOORS, Ambysoft Agile Development Life Cycle, Siemens Team Center

Edwards Group Conference Abstracts

Below is the list of abstracts produced by the PIXEL group at NAU

Ahern, A., Rogers, A., Bandfield, J., Edwards, C., & Fergason, R. (2017). *Constraining Shallow Vertical Heterogeneity in Martian Surface Materials from Mars Odyssey THEMIS Data.* Paper presented at the Lunar and Planetary Science Conference.

Al Shamsi, M., Amiri, S., Al Dhafri, S., Al Teneiji, E., Lootah, F., Badri , K., McGrath, M., Withnell, P., Ferrington, N., Reed, H., Brain, D., Dieghan, J., Chaffin, M., Holsclaw, G., Barrett, R., Drake, G., Edwards, C. S., Mehall, G., Wolff, M., Lillis, R., Forget, F., England, S., Christensen, P. R., Osterloo, M., Jones, A., & Parker, J. (2017). *Emirates Mars Mission 2020: Science Targets and Observations.* Paper presented at the 68th International Astronautical Congress.

Al Shamsi, M., Amiri, S., AlDhafri, S., Al Matroushi, H., Al Teneiji, E., Lootah, F., McGrath, M., Withnell, P., Ferrington, N., Reed, H., Brain, D., Deighan, J., Chaffin, M., Holsclaw, G., Barrett, R., Drake, G., Osterloo, M., Jones, A., Parker, J., Edwards, C. S., Mehall, G., Christensen, P. R., Wolff, M., Lillis, R., Fillingim, M., Smith, M. D., Forget, F., & England, S. (2018). *EMIRATES MARS MISSION 2020: SCIENCE TARGETS AND OBSERVATIONS.* Paper presented at the Mars Atmosphere Data Assimilation (MADA) Workshop.

AlDhafri, S., Khoory, M., AlZarooni, K., AlShehhi, A., AlShamsi, M., AlTunaiji, E., Badri, K., Matroushi, H., Lootah, F., Reed, H., Drake, G., Mehall, G., Barrett, R., Holsclaw, G., Jones, A., & Edwards, C. S. (2017). *EMIRATES MARS MISSION (EMM) INSTRUMENTS DESIGN, OPERATIONS, AND DATA.* Paper presented at the 68th International Astronautical Congress.

Alhantoobi, A., Buz, J., O'Rourke, J. G., Edwards, C. S., & Langlais, B. (2019). *The Relationship of Martian Crustal Remnant Magnetism and Mineralogy.* Paper presented at the AGUFM.

Alhantoobi, A., Buz, J., O'Rourke, J. G., Langlais, B., & Edwards, C. S. (2020). *Mineralogical enhancement of crustal magnetization on Mars.* Paper presented at the AGU Fall Meeting Abstracts.

AlJanaahi, A. A., AlShamsi, M. R., Smith, M. D., Altunaiji, E. S., & Edwards, C. S. (2016). *Local Time Variation of Water Ice Clouds on Mars as Observed by TES During Aerobraking.* Paper presented at the American Geophysical Union Fall Meeting, San Francisco, CA.

Almatroushi, H., Sharaf, O., Amiri, S., AlMheiri, S., AlRais, A., Wali, M., Al Shamsi, Z., Al Qasim, I., Al Harmoodi, K., & Al Teneiji, N. (2020). *Emirates Mars Mission (EMM) 2020 Overview and Status.* Paper presented at the AGU Fall Meeting Abstracts.

AlShamsi, M. R., AlJanaahi, A. A., Smith, M. D., Altunaiji, E. S., & Edwards, C. S. (2016). *Local Time Variation of Water Vapor on Mars using TES Aerobraking Spectra.* Paper presented at the American Geophysical Union Fall Meeting, San Francisco, CA.

AlTeneiji, E., Badri , K., Edwards, C. S., Smith, M. D., Christensen, P. R., Al Dhafri, S., Reed, H., & Team, E. (2018). *SCIENTIFIC PAYLOAD OF THE EMIRATES MARS MISSION:EMIRATES MARS INFRARED SPECTROMETER (EMIRS)* Paper presented at the Mars Atmosphere Data Assimilation (MADA) Workshop.

Altunaiji, E., Edwards, C., Christensen, P., Smith, M., & Badri Sr, K. (2017a). *Scientific Payload Of The Emirates Mars Mission: Emirates Mars Infrared Spectrometer (Emirs) Overview.* Paper presented at the AGU Fall Meeting Abstracts.

Altunaiji, E., Edwards, C., Smith, M., Christensen, P., AlMheiri, S., & Reed, H. (2017b). *Emirates Mars Infrared Spectrometer (EMIRS) Overview from the Emirates Mars Mission.* Paper presented at the EGU General Assembly Conference Abstracts.

Altunaiji, E., Edwards, C. S., Smith, M. D., Christensen, P. R., & Team, a. t. E. (2017c). *Scientific Payload of the Emirates Mars Mission: Emirates Mars Infrared Spectrometer (EMIRS) Overview*. Paper presented at the Sixth Inernational Workshop on the Mars Atmosphere: Modelling and Observations, Granada, Spain.

Altunaiji, E., Smith, M. D., & Edwards, C. S. (2017d). *TES Footprint Mapping to Mars*. Paper presented at the Asia Oceania Geosciences Society Meeting Proceedings.

Altunaiji, E. S., Badri Sr, K., Edwards, C. S., Smith, M. D., Christensen, P. R., AlMheiri, S., & Reed, H. (2020). *Emirates Mars Mission 2020: Emirates Mars Infrared Spectrometer (EMIRS) Overview*. Paper presented at the AGU Fall Meeting Abstracts.

Altunaiji, E. S., Edwards, C. S., Smith, M. D., AlShamsi, M. R., & AlJanaah, A. A. (2016). *Mapping TES Aerobreaking Data of The Martian Polar Caps* Paper presented at the American Geophysical Union Fall Meeting, San Francisco, CA.

Amiri, S., Lillis, R., Almatroushi, H., Al Shamsi, M., Brain, D., Edwards, C. S., Wolff, M., Smith, M. D., Deighan, J., Fillingim, M., Forget, F., Lootah, F., Chaffin, M., England, S., Osterloo, M., Jones, A., Holsclaw, G., Christensen, P. R., Al Teneiji, E., Badri, K., Jakosky, B., & Luhmann, J. (2018). *Emirates Mars Mission Science Closure Strategy*. Paper presented at the AGU Fall Meeting.

Amiri, S., Sharaf, O., AlMheiri, S., AlRais, A., Wali, M., Al Shamsi, Z., Al Qasim, I., Al Harmoodi, K., Al Teneiji, N., & Almatroushi, H. (2017). *Emirates Mars Mission (EMM) 2020 Overview*. Paper presented at the AGU Fall Meeting Abstracts.

Annex, A., Koeppel, A., Pan, C., Edwards, C., & Lewis, K. (2019). *Scarp Associated with Martian Layered Deposits in Arabia Terra*. Paper presented at the Lunar and Planetary Science Conference.

Annex, A., Lewis, K., Koeppel, A., & Edwards, C. (2020a). *Arabia Terra Layered Deposit Stratigraphy from Correlation and Geologic Modeling*. Paper presented at the LPI.

Annex, A., Lewis, K. W., Koeppel, A., & Edwards, C. S. (2020b). *Integrating the sedimentary stratigraphy of Arabia Terra, Mars: depositional history of Sera and Jiji craters*. Paper presented at the AGU Fall Meeting Abstracts.

Annex, A. M., Lewis, K. W., & Edwards, C. S. (2017). *Stratigraphic Mapping of Intra-Crater Layered Deposits in Arabia Terra from High-Resolution Imaging and Stereo Topography*. Paper presented at the AGU Fall Meeting Abstracts.

Annex, A. M., Lewis, K. W., & Edwards, C. S. (2018). *Stratal thicknesses in the Layered Deposits of Arabia Terra using High-Resolution Stereo Topography*. Paper presented at the AGU Fall Meeting.

Badri , K., Altunaiji, E., Edwards, C. S., Smith, M. D., AlMheiri, S., & Reed, H. (2018). *Preparing for EMIRS: Using TES aerobraking observations to assess the diurnal variation of surface and atmospheric temperature*. Paper presented at the AGU Fall Meeting.

Badri, K., Edwards, C., Smith, M., Altunaiji, E., Christensen, P., Almheiri, S., Reed, H., & Team, E. (2019a). *Scientific Payload of the Emirates Mars Mission: Emirates Mars Infrared Spectrometer (EMIRS)*. Paper presented at the 9th International Conference on Mars.

Badri, K. M., Smith, M. D., Edwards, C. S., Altunaiji, E. S., Christensen, P. R., AlMheiri, S., & Reed, H. (2019b). *Preparing for EMIRS: Utilizing TES Aerobraking Observations to Assess the Uncertainty in Measurements Due to Altering Parameters*. Paper presented at the AGUFM.

Badri, K. M., Smith, M. D., Edwards, C. S., Altunaiji, E. S., Christensen, P. R., AlMheiri, S., & Reed, H. (2020). *Preparing for EMIRS: Utilizing the EMIRS Simulator to Help Develop a Retrieval Algorithm for Aerosols in Mars Atmosphere*. Paper presented at the AGU Fall Meeting Abstracts.

Bahremand, A., Gold, L., Richards, C., Sese, K., Powell, K., Dickenshied, S., Anwar, S., Hill, J., Edwards, C., & LiKamWa, R. (2020). *Virtual and Augmented Reality Tools for Planetary Scientific Analysis and Public Engagement*. Paper presented at the LPI.

Bandfield, J., Piqueux, S., Glotch, T., Shirley, K., Duxbury, T., Hill, J., Edwards, C., Plaut, J., Hamilton, V., & Christensen, P. (2018a). *Mars Odyssey THEMIS Observations of Phobos: New Spectral and Thermophysical Measurements.* Paper presented at the Lunar and Planetary Science Conference.

Bandfield, J., Poston, M., Klima, R., & Edwards, C. (2017). *A Prominent and Ubiquitous OH/H2O Feature in Corrected Lunar Spectra.* Paper presented at the Lunar and Planetary Science Conference.

Bandfield, J. L., Piqueux, S., Glotch, T. D., Shirley, K. A., Duxbury, T. C., Hill, J. R., Edwards, C. S., Plaut, J. J., Hamilton, V. E., & Christensen, P. R. (2018b). *Mars Odyssey THEMIS Observations of Phobos: New Spectral and Thermophysical Measurements.* Paper presented at the 49th Lunar and Planetary Science Conference, Abstract 2643.

Bapst, J., Piqueux, S., Edwards, C., & Fergason, R. (2019). *When and Where? Prioritizing Temperature Measurements for Thermophysical Analysis.* Paper presented at the Lunar and Planetary Science Conference.

Bapst, J., Piqueux, S., Edwards, C., Hayne, P., Kass, D., & Kleinböhl, A. (2021). *Global Dust Redistribution on Mars: Insights from Observed Surface Temperatures.* Paper presented at the Lunar and Planetary Science Conference.

Bapst, J., Piqueux, S., Edwards, C. S., Hayne, P. O., Kleinboehl, A., & Kass, D. M. (2020). *Global Changes in Surface Dust Coverage using Mars Climate Sounder.* Paper presented at the AGU Fall Meeting Abstracts.

Bennett, K., Edgett, K., Fey, D., Edgar, L., Fraeman, A., McBride, M., & Edwards, C. (2018a). *Fine-Scale Textural Observations at Vera Rubin Ridge, Gale Crater, from the Mars Hand Lens Imager (MAHLI).* Paper presented at the Lunar and Planetary Science Conference.

Bennett, K., Fox, V., Vasavada, A., Grotzinger, J., & Edwards, C. (2018b). *The Clay-Bearing Unit in Gale Crater II: Plans for the Investigation of the Clay-Bearing Unit by the Curiosity Rover.* Paper presented at the Lunar and Planetary Science Conference.

Bennett, K., Hill, J., Murray, K., Edwards, C., Bell, J., & Christensen, P. (2017a). *THEMIS-VIS Color and Morphologic Investigations at Gale Crater.* Paper presented at the Lunar and Planetary Science Conference.

Bennett, K. A., & Edwards, C. S. (2017). *THEMIS VIS Color Observations of Gale Crater.* Paper presented at the Flagstaff Astronomy Symposium.

Bennett, K. A., Fox, V., Vasavada, A., Edwards, C. S., Stack, K. M., & Williams, A. J. (2018c). *THE CLAY-BEARING UNIT IN GALE CRATER: OVERVIEW AND PLANS FOR INVESTIGATION WITH THE CURIOSITY ROVER.* Paper presented at the Geological Society of America Cordilleran Meeting

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