

## Academic & Research Employment

### Director of Research and Post-Doctoral Fellow

Space Technology and Science (NewSpace) Initiative, Arizona State University, Tempe, AZ Sept 2016–present



Business development liaison working to create links between academia and the entrepreneurial commercial space sector by facilitating partnerships on NASA, DoD, NSF, DARPA, etc., proposals on both the research and business development side



Mars geomorphology research focusing on surface processes and landing sites for the 2020 rover



Payload Downlink Lead and Science Team Collaborator for NASA's Opportunity rover



Science team collaborator for the Mars 2020 rover Mastcam-Z cameras

### Research Assistant

Centre for Planetary Science & Exploration, University of Western Ontario, London, ON May 2014–Aug 2016



Content lead for the Interactive Mapping of Mars (iMARS) web tool: Designed rover challenges and wrote associated KML files; created figures and descriptions of martian landforms for tutorials



Editor for the Geological Association of Canada Planetary Sciences Division Newsletter



In charge of the Geological Association of Canada Planetary Sciences Division Twitter feed (@pgg\_canadian)



Interim Public Outreach Coordinator from Sept–Dec 2014, which involved training and leading a group of 7 outreach assistants and a pool of volunteers in order to run outreach events with local K-12 classes

### Web Editor Intern

The Planetary Society, Pasadena, CA May 2013–present



Edit and write blog articles on a variety of space-related topics intended to educate the public



Update the society's space image gallery to showcase amateur-processed images



Migrate web content to the Society's new web server and database

### Public Outreach/Teaching Assistant

University of Western Ontario, London, ON Sept 2012–Aug 2014



Organized and executed public outreach events and projects such as interactive web activities, museum exhibits, and in-classroom educational activities for students from grades K–12 for Western's Centre for Planetary Science and Exploration



Graded essays, assignments, and lab reports, and answered student questions for the sophomore-level Earth Sciences department course "Catastrophic Events in Earth History"

### Assistant Staff Scientist

Malin Space Science Systems, San Diego, CA Aug 2008–May 2012



Targeted thousands of images for NASA's Mars Reconnaissance Orbiter (MRO) Context Camera (CTX) as a mission operations specialist, helping to map out over 80% of Mars at an unprecedented resolution and resulting in a group achievement award from NASA



Monitored the martian weather to watch for any potential threats to the Spirit and Opportunity rovers

using the MRO Mars Color Imager (MARCI), alerting the rover team when necessary to help them avoid damage to their instruments



Aided in pre-launch and cruise-phase testing of NASA's Mars Science Laboratory ("Curiosity") rover Mast Camera, Mars Hand Lens Imager (MAHLI), and Mars Descent Imager (MARDI) cameras in preparation for Mars surface operations of the rover



Overhauled and maintained the company website to create a more modern and easier-to-use interface for the general public



Initiated a more active education and public outreach program at the company to increase visibility of CTX, MARCI, the Curiosity cameras, and the Juno mission to Jupiter, including setting up job shadowing experiences with the local Girl Scouts and creating educational activities for girls in the Expanding Your Horizons program

**Researcher**

**University of Washington Department of Astronomy, Seattle, WA**

Jul 2008–Aug 2008



Processed Hubble Space Telescope WFPC2 data using IRAF and Microsoft Excel to study the photometry of open clusters in the Andromeda Galaxy

**Teaching Assistant**

**Wesleyan University Department of Earth & Environmental Sciences, Middletown, CT**

Aug 2006–May 2008



Led lab sessions and lectures, graded assignments, and assisted on field trips for the following courses (freshman through junior-level): Introduction to Environmental Sciences; Introduction to Planetary Geology; Geology of Connecticut; Global Climate Change

**Researcher**

**University of Washington Department of Earth and Space Sciences, Seattle, WA**

Jun 2006–Aug 2006



Processed MODIS AQUA/TERRA satellite data of the Antarctic Dry Valleys using ENVI and ArcGIS to look for snow cover events, leading to a first-author abstract presented at the annual fall American Geophysical Union meeting

**Researcher**

**University of Washington Department of Astronomy, Seattle, WA**

Jun 2006–Aug 2006



Processed ground-based spectroscopic data of the recurring novae RS Ophiuchi and T Coronae Borealis to determine metallicities, resulting in the discovery of a lithium enhancement in recurring novae relative to other binary star systems, and a publication in the Publications of the Astronomical Society of the Pacific

**Public Outreach Involvement**

**The Planetary Society**

**Pasadena, CA**

2010–2012



Provided processed CTX images, anaglyphs, and mosaics for blog articles for public engagement; wrote a blog article to increase public awareness of the CTX and MARCI cameras

Jet Propulsion Laboratory (JPL)  
Pasadena, CA

2011–2012



Staffed the Mars Reconnaissance Orbiter booth at JPL’s annual Open House to educate members of the general public of all ages and backgrounds on Mars



Created CTX mosaics, anaglyphs, and visual aids in support of the Mars Science Laboratory rover mission to be used by both the scientific community as well as for education and public outreach purposes

Expanding Your Horizons  
San Diego, CA

2010–2011



Designed and led Mars-related activities for girls in grades 8–12 to spark their interest in careers in science

Norwescon  
Seattle, WA

2000–2010



Head of programming for the space (2000–2006; 2010), science (2000–2006), and astrophysics (2009) tracks for the largest science fiction convention in the Pacific Northwest



Created topical panels and searched for appropriate panelists in the field (e.g., professors, authors, engineers)



Scheduled the timing of panels to work with the schedules of the panelists and the convention as a whole

Pacific Science Center  
Seattle, WA

2000–2003



Staffed exhibits throughout the museum in order to communicate a range of scientific and historical topics to a diverse audience

Television, Radio, and Podcast Appearances



Al Jazeera English (2018–2019)



CBC Radio *The Current* (2018)



NPR Phoenix KJZZ *The Show* (2018)



KFYI AM 550 Phoenix (2018)



talkRADIO UK *Paul Ross Show* (2018)



*Off-Nominal* podcast (2018)







iTV24 *Stateside with David Shuster* (2018)






Fox10 Phoenix News (2018)












AZ Channel 12 News (2018)

-  NPR Phoenix (2018)
-  The Weather Channel *WX Geeks* (2017)
-  *TechDirt* podcast (2016)
-  *WeMartians* podcast (2016)
-  AM650 CKOM radio (2015)
-  *Western Worlds* radio (2013)

### Print Articles

-  [“After Opsy, an Opportunity for NASA to work with SpaceX.”](#) *Houston Chronicle*, February 21, 2019
-  [“The past and present of water on Mars.”](#) *Astronomy Magazine* (cover article), July 2017 issue
-  [“Why do Earthlings care so much about Mars?”](#) *The Globe and Mail*, September 29, 2015

### Online Articles

-  [“Monitoring martian weather, Part 1: On the ground.”](#) Medium, February 26, 2019.
-  [“The night NASA said goodbye to Opsy.”](#) Medium, February 13, 2019.
-  [“Inspirational women in space: Peggy Whitson.”](#) Medium, January 9, 2019.
-  [“The top 10 things to look forward to on Mars in 2019.”](#) Medium, January 1, 2019.
-  [“What is winter like on Mars?”](#) Medium, December 31, 2018.
-  [“Dusty skies for Opportunity.”](#) Medium, June 11, 2018.
-  [“The curious case of methane on Mars.”](#) Medium, June 7, 2018.
-  [“Mars Phoenix Lander: 10 years later.”](#) Medium, May 28, 2018.
-  [“Galileo proves old data can still yield new tricks.”](#) Medium, May 15, 2018.
-  [“Chasing the total solar eclipse at 38,000 feet.”](#) The Planetary Society, August 24, 2017.
-  [“Keeping an eye on climate change.”](#) Slate Future Tense, March 27, 2017.
-  [“Will the real culprit behind Mars’ gullies please stand up?”](#) *Astronomy Magazine*, August 16, 2016.
-  [“LPSC 2016: Martian geomorphology.”](#) The Planetary Society, April 4, 2016.
-  [“A workhorse at Mars.”](#) The Planetary Society, September 11, 2015.





-  ["Help map Mars' south polar region!"](#) The Planetary Society, July 24, 2015.
-  ["Canadian Mars Analogue Mission: Field Report, Week 2."](#) The Planetary Society, August 28, 2014.
-  ["Canadian Mars Analogue Mission: Field Report, Week 1."](#) The Planetary Society, August 20, 2014.
-  ["MAVEN Launches!"](#) The Planetary Society, September 18, 2013.
-  ["MAVEN NASA Social: Day 2."](#) The Planetary Society, November 18, 2013.
-  ["MAVEN NASA Social: Day 1"](#). The Planetary Society, November 17, 2013.
-  ["CTX and MARCI—The OTHER cameras on the Mars Reconnaissance Orbiter."](#) The Planetary Society, January 25, 2010.

### Invited Speaking Engagements

-  re:MARS (2019)
-  VivaTech (2019)
-  Global Space Congress (2019)
-  Steamboat Weather Summit (2019)
-  University of Toronto Scarborough (2019)
-  Penny Arcade Expo (PAX) West, Seattle (2018)
-  Royal Astronomical Society of Canada, Toronto Centre (2018)
-  Ontario Science Centre Marsfest (2018)
-  Royal Astronomical Society of Canada General Assembly, Calgary (2018)
-  TEDxASU (2018)
-  Satellite 2018 SDx (2018)
-  Badass Ladies of ASU event (2017)
-  Long Beach Comic-Con (2017)
-  Royal Astronomical Society of Canada, Mississauga Centre (2017)
-  Idaho Star Party keynote speaker (2017)
-  Los Alamos National Labs (2017)
-  March for Science Toronto (2017)
-  IEEE Nuclear and Space Radiation Effects Conference keynote speaker (2017)

-  Lucasfilm (2016)
-  Students for the Exploration and Development of Space Canada Ascension keynote speaker (2016)
-  Zonta International Meeting, Stratford, Ontario (2015)
-  Western Staff and Leaders Conference (2013)
-  Royal Astronomical Society of Canada, London Centre (2013)
-  University of Western Ontario Mars Science Laboratory Rover Landing Event (2012)
-  National Space Society, Seattle Chapter (2000, 2009, 2011, 2015–2017)
-  San Diego Astronomy Association (2010)
-  CascadiaCon (2005)
-  VikingCon (2000)
-  Norwescon (1999–2007)

### Consulting Work

-  Script writer and host of the YouTube series “How to Build a Spaceship” for Honeywell Aerospace (2018–present)
-  Mars consultant for video game production at IDEO, San Francisco (2016)
-  Science consultant for various sci-fi authors (2016–present)
-  Science consultant for “Mars Two” show pitched to the Canadian Broadcasting Company (CBC) (2014)

### Education

- Ph.D. Geology with a Specialization in Planetary Science and Exploration, University of Western Ontario, London, ON, August 2016  
Thesis: Martian Gully Formation and Evolution: Studies from the Local to Global Scale  
Relevant coursework: Impact Cratering; Remote Sensing; Planetary Science Field School
- M.A. Earth and Environmental Sciences, Wesleyan University, Middletown, CT, May 2008  
Thesis: Origin and Composition of the Light-Toned Layered Deposits in Iani Chaos, Mars  
Relevant coursework: Geomorphology; Introduction to GIS; Mineralogy; Hydrology; Petrology; Structural Geology
- B.Sc. Physics and Astronomy (double major), University of Washington, Seattle, WA, June 2006  
Relevant coursework: Introduction to Glaciology; Observational Astronomy; Stellar Observation






and Theory; Thermal Physics; Electromagnetism; Quantum Mechanics

## NASA/Canadian Space Agency (CSA) Project Participation









-  Science Team Collaborator, Mars 2020 Rover Mastcam-Z (2017–present)
-  Science Team Collaborator, Mars Exploration Rover Opportunity Pancam (2016–2019)
-  CSA CanMars Mars Sample Return Analogue Mission (2015)
-  CSA Mars Analogue Missions (2013–2014)
-  NASA Planetary Science Summer School (2012)
-  Science Team Collaborator, Mars Science Laboratory (Curiosity) Mastcam, Mars Descent Imager, & Mars Hand Lens Imager (2010–2012)
-  Science Operations Team, Mars Science Laboratory (Curiosity) Mastcam, Mars Descent Imager, & Mars Hand Lens Imager cameras (2010–2012)
-  Science Operations Team, Mars Reconnaissance Orbiter Context Camera (2008–2012)
-  Science Operations Team, Mars Reconnaissance Orbiter Mars Color Imager (2008–2012)

## Awards/Honors

-  Via Satellite's Young People to Watch List (2018)
-  Geological Society of America Paul Pellas-Graham Ryder Award for Best Student Paper in Planetary Sciences (2016)
-  Amelia Earhart Fellowship (2014 & 2015)
-  Geological Society of America On to the Future Award (2014)
-  University of Western Ontario Research Western Award (2014)
-  Vanier Canada Graduate Scholarship (2014)
-  NASA Group Achievement Award, presented to the Mars Science Laboratory Mastcam, MAHLI, & MARDI instruments team (2013)
-  Lunar and Planetary Institute Career Development Award (2013)
-  NSERC CREATE Technologies and Techniques for Space Exploration Ph.D. Fellowship (2012)
-  NSERC CREATE Canadian Astrobiology Training Program Ph.D. Fellowship (2012)

-  University of Western Ontario Graduate Research Scholarship (2012–2014)
-  NASA Group Achievement Award, presented to the MRO MARCI/CTX science team (2011)
-  NASA Connecticut Space Grant Scholar (2008)
-  GSN Get Schooled Games Tour Seattle 529 College Savings Plan Winner (2004)
-  Washington Promise Scholar (2003)

## Publications

-  **Harrison, T. N.**, G. R. Osinski, L. L. Tornabene, and C. M. Stuurman, Late Amazonian geologic history of Western Utopia Planitia, Mars. Accepted to *Icarus*.
-  Godin, E., G. R. Osinski, A. J. Pontefract, and **T. N. Harrison**. Geomorphology of gullies at the Thomas Lee Inlet, Devon Island, Canadian High Arctic. Accepted to *Permafrost and Periglacial Processes*.
-  Adler, J., **T. N. Harrison**, J. F. Bell, E. Sefton-Nash, N. Warner, J. Davis, and P. Fawdon, Hypotheses for the origin of the fan-shaped deposit at the edge of the Chryse Escarpment, Mars: Is it a Delta? Accepted to *Icarus*.
-  Tornabene, L. L., W. Watters, G. R. Osinski, J. Boyce, **T. N. Harrison**, V. Ling, and A. McEwen (2018), Revised Depth-Diameter Scaling Relationships Based on the Recognition of Best-Preserved and Deepest Martian Craters. *Icarus* 299, 68–83.
-  Conway, S. J., **T. N. Harrison**, and S. R. Lewis (2018), Martian gullies and their connection with the martian climate. In: Soare, R. J., S. J. Conway, and S. M. Clifford (eds) *Dynamic Mars: Recent and Current Landscape Evolution of the Red Planet*. Elsevier, Cambridge, MA, ISBN: 978-0-12-813018-6.
-  Conway, S. J., T. de Haas, and **T. N. Harrison** (2018), Martian gullies: A comprehensive review of observations, mechanisms and the insights from Earth analogues. In: Conway, S. J., J. L. Carravick, P. A. Carling, T. de Haas, and T. Harrison (eds) *Martian Gullies and Their Earth Analogues*. Geological Society of London Special Publications 467, doi:10.1144/SP467.14.
-  Conway, S. J., T. de Haas, **T. N. Harrison**, P. A. Carling, and J. Carravick (2018), Martian gullies and their Earth analogues: Introduction. In: Conway, S. J., J. L. Carravick, P. A. Carling, T. de Haas, and T. Harrison (eds) *Martian Gullies and Their Earth Analogues*. Geological Society of London Special Publications 467, doi:10.1144/SP467.15.
-  **Harrison, T. N.**, L. L. Tornabene, G. R. Osinski, and S. J. Conway. Thermal inertia variations from recent gully and mass wasting activity in Gasa Crater, Mars. (2017), In: Conway, S. J., J. L. Carravick, P. A. Carling, T. de Haas, and T. Harrison (eds) *Martian Gullies and Their Earth Analogues*. Geological Society of London Special Publications 467, doi:10.1144/SP467.3.



-  Conway, S. J., **T. N. Harrison**, R. J. Soare, A. Britton, and L. J. Steele. New slope-normalized global gully density and orientation maps for Mars (2017), In: Conway, S. J., J. L. Carravick, P. A. Carling, T. de Haas, and T. Harrison (eds) *Martian Gullies and Their Earth Analogues*. Geological Society of London Special Publications 467, doi:10.1144/SP467.3.
-  Tornabene, L. L., F. P. Seelos, A. Pommerol, N. Thomas, C. M. Caudill, P. Becerra, J. C. Bridges, S. Byrne, M. Cardinale, M. Chojnacki, S. J. Conway, G. Cremonese, C. M. Dundas, M. R. El-Maary, J. Fernando, C. J. Hansen, **T. N. Harrison**, R. Henson, L. Marinangeli, A. S. McEwen, M. Pajola, S. S. Sutton, and J. J. Wray (2017), Image simulation and assessment of the colour and spatial capabilities of the Colour and Stereo Surface Imaging System (CaSSIS) on the ExoMars Trace Gas Orbiter. *Space Science Reviews*, doi:10.1007/s11214-01700436-7.
-  Suer, T., S. Padovan, J. Whitten, R. W. Potter, S. Shkolyar, M. Cable, C. C. Walker, J. Szalay, C. Parker, J. Cumbers, D. Gentry, **T. Harrison**, S. Naidu, H. Trammel, J. Reimuller, C. Budney, and L. L. Lowes (2017), FIRE: Flyby of Io with Repeat Encounters: A conceptual design for a New Frontiers mission to Io. *Advances in Space Research*, doi:10.1016/j.asr.2017.05.019.
-  **Harrison, T. N.**, G. R. Osinski, and L. L. Tornabene (2015), Global Documentation of Gullies with the Mars Reconnaissance Orbiter Context Camera and Implications for Their Formation. *Icarus* 252, 236–324.
-  Williams, R. M. E., R. P. Irwin III, D. M. Burr, **T. N. Harrison**, and P. McClelland (2013), Variability in Martian Sinuous Ridge Form: Case Study of Aeolis Serpens in the Aeolis Dorsa, Mars, and Insights from the Mirackina Paleoriver, South Australia. *Icarus* 225, 308–324.
-  **Harrison, T. N.**, M. S. Gilmore, and J. P. Greenwood (2012), Experimental VNIR Reflectance Spectroscopy of Gypsum Dehydration: Investigating the Gypsum to Bassanite Transition. *American Mineralogist* 97, 598–609.
-  **Harrison, T. N.**, M. C. Malin, K. S. Edgett, D. E. Shean, M. R. Kennedy, L. J. Lipkaman, B. A. Cantor, and L. V. Posiolova (2010), Impact-Induced Overland Fluid Flow and Channelized Erosion at Lyot Crater, Mars. *Geophysical Research Letters* 37, L21201.
-  Byrne, S., C. M. Dundas, M. R. Kennedy, M. T. Mellon, A. S. McEwen, S. C. Cull, I. J. Daubar, D. E. Shean, K. D. Seelos, S. L. Murchie, B. A. Cantor, R. E. Arvidson, K. S. Edgett, A. Reufer, N. Thomas, **T. N. Harrison**, L. V. Posiolova, and F. P. Seelos (2009), Distribution of Mid-Latitude Ground Ice on Mars from New Impact Craters, *Science* 325, 1674–1676.
-  Wallerstein, G., **T. Harrison**, U. Munari, and A. Vanture (2008), The Metallicity of Lithium Abundances of the Recurring Novae T CrB and RS Oph, *Publications of the Astronomical Society of the Pacific* 120, 867, 492–497.

## Affiliations/Memberships

-  American Geophysical Union



Geological Society of America



Space Generation Advisory Council

## Relevant Skills



Mapping software: ArcGIS, KML, GDAL, ENVI, JMARS, USGS ISIS



Astronomical data processing: IRAF, MOOG



General image processing: Adobe Photoshop, Illustrator