

January 2017

Briony H. N. Horgan

Assistant Professor
Dept. of Earth, Atmospheric, and Planetary Sciences
Purdue University

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Education and Appointments

- 2014-present **Assistant Professor**, Purdue University
- 2013 **Faculty Research Associate**, Arizona State University
- 2010-2012 **Exploration Postdoctoral Fellow**, Arizona State University
Advisors: Profs. Phil Christensen, Jack Farmer, and Tom Sharp
- 2005-2010 **Ph.D., Cornell University**, Astronomy and Space Sciences
Advisor: Prof. Jim Bell
- 2001-2005 **B.S., Oregon State University**, Physics, summa cum laude.

Fields of Expertise

- Surface geology, mineralogy, and remote sensing of the terrestrial planets
- Visible, near-infrared, and thermal-infrared spectroscopy
- Mapping and analysis of large hyperspectral datasets
- Planetary analog field studies of weathering, aeolian, volcanic, and glacial processes

NASA Mission Experience

- 2016-present Participating Scientist, Mars Science Laboratory Mission
- 2015-present Co-I, Mastcam-Z imaging investigation, Mars2020 Mission
- 2008-2014 Science Team, THEMIS camera, Mars Odyssey Mission

Support: Current and Past

- 2016-2020 Principal Investigator, NASA MSL Participating Scientist Program – \$414,735
Using composition to constrain paleoenvironments and sites of organic preservation in Gale Crater
- 2016-2019 Principal Investigator, NASA Solar System Workings Program – \$563,917
Icy environments on Mars: Investigating Glacial Weathering in Volcanic Terrains
- 2016-2019 Co-Investigator, NASA Lunar Data Analysis Program – \$137,866
Lunar pyroclastic deposits: Windows to the Lunar Interior (PI: Dr. Lisa Gaddis)
- 2015-2020 Co-Investigator, NASA Mars2020 Mission Phases B-D – \$207,745
Mastcam-Z: A Geologic, Stereoscopic, and Multispectral Investigation for the NASA Mars 2020 Rover Mission (PI: Prof. Jim Bell)
- 2013-2016 Principal Investigator, NASA Mars Data Analysis Program – \$220,290
Investigating the origin and alteration history of north polar sediments with high resolution spectroscopy

- 2012-2015 Co-Investigator, NASA Mars Data Analysis Program – \$492,646
Imaging and spectroscopic studies of the martian surface (PI: Prof. Jim Bell)
- 2012-2013 Mars Odyssey THEMIS Mission Phase E
Compositional and analog studies of Mars (PI: Prof. Phil Christensen)
- 2010-2012 Fellow, Exploration Postdoctoral Fellowship, Arizona State University
Reconstructing ancient surface environments on Mars: Spectral and analog studies
- 2008-2011 Student Co-I, NASA Mars Data Analysis Program
Mineralogic and morphologic studies of Mars and implications of observed water-rock alteration (PI: Prof. Jim Bell)
- 2008-2010 Fellow, NASA Harriet G. Jenkins Pre-doctoral Fellowship
Minerals, ice, and dunes: Signs of water-related processes in the martian north polar basin (Mentor: Dr. Kenneth Tanaka)

Publications

1. L. Hays, H. Graham, **B. Horgan**, S. Potter-McIntyre, A. Williams, D. Des Marais, M. Parenteau, E. Hausrath, T. McCollom, K. Lynch (2017). Report from the Biosignature Preservation and Detection in Mars Analog Environments Workshop, *Astrobiology*, accepted.
2. R. Smith*, **B. Horgan**, P. Mann, E. Cloutis, P. Christensen (2017). Acid weathering of basalt and basaltic glass: II. Effects of microscopic alteration textures on surface properties, *Icarus*, doi:10.1002/2016JE005112.
3. **B. Horgan**, R. Smith*, P. Mann, E. Cloutis, P. Christensen (2017). Acid weathering of basalt and basaltic glass: I. Near-infrared spectra, mid-infrared spectra, and implications for Mars, *Icarus*, doi:10.1002/2016JE005111.
4. B. Ehlmann, F. Anderson, J. Andrews-Hanna, J. Carter, D. Catling, P. Christensen, B. Cohen, C. Dressing, C. Edwards, L. Elkins-Tanton, K. Farley, C. Fassett, W. Fischer, A. Fraeman, M. Golombek, V. Hamilton, A. Hayes, C. Herd, **B. Horgan**, and 28 others (2016). The sustainability of habitability on terrestrial planets: Insights, questions, and needed measurements from Mars for understanding the evolution of Earth-like worlds, *Journal of Geophysical Research*, doi:10.1002/2016JE005134.
5. L. Fenton, J. Bishop, S. King, B. Lafuente*, **B. Horgan**, D. Bustos, P. Sarrazin (2016). Sedimentary differentiation of aeolian grains at the White Sands National Monument, NM, USA, *Aeolian Research*, in press, doi:10.1016/j.aeolia.2016.05.001.
6. K. Bennett*, **B. Horgan**, L. Gaddis, B. Greenhagen, C. Allen, P. Hayne, J. Bell, and D. Paige (2016). Complex explosive volcanic activity within Oppenheimer Crater on the Moon, *Icarus*, 273, 296–314, doi:10.1016/j.icarus.2016.02.007.
7. R. Soare, **B. Horgan**, S. Conway, C. Souness, M. El Maaray (2015). Volcanic terrain and the possible periglacial formation of “excess ice” at the mid-latitudes of Utopia Planitia, Mars, *Earth & Planetary Science Letters*, 423, 182–192, doi:10.1016/j.epsl.2015.04.033.

8. K. Lynch*, **B. Horgan**, J. Munakata Marr, J. Hanley, and 5 others (2015). Near-infrared spectroscopy of lacustrine sediments in the Great Salt Lake Desert: An analog study for Martian paleolake basins, *J. Geophys. Res.*, *120*, doi:10.1002/2014JE004707.
9. **B. Horgan** and D. Hooper (2015). Dune Apron/Denivation Features (two entries), in *Encyclopedia of Planetary Landforms*, eds: H. Hargitai, A. Kereszturi, doi: 10.1007/978-1-4614-9213-9.
10. W. Farrand, T. Glotch, **B. Horgan** (2014). Detection of ferric and ferrous sulfate minerals in the northern Mawrth Vallis region of Mars: Evidence of acid sulfate alteration. *Icarus*, *241*, 346-357, doi:10.1016/j.icarus.2014.07.003.
11. **B. Horgan**, E. Cloutis, P. Mann, J. Bell (2014). Near-infrared spectra of ferrous mineral mixtures and methods for their identification in planetary surface spectra, *Icarus*, *234*, 132-154, doi:10.1016/j.icarus.2014.02.031.
12. **B. Horgan** (2013). Planetary Science: Evolved Magma on Mars (News & Views). *Nature Geoscience*, doi:10.1038/ngeo2010.
13. G. Berard*, D. Applin, E. Cloutis, J. Stromberg, R. Sharma, P. Mann, S. Grasby, R. Bezys, **B. Horgan**, and 7 others (2013). A hypersaline spring analogue in Manitoba, Canada for potential ancient spring deposits on Mars. *Icarus*, *224*, 399-412, doi:10.1016/j.icarus.2012.12.024.
14. M. Rice, E. Cloutis, J. Bell, D. Bish, **B. Horgan**, S. Mertzman, M. Craig, R. Renaut, B. Gautason, B. Mountain (2013). Reflectance spectra diversity of silica-rich materials: Sensitivity to environment and implications for detections on Mars. *Icarus*, *223*, 499-533, doi:10.1016/j.icarus.2012.09.021.
15. J. Huang*, C. Edwards, **B. Horgan**, P. Christensen, M. Kraft, L. Xiao (2012). Identification and mapping of dikes with relatively primitive compositions in Thaumasia Planum on Mars: Implications for Tharsis volcanism and the opening of Valles Marineris. *Geophysical Research Letters*, *39*, L17201, doi:10.1029/2012GL052523.
16. **B. Horgan**, J. Bell (2012). Widespread weathered glass on the surface of Mars, *Geology*, *40*, 391-394, doi: 10.1130/G32755.1.
17. **B. Horgan**, J. Bell (2012). Active slipface avalanches in the north polar sand sea of Mars: Evidence for a wind-related origin, *Geophysical Research Letters*, *39*, L09201, doi:10.1029/2012GL051329.
18. **B. Horgan**, J. Bell, E. Noe Dobrea, E. Cloutis, D. Bailey, M. Craig, L. Roach, J. Mustard (2009). Distribution of hydrated minerals in the north polar region of Mars, *Journal of Geophysical Research*, *114*, E01005, doi:10.1029/2008JE003187.
19. M. Kangas, M. Ansmann, **B. Horgan**, N. Lemaster, R. Leonardi, A. Levy, P. Lubin, J. Marvil, P. McCreary, T. Villela (2005). A 31 pixel flared 100-GHz high-gain scalar corrugated nonbonded platelet antenna array, *IEEE: Antennas and Wireless Propagation Letters*, *4*, 245-248.
20. M. Kangas, M. Ansmann, K. Copey, **B. Horgan**, R. Leonardi, P. Lubin, T. Villela (2005). A 100-GHz High-gain Tilted Corrugated Nonbonded Platelet Antenna, *IEEE: Antennas and Wireless Propagation Letters*, *4*, 304 – 307.

*indicates student authors

Upcoming Manuscripts

1. J. Lai, B. Horgan, J. Bell, Assessing martian bedrock mineralogy through “windows” in the dust using near-infrared and thermal-infrared remote sensing, *Icarus*, submitted.

Selected Conference Proceedings (Non-Refereed)

1. B. Horgan, A. Rutledge, N. Scudder, and E. Rampe (2016). Glacial and periglacial chemical weathering on Mars. *6th Intl Conference on Mars Polar Science and Exploration*, abstract #6113.
2. B. Horgan (2016). Strategies for searching for biosignatures in ancient martian sub-aerial surface environments. *Biosignature Preservation and Detection in Mars Analog Environments*, abstract #2032.
3. B. Horgan, D. Loizeau, F. Poulet, J. Bishop, and 7 others (2015). Habitable Noachian Environments and Abundant Resources in the Mawrth Vallis Exploration Zone. *1st EZ Workshop for Human Missions to Mars*, abstract #1009.
4. B. Horgan (2015). Evaluating a weathering origin for phyllosilicates in ancient sediments on Mars: Spectral characteristics and clay mineralogy of a terrestrial paleosol sequence. *AGU Fall Meeting*, #P23C-07 (invited).
5. B. Horgan, K. Bennett, L. Gaddis, B. Greenhagen, C. Allen, P. Hayne, J. Bell, D. Paige (2015). Complex Explosive Volcanic Activity on the Moon in Oppenheimer Crater. *AGU Fall Meeting*, #P31H-03.
6. B. Horgan, A. Rutledge, and E. Rampe (2015). Clay mineralogy and crystallinity as a climatic indicator: Evidence for both cold and temperate conditions on early Mars. *LPSC 46*, #2923.
7. B. Horgan, M. Rice, and S. Ackiss (2015). Constraints on the formation and alteration history of Mt. Sharp, Gale Crater, Mars from a new CRISM mineral map. *LPSC 46*, #2943.
8. B. Horgan (2014). Evidence for habitable surface environments in soils on early Mars. *AGU Fall Meeting*, #P32A-06.
9. B. Horgan, J. Bishop, A. Fraeman, W. Farrand (2014). Plateau wetlands at Mawrth Vallis and possible implications for clay and oxide layers in Gale Crater. *8th Int'l Conference on Mars*, #1276.
10. B. Horgan, F. Seelos (2014) Constraints on the geologic and aqueous history of the north polar region of Mars from the mineralogy of north polar sediments. *LPSC 45*, #2158.
11. B. Horgan, M. Chojnacki, J. Lai, K. Bennet, J. Bell (2013). Remote identification of pyroclastic deposits on Mars and the Moon with near-infrared spectroscopy. *AGU Fall Meeting*, #V53C-2816.
12. B. Horgan, J. A. Kahmann-Robinson, J. Bishop, P. Christensen (2013). Climate change and a sequence of habitable ancient surface environments preserved in pedogenically altered sediments at Mawrth Vallis, Mars. *LPSC 44*, #3059.

13. B. Horgan, R. Smith, P. Mann, J. Stromberg, E. Cloutis, P. Christensen, J. Bell (2013). New evidence for a weathering origin for the high-silica component of TES Surface Type 2 on Mars. *LPSC 44*, #3032.
14. B. Horgan, M. Chojnacki, J. Lai, D. Clarke, J. Joseph, and J. Bell (2012). Widespread explosive volcanism on Mars inferred from the global distribution of glass-rich sediments (2012). *GSA 2012*, #208781, *invited*.
15. B. Horgan, J. Farmer, P. Christensen (2011). Soils, soil formation, and paleosols on Mars: Habitability and organic preservation, *Exploring Mars Habitability*, #2186130.
16. B. Horgan, P. Mann, J. Stromberg, E. Cloutis (2011). Acid alteration of basalts: Near-IR spectra and implications for martian soil formation, *LPSC XLII*, #2415.
17. B. Horgan, J. Bell. (2010). New insights into aqueous processes within martian high latitude soils, *AGU 2010*, #P52B-06.
18. B. Horgan, J. Bell, M. Bourke (2010). Ice and sulfate induration in the martian north polar sand sea" *2nd Intl. Planetary Dunes Workshop*, #2023.

Invited Talks

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| 2017 | Jan. | Texas A&M Geology & Geophysics seminar, College Station, TX |
| 2016 | Feb. | Purdue Back to Class alumni seminar, Naples, FL |
| | Mar. | Geology Colloquium, Univ. of Cincinnati, Cincinnati, OH |
| | Apr. | Purdue Meet the Dean alumni seminar, Indianapolis, IN |
| | July | Purdue President's Council Family Day, Chicago, IL |
| | Oct. | SESE Colloquium, Arizona State University, Tempe, AZ |
| | Oct. | Indiana Astronomical Society, Indianapolis, IN |
| | Oct. | National Geographic Live! Mankind to Mars, Chicago, IL |
| 2015 | Feb. | EPS Colloquium, State University of New York – Stonybrook, Stonybrook, NY |
| | May | Seminar, NASA Goddard Space Flight Center, Greenbelt, MD |
| | June | Seminar, Southwest Research Institute, Boulder, CO |
| | Sept. | Dawn or Doom 2 Conference, Purdue University, West Lafayette, IN |
| | Nov. | NASA Astrobiology Institute Seminar, University of Washington, Seattle, WA |
| | Dec. | American Geophysical Union Fall Meeting, San Francisco, CA |
| 2014 | Nov. | University of Tennessee EPS Colloquium, Knoxville, TN |
| 2012 | May | Planetary Science Institute Seminar, Tuscon, AZ |
| | Nov. | Harvey Mudd Physics Colloquium, Claremont, CA |
| | Nov. | Geological Society of America Annual Meeting, Charlotte, NC |
| 2011 | April | USGS Astrogeology Science Center Seminar, Flagstaff, AZ |
| 2010 | Aug. | Buffalo State University Science Colloquium, Buffalo, NY |
| 2009 | April | MIT Women in Aerospace Symposium, Cambridge, MA |

Media Coverage

1. **Planetary Society**, 1/26/2017, "Let's talk about this whole Moon vs. Mars thing for human spaceflight." <http://www.planetary.org/blogs/jason-davis/2017/20170126-moon-vs-mars-hsf.html>
2. **Titanium Physicists Podcast**, 7/20/2016: "Episode 66: Life on Mars with Zach Weinersmith." <http://titaniumphysicists.brachiolopemedia.com/2016/07/20/episode-66-life-on-mars-with-zach-weinersmith/>
3. **Cornell Daily Sun**, 5/4/2016: "Mars 2020 mission: Students survey rover landing sites." <http://www.news.cornell.edu/stories/2016/05/mars-2020-mission-students-survey-rover-landing-sites>
4. **NASA**, 5/3/2016: "Found: Clues about Volcanoes Under Ice on Ancient Mars." <https://www.nasa.gov/feature/jpl/found-clues-about-volcanoes-under-ice-on-ancient-mars>
5. **Planetary Society**, 10/29/2015: "At Mars Workshop, Science and Human Spaceflight Find Common Ground." <http://www.planetary.org/blogs/jason-davis/2015/20151029-mars-science-hsf-common-ground.html>
6. **Indianapolis Star**, 10/1/2015: "Mars has an Indiana connection" <http://www.indystar.com/story/news/2015/09/30/life-mars-search-continues/73052670/>
7. **Sky and Telescope**, also covered by **WIBC**, **WXIN Fox59**, 9/28/2015: "Waterlogged Salts on Mars." <http://www.skyandtelescope.com/astronomy-news/water-logged-salts-on-mars-2809201523/>
8. **Purdue News**, also covered by **Phys.org**, **WIBC 10 for 10**, **WLFJ News 18**, **Lafayette Journal & Courier**, **Purdue Exponent**, 9/17/2015: "Purdue professor will use an array of colors to study the Red Planet." <http://www.purdue.edu/newsroom/releases/2015/Q3/purdue-professor-will-use-an-array-of-colors-to-study-the-red-planet.html>
9. **Planetary Society**, 3/26/2013: "LPSC 2013: Watery martian minerals." <http://www.planetary.org/blogs/emily-lakdawalla/2013/03281019-lpsc-2013-watery-martian.html>
10. **The Oregonian**, 8/10/2012: "John Day Fossil Beds could help search for water on Mars." http://www.oregonlive.com/environment/index.ssf/2012/08/john_day_fossil_beds_could_help.html
11. **EOS Research Highlights**, 5/28/2012: "Wind may have driven avalanches on Martian dunes." <http://www.agu.org/cgi-bin/highlights/highlights.cgi?action=show&doi=10.1029/2012GL051329&jc=gl>
12. **Astrobiology Magazine**, 4/26/2012: "Martian Volcanic Glass Could Be Hotspot for Life." <http://www.astrobio.net/exclusive/4714/martian-volcanic-glass-could-be-hotspot-for-life>

13. **New Scientist**, 4/15/2012: "Mysteriously dark Mars regions are made of glass."
<http://www.newscientist.com/article/mg21428604.900-mysteriously-dark-mars-regions-are-made-of-glass.html>
14. **Discovery News**, 4/2/2012: "Martian dark spots reveal heart of glass."
<http://news.discovery.com/space/mars-dark-spots-120402.html>

Awards and Honors

2016	Purdue College of Science Undergraduate Mentoring Award
2010-2012	Arizona State University Exploration Postdoctoral Fellowship
2009	Cornell University Eleanor Norton York Prize in Astronomy
2009, 2010	NASA Mars Exploration Student Travel Award
2009	Lunar and Planetary Institute Career Development Award
2008	NASA Harriet G. Jenkins Pre-doctoral Fellowship
2008	NASA Earth and Space Science Fellowship

Teaching and Mentoring Experience

2014-present	Faculty Instructor , Purdue University <i>Curriculum coordinator for Planetary Science major program.</i> <i>Primary courses: EAPS 556, "Planetary Geology", EAPS 105, "The Planets";</i> <i>EAPS 577 "Remote Sensing of the Planets".</i>
2014-present	Advisor for Undergraduate and Graduate Students , Purdue University
2011-2015	Graduate Student Mentor , Bell/Christensen Research Groups, ASU <i>Advised graduate students on research and career development</i> <i>Lead lab, field, and remote sensing work involving graduate students</i>
2011-2012	Undergraduate Mentor , Arizona Space Grant Internship <i>Lead a non-science major in a study of dune compositions on Mars</i>
2009	Field trip leader , Cornell University <i>Astro 577, "Planetary Surface Processes"</i>
2005-2006	Graduate Teaching Assistant , Cornell University <i>Astro 102, "Our Solar System"; Astro 310, "Planetary Image Processing"</i>
2003-2005	Undergraduate Teaching Assistant, Oregon State University <i>Physics 427, "Paradigm: Periodic Systems"; Physics 423, "Paradigm: Energy & Entropy";</i> <i>Physics 211, "General Physics w/ Calculus"; Physics 201, "General Physics"</i>
2003-2005	Physics Department Tutor , Oregon State University

Graduate Advisees and Undergraduate Research Assistants

PhD	2020	Marie McBride	
	2020	Noel Scudder	<i>EAPS Andrews Fellowship</i>
	2019	Sheridan Ackiss	<i>NASA Earth and Space Science/Purdue Doctoral Fellow</i>
MS	2016	Cesare Guariniello	
BS	2019	Ben Oxley, Brandon Smith	
	2018	Dan McGahan	
	2017	Rhianna Moore, John Riccione, Aaron Campbell	
	2016	Ellen Czaplinski (PhD student at Univ. Arkansas), Rachel Maxwell (PhD student at Univ. California - Santa Cruz), Caleb Engle (MS student at Colorado School of Mines)	

Professional Service and Outreach

2016-2017	Science Committee, Biosignature Detection and Preservation...
2016	Organizing Committee, Sixth Intl Conf on Mars Polar Science & Exploration
2016	Co-Organizer, LPSC Young Planetary Faculty Lunch
2015-2016	Organizing Committee, 6 th Intl. Mars Polar Conference
2015-present	Member, Mars 2020 PSG Landing Site Working Group
2015-2016	Organizing Committee, Biosignature Preservation Workshop
2014-2015	Organizing Committee, 4 th Intl Planetary Dunes Workshop
2010-present	Review panelist, NASA funding programs, Netherlands Space Office
2008-present	Referee, <i>JGR, Astrobiology, Icarus, Nature Geoscience, EPSL, GRL</i>
2010-2014	Instructor and Advisor, Mars Student Imaging Program, ASU
2012-2013	Organizer, Salt River Pima-Maricopa Indian Community Science Fair
2011-2012	Organizing Committee, Third Planetary Dunes Workshop
2008	Organizing Committee, 40 th AAS Division of Planetary Science Meeting
2007-2009	Initial Contacts Chair, Expanding Your Horizons Youth Conference, Cornell
2006-2009	Cornell Graduate and Professional Student Assembly Co-founder, Student Advocacy Committee Assembly Member for the Physical Sciences Council of Representatives Member for the Department of Astronomy
2007-2008	Vice President, Cornell Graduate Women in Physics
2006-2008	Chair, Cornell Department of Astronomy Planetary Lunch Seminar
2006-2008	Founding VP and President, Cornell Astronomy Graduate Network