

CRAIG J. HARDGROVE

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CURRENT POSITION:

Assistant Professor, Arizona State University, School of Earth and Space Exploration, 2016 – present
Director of Projects, Arizona State University, NewSpace Initiative, 2016 - present
Honors Faculty at Arizona State University, Barrett Honors College, 2017 – present
Adjunct Assistant Professor, University of Tennessee, Department of Earth and Planetary Science, 2019 - present

PREVIOUS POSITIONS:

Postdoctoral Research Scientist, ASU, 2013 – 2016
Assistant Staff Scientist, Malin Space Science Systems, 2012 – 2013
Postdoctoral Researcher, Stony Brook University, 2011 - 2012
NASA Graduate Research Program (GSRP) Fellow, NASA Goddard Space Flight Center and the Department of Earth and Planetary Sciences at University of Tennessee, 2008 - 2011

EDUCATION:

Ph.D.: 2011, University of Tennessee, Geology
B.S.: 2004, Georgia Institute of Technology, Physics

PROFESSIONAL ACTIVITIES:

Principal Investigator, NASA LunaH-Map mission, 2015 to present
Participating Scientist: NASA Mars Science Laboratory Curiosity Rover, 2016 to present
Co-I., NASA Mars 2020 Perseverance Rover Mastcam-Z instrument team, 2014 to present
Co-I., ESA BepiColombo Mission, Gamma-Ray and Neutron Spectrometer team, 2019 to present
P.I., NASA Planetary Instrument Concepts for the Advancement of Solar System Observations - development of an active source, pulsed neutron and gamma-ray instrument (SINGR), 2015 to 2018
Science Team Member: NASA Mars Odyssey Context Imager instrument, 2011 to 2012
Science Team Member: NASA Mars Exploration Rover Missions, 2006 to 2011

HONORS AND AWARDS:

NASA Group Achievement Awards (2), MSL/Curiosity Science Team, 2015-2017
NASA Early Career Fellowship Award, 2016
Outstanding Young Alumnus Award, EPS Department, University of Tennessee, 2016
NASA Group Achievement Award, MSL/Curiosity Operations Team, 2013
NASA Graduate Student Researcher's Program Fellowship, 2008-2011

Interdisciplinary Research Award, EPS Department, University of Tennessee, 2010
Professional Promise Award, EPS Department, University of Tennessee, 2008
NASA Group Achievement Awards (2), MER 3rd & 4th Extended Missions, 2008
Excellence in Graduate Coursework, EPS Department, University of Ten., 2006 and 2007
NASA Group Achievement Awards (2), MER 1st, 2nd Extended Missions, 2004-2005

TEACHING EXPERIENCE:

GLG 406/598: 'Geology of Mars', Spring 2019, Spring 2021
SES 591: 'Mars Curiosity Rover Science, Spring 2020
SES 100: 'Introduction to Exploration', Fall 2018, Fall 2019
SES 494/598: 'Space Business and Entrepreneurship', co-taught, Fall 2019
SES 494/598: 'Commercial Opportunities in Space', co-taught, Fall 2016, Fall 2017,
Spring 2018
SES 591: 'Planetary Nuclear Spectroscopy Seminar', Spring 2017
AST 113: 'Astronomy Laboratory', Spring 2016

MENTORING EXPERIENCE:

Primary dissertation advisor for 3 SESE PhD students (Lena Heffern, Sean Czarnecki,
Jack Lightholder)
Primary thesis advisor for 1 SESE MS student (Stephen West)
Secondary dissertation advisor for 3 SESE PhD students (Steven Dibb, Angelica Berman,
Akshatha Vydula)
Committee Member for ASU PhD/MS students (Paul Horton, Jenna Moore)
External dissertation advisor for 1 University of Tennessee PhD student (Claire Mondro)
Graduated 2 SESE PhD students (Hannah Kerner, Travis Gabriel) as 2nd advisor
Graduated 1 ASU MS student (Kush Gupta)
Committee Member for graduated ASU PhD/MS students (Susan Klem, Nicholas
Dallman)
Barrett Honors Thesis Advisor (Ivy Ettinborough - graduated)
Served/Serving as PhD committee member for 11 total SESE graduate students
Advisor: 10 undergraduate researchers, 2015 to present
SESE Undergraduate Mentor, 2016 to present (10 students per semester)

DEPARTMENT/UNIVERSITY FACULTY SERVICE:

Member of year-long ASU 2020 Inaugural Cohort for Space-focused Research
(organized by SESE Director Wadhwa and ASU Knowledge Enterprise), 2020 to
present
Hosted David Lawrence and Andy Klesh for SESE Department Colloquium, January &
September 2019
Co-Director: LANL/SESE Partnership with Interplanetary Initiative, 2017-2018
ASU/SESE Undergraduate Recruitment/Oversight Committee, 2016 to present
Director of Projects: ASU NewSpace, 2016 to present
Organized a joint SESE-LANL '*Workshop on Neutron Spectroscopy*' in Sept 2017 with 6
SESE graduate students and LANL staff scientists and researchers (led to 2
LANL graduate summer internships)

Organized a joint ASU-JPL ‘*Interactive Spacecraft Trajectory Design Seminar and Workshop*’ in March 2017 with JPL Mission Design and Navigation Engineers to teach students about spacecraft trajectory design methods (20 undergrad and grad students)
SESE Nininger Travel Award Review Panel, 2016

PROFESSIONAL SERVICE:

External Reviewer: NASA PDART 2020
Invited Reviewer: ‘NucSpec’ Nuclear Spectroscopy Discipline Dictionary Review for the Planetary Data System Asteroid/Dust Subnode, 2019
Member: Preliminary Design Review Board for VIPER Neutron Spectrometer at NASA Ames, 2019
Member: LDAP Review Board, 2019
Panelist: NASA ‘Planetary Vision 2050’ Conference at NASA Headquarters, 2017
Member: LDAP External Review Panel, 2017
Member: MDAP External Review Panel, 2017
Member: PICASSO Review Panel, 2017
Member: NASA *PG&G*, *MDAP*, *ASTID*, *SSW*, 2012 to present
Reviewer: *JGRP*, *JGRA*, *MAPS*, *Icarus*, *SSR* 2012 to present
Session Chair: *AGU Planetary Sciences Section*, 2011 and 2013
Committee Member: Stony Brook University Postdoctoral Working Group, 2012
Writing Associate: New York Academy of Sciences, 2012 to 2013
Consultant: NAS Science & Entertainment Exchange, 2012 - present

PROFESSIONAL AFFILIATIONS:

American Geophysical Union (Planetary Sciences Section); The Planetary Society (Member), American Physical Society (Member)

INVITED TALKS/LECTURES:

LunaH-Map Mission Status and Update – Invited talk – Interplanetary Small Satellite Conference (2021)
TechCrunch TC Sessions: Space 2020, University Showcase — Boldly Innovating in Space, for Space Invited panelist (2020)
LunaH-Map Invited talk - Lunar Surface Science Virtual Workshop, Virtual Session 2: Lunar Volatiles and Samples, July 29–30, (2020)
Searching for Lunar Water with LunaH-Map: Tiny Interplanetary Spacecraft With Big Science and Exploration Goals ASU School of Earth and Space Exploration Colloquium Fall Series Invited Speaker (2020)
New Access to Space –Centennial AGU Panelist Invited panelist for Centennial AGU Panel on new access to lunar exploration, December (2019)
The Lunar Polar Hydrogen Mapper Mission - Status and Instrument Development Invited talk at NASA Goddard Space Flight Center CubeSat Symposium (2019)
Neutron spectroscopy of the Moon using a small, low-cost cubesat Invited talk at the 2019 International Conference on Applications of Nuclear Techniques, Crete, Greece (2019)

- Development of the Lunar Polar Hydrogen Mapper Mission* Invited talk at Interplanetary Small Satellite Conference Special Session on Artemis-1 mission (2019)
- Exploring the Surface of Mars with the Curiosity Rover Neutron Detector* Invited Colloquium and technical talk on *The Lunar Polar Hydrogen Mapper Mission* at Northern Arizona University Department of Astronomy and Planetary Science (2019)
- Exploring the Surface of Mars with a Neutron Detector* Invited talk on MSL Curiosity neutron detector results at Radiation Monitoring Devices, Watertown, MA (2019)
- Exploring the Surface of Mars with the Curiosity Rover Neutron Detector* Invited plenary talk on MSL Curiosity neutron detector results at American Physical Society Four Corners meeting, Salt Lake City, UT (2018)
- Lessons Learned in the Development of the Lunar Polar Hydrogen Mapper Mission* NASA Smallsat Reliability Technical Interchange Meeting 3, San Luis Obispo, CA (2018)
- Active Neutron Investigations on the Mars Science Laboratory Curiosity Rover* Los Alamos National Laboratory – Planetary Science Seminar Series, Los Alamos, NM (2018)
- Single Scintillator Neutron and Gamma-Ray Spectrometer Progress* NASA Goddard Space Flight Center PICASSO program review, Goddard, MD (2018)
- Development of the Lunar Polar Hydrogen Mapper Mission* NASA Smallsat Reliability Technical Interchange Meeting 2, Washington, DC (2017)
- The Lunar Polar Hydrogen Mapper Mission* Invited Talk at LPSC Microsymposium on Solar System Polar Volatiles, Houston, TX (2016)
- The Lunar Polar Hydrogen Mapper Mission* Santa Monica College STEM lecture series, Santa Monica, CA (2016)
- The Lunar Polar Hydrogen Mapper Mission* SESE Engineering Coffee, Tempe, AZ (2016)

EDUCATION, OUTREACH, AND COMMUNITY ACTIVITIES:

- ASU Now Article Interview “ASU-led LunaH-Map spacecraft ready for final testing” <https://asunow.asu.edu/20200519-asu-led-lunah-map-spacecraft-ready-final-testing> 2020
- ASU State Press Article Interview “ASU spacecraft makes an appearance in popular video game” <https://www.statepress.com/article/2019/10/spbiztech-asu-spacecraft-makes-an-appearance-in-a-popular-video-game> 2019
- NPR Interview on KJZZ “Tiny Satellites Land Startup Company In Big Trouble With FCC” January 9th, 2019
- Panelist and Invited Speaker on “To the Moon” panel discussion at Flagstaff 50th Anniversary of Apollo Festival of Science on September 29th, 2019
- ASU KEDTalk on LunaH-Map, 2018
- Fox 10 Newsmakers segment on LunaH-Map, 2016
- SESE Night of the Open Door presentation on LunaH-Map, 2016
- ASU Connections Podcast, 2016
- LunaH-Map talk at SESE Earth and Space Exploration Day, 2016
- Panelist: Project Hieroglyph at ASU Center for Science and the Imagination, guest science expert on asteroid subpanel, 2016

Consultant: Environmental Art at Bungie Studios, 2013 to 2015
Science Panelist: Phoenix Comicon, 2014
Science Organizer: San Diego Air and Space Museum Space Day, 2013
Science Volunteer: San Diego Festival of Science and Engineering, 2013

PUBLICATIONS IN REFEREED JOURNALS

Total of 53 publications (12 published as a member of the “MSL Science Team”); H-Index of 24; I10-Index of 37; Total number of citations is 3106 according to Astrophysics Data System metrics adsabs.harvard.edu search on 5/6/2021

*Names of students and postdocs who worked on the paper under my direct supervision are denoted with an *. Also, in our field, the senior scientist leading the research is either the first author or the second author in cases when students or postdocs are first authors.*

Impact factors of the peer-reviewed journals are:

Nature Geoscience = 13.57
Space Science Reviews = 9.33
Earth and Planetary Science Letters = 4.82
Geophysical Research Letters = 4.58
Journal of Geophysical Research - Planets = 3.71
Icarus = 3.56
American Mineralogist = 2.20
IEEE Aerospace & Electronics Magazine = 2.37
Planetary and Space Science = 1.82
Nuclear Instruments and Methods in Physics Research A = 1.14

1. T. Gabriel*, **C. Hardgrove**, C. Achilles, E. Rampe, W. Rapin, S. Nowicki, S. Czarnecki, L. Thompson, S. Nikiforo, M. Litvak, I. Mitrofanov, D. Lisov, J. Frydenvang, A. Yen, R. Wiens, A. Treiman, A. McAdam. On an extensive late groundwater event in Gale crater as indicated by water-rich fracture halos. JGR - Planets, *submitted*.
2. J. F. Bell, J.N. Maki, G.L. Mehall, M.A. Ravine, M.A. Caplinger, Z.J. Bailey, S. Brylow, J.A. Schaffner, K.M. Kinch, M.B. Madsen, A. Winhold, A.G. Hayes, P. Corlies, C. Tate, M. Barrington, E. Cisneros, E. Jensen, K. Paris, K. Crawford, C. Rojas, L. Mehall, J. Joseph, J.B. Proton, N. Cluff, R.G. Deen, B. Betts, E. Cloutis, A.J. Coates, A. Colaprete, K.S. Edgett, B.L. Ehlmann, S. Fagents, J.P. Grotzinger, **C. Hardgrove**, K.E. Herkenhoff, B. Horgan, R. Jaumann, R.J. Johnson, M. Lemmon, G. Paar, M. Caballo-Perucha, S. Gupta, C. Traxler, F. Preusker, M.S. Rice, M.S. Robinson, N. Schmitz, R. Sullivan, M.J. Wolff, The Mars 2020 Perseverance Rover Mast Camera Zoom (Mastcam-Z) Multispectral, Stereoscopic Imaging Investigation. Space Science Reviews, Volume 217, Issue 1, article id.24 Space Science Reviews, Volume 217, Issue 1, article id.24 (2021)
3. **C. Hardgrove**, R. Starr, A. Babuscia, I. Lazbin, B. Roebuck, J. DuBois, N. Struebel, A. Colaprete, D. Drake, E. Johnson, J. Christian, L. Heffern, S. Stem, S. Parlapiano, M. Wiens, A. Genova, D. Dunham, D. Nelson, B. Williams, J. Bauman, P. Hailey, T.

- O'Brien, K. Marwah, L. Vlieger, J. Bell, and T. Prettyman. The Lunar Polar Hydrogen Mapper CubeSat Mission. *IEEE Aerospace and Electronic Systems Magazine*, vol. 35, no. 3, pp. 54-69, 1, doi: 10.1109/MAES.2019.2950747 (2020)
4. S. West*, D. Beckman, D. Coupland, N. Dallmann, **C. Hardgrove**, K. Mesick, L. Stonehill. Compact readout of large CLYC scintillators with silicon photomultiplier arrays. *Nuclear Instruments and Methods in Physics Research Section A*, Vol. 951, 162928, doi.org/10.1016/j.nima.2019.162928, (2020)
 5. S. Czarnecki*, **C. Hardgrove**, P. Gasda, T. Gabriel, M. Starr, M. Rice, J. Frydenvang, R. Wiens, W. Rapin, S. Nikiforov, D. Lisov, M. Litvak, F. Calef, H. Gengl, H. E. Newsom, L. Thompson, S. Nowicki. Identification and description of a silicic volcanoclastic layer in Gale crater, Mars using active neutron interrogation. *Journal of Geophysical Research - Planets*, Volume 125, Issue 3, E2019JE006180 (2020)
 6. H. Kerner*, **C. Hardgrove**, S. Czarnecki, T. Gabriel, I. Mitrofanov, M. Litvak, A. Sanin, D. Lisov, Analysis of active neutron measurements from the Mars Science Laboratory Dynamic Albedo of Neutrons instrument: Intrinsic variability, outliers, and implications for future investigations. *Journal of Geophysical Research – Planets*, Volume 125, Issue 5, E2019JE006264 (2020)
 7. A.A. Fraeman, L.A. Edgar, E.B. Rampe, L.M. Thompson, J. Frydenvang, C.M. Fedo, J.G. Catalano, W.E. Dietrich, T.S.J. Gabriel, A.R. Vasavada, J.P. Grotzinger, J. L'Haridon, N. Mangold, V.Z. Sun, C.H. House, A.B. Bryk, **C. Hardgrove**, S. Czarnecki, K.M. Stack, R.V. Morris, R.E. Arvidson, S.G. Banham, K.A. Bennett, J.C. Bridges, C.S. Edwards, W.W. Fischer, V.K. Fox, S. Gupta, B.H.N. Horgan, S.R. Jacob, J.R. Johnson, S.S. Johnson, D.M. Rubin, M.R. Salvatore, S.P. Schwenzer, K.L. Siebach, N.T. Stein, S.M.R. Turner, D.F. Wellington, R.C. Wiens, A.J. Williams, G. David, G.M. Wong. Evidence for a Diagenetic Origin of Vera Rubin Ridge, Gale Crater, Mars: Summary and Synthesis of Curiosity's Exploration Campaign. *Journal of Geophysical Research: Planets*, Volume 125, Issue 12, article id. e06527 (2020)
 8. W. Rapin, B.L. Ehlmann, G. Dromart, J. Schieber, N.H. Thomas, W.W. Fischer, V.K. Fox, N.T. Stein, M. Nachon, B.C. Clark, L.C. Kah, L. Thompson, H.A. Meyer, T.S.J. Gabriel, **C. Hardgrove**, N. Mangold, F. Rivera-Hernandez, R.C. Wiens, A.R. Vasavada. An interval of high salinity in ancient Gale crater lake on Mars. *Nature Geoscience*, Volume 12, Issue 11, p.889-895 (2019)
 9. C.G. Tate, J. Moersch, I. Mitrofanov, M. Litvak, P. Bellutta, W.V. Boynton, N. Cagle, B. Ehresmann, F. Fedosov, D. Golovin, **C. Hardgrove**, K. Harshman, D.M. Hassler, I. Jun, A.S. Kozыrev, D. Lisov, A. Malakhov, M. Mischna, S. Nikiforov, A.B. Sanin, R. Starr, A. Vostrukhin, C. Zeitlin. Mars Science Laboratory Dynamic Albedo of Neutrons passive mode data and results from sols 753 to 1292: Pahrump Hills to Naukluft Plateau. *Icarus*, Volume 330, p. 75-90, (2019).
 10. T. S. J. Gabriel*, **C. Hardgrove**, S. Czarnecki L. Rampe W. Rapin C. N. Achilles D. Sullivan S. F. Nowicki L. Thompson M. Litvak I. Mitrofanov R. T. Downs, [Water](#)

[abundance of dunes in Gale crater, Mars from active neutron experiments & implications for amorphous phases](#). *Geophysical Research Letters*, DOI:10.1029/2018GL079045, (2018).

11. W. Rapin, B. Chauviré T. S. J. Gabriel* A. C. McAdam B. L. Ehlmann **C. Hardgrove** P.-Y. Meslin B. Rondeau E. Dehouck H. B. Franz N. Mangold S. J. Chipera R. C. Wiens J. Frydenvang S. Schröder. In situ analysis of opal in Gale crater, Mars. *JGR-Planets*, 123(8), 1955–1972 (2018).
12. C.G. Tate, J. Moersch, I. Mitrofanov, M. Litvak, P. Bellutta, W.V. Boynton, D. Drake, B. Ehresmann, F. Fedosov, D. Golovin, **C. Hardgrove**, K. Harshman, D.M. Hassler, I. Jun, A.S. Kozyrev, D. Lisov, A. Malakhov, D.W. Ming, M. Mischna, M. Mokrousov, S. Nikiforov, A.B. Sanin, R. Starr, A. Vostrukhin, C. Zeitlin. Results from the dynamic albedo of neutrons (DAN) passive mode experiment: Yellowknife Bay to Amargosa Valley (Sols 201-753). *Icarus*, 299, p.513-537. (2018)
13. C. Tate, J. Moersch, I. Jun, I. Mitrofanov, M. Litvak, W. Boynton, D. Drake, F. Fedosov, D. Golovin, **C. Hardgrove**, K. Harshman, A. Kozyrev, R. Kuzmin, D. Lisov, E. Maclennan, A. Malakhov, M. Mischna, M. Mokrousov, S. Nikiforov, A. Sanin, R. Starr, A. Vostrukhin, Observed diurnal variations in Mars Science Laboratory Dynamic Albedo of Neutrons passive mode data. *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* 892 (2018).
14. L. Edgar, S. Gupta, D. Rubin, K. Lewis, G. Kocurek, R. Anderson, J. Bell, G. Dromart, K. Edgett, J. Grotzinger, **C. Hardgrove**, L. Kah, R. Leveille, M. Malin, N. Mangold, R. Milliken, M. Minitti, M. Palucis, M. Rice, S. Rowland, J. Schieber, K. Stack, D. Sumner, R. Wiens, R. Williams, A. Williams. Shaler: in situ analysis of a fluvial sedimentary deposit on Mars. *Sedimentology* 65, 1, (2018)
15. B. L. Ehlmann, K. S. Edgett, B. Sutter, C. N. Achilles, M. L. Litvak, M. G. A. Lapotre, R. Sullivan, A. A. Fraeman, R. E. Arvidson, D. F. Blake, N. T. Bridges, P. G. Conrad, A. Cousin, R. T. Downs, T. S. J. Gabriel, R. Gellert, V. E. Hamilton, **C. Hardgrove**, J. R. Johnson, S. Kuhn, P. R. Mahaffy, S. Maurice, M. McHenry, P.Y. Meslin, D. W. Ming, M. E. Minitti, J. M. Morookian, R. V. Morris, C. D. O'Connell-Cooper, P. C. Pinet, S. K. Rowland, S. Schröder, K. L. Siebach, N. T. Stein, L. M. Thompson, D. T. Vaniman, A. R. Vasavada, D. F. Wellington, R. C. Wiens, A. S. Yen. Chemistry, mineralogy, and grain properties at Namib and High dunes, Bagnold dune field, Gale crater, Mars: A synthesis of Curiosity rover observations. *JGR-P Vol 122*, 12, pp. 2510-2543 (2017)
16. J. F. Bell III, A. Godber, S. McNair, M. A. Caplinger, J. N. Maki, M. T. Lemmon, J. Van Beek, M. C. Malin, D. Wellington, K. M. Kinch, M. B. Madsen, **C. Hardgrove**, M. A. Ravine, E. Jensen, D. Harker, R. B. Anderson, K. E. Herkenhoff, R. V. Morris, E. Cisneros, R. G. Deen. The Mars Science Laboratory Curiosity rover Mastcam instruments: Preflight and in-flight calibration, validation, and data archiving. *ESS*, 4, 7, 396-452 (2017).

17. Danika F. Wellington, James F. Bell, Jeffrey R. Johnson, Kjartan M. Kinch, Melissa S. Rice, Austin Godber, Bethany L. Ehlmann, Abigail A. Fraeman, **Craig Hardgrove**. Visible to near-infrared MSL/Mastcam multispectral imaging: Initial results from select high-interest science targets within Gale Crater, Mars. *American Mineralogist*, 102, 6, 1202-1217 (2017).
18. N. Lanza, R. Wiens, R. Arvidson, B.C. Clark, W.W. Fischer, R. Gellert, J.P. Grotzinger, J.A. Hurowitz, S.M. McLennan, R.V. Morris, M.S. Rice, J.F. Bell, J.A. Berger, D.L. Blaney, N.T. Bridges, F. Calef, J.L. Campbell, S.M. Clegg, A. Cousin, K Edgett, C. Fabre, M.R. Fisk, O. Forni, J. Frydenvang, K.R. Hardy, **C. Hardgrove**, J.R. Johnson, J. Lasue, S. Le Mouélic, M.C. Malin, N. Mangold, J. Martin-Torres, S. Maurice, M.J. McBride, D.W. Ming, H.E. Newsom, A.M. Ollila, V. Sautter, S. Schröder, L.M. Thompson, A.H. Treiman, S. VanBommel, D.T. Vaniman, M-P. Zorzano. Oxidation of manganese in an ancient aquifer, Kimberley formation, Gale crater, Mars. *Geophysical Research Letters*, Vol. 43, Issue 14, pp. 7398-7407 (2016)
19. **C.J. Hardgrove**, A. D. Rogers, T. D. Glotch, and J. A. Arnold. [Thermal Emission Spectroscopy of Microcrystalline Sedimentary Phases: Effects of Natural Surface Roughness on Spectral Feature Shape](#). *Journal of Geophysical Research: Planets* 121, no. 3 (2016).
20. Litvak, Mitrofanov, **Hardgrove**, Stack, Sanin, Lisov, Boynton, Fedosov, Golovin, Harshman, Jun, Kozyrev, Kuzmin, Malakhov, Milliken, Mischna, Moersch, Mokrousov, Nikiforov, Starr, Tate, Tret'yakov, and Vostrukhin. Hydrogen and Chlorine Abundances in the Kimberley Formation of Gale Crater Measured by the DAN Instrument on Board the Mars Science Laboratory Curiosity Rover. *Journal of Geophysical Research: Planets* 121, no. 5 (2016).
21. Tate, Moersch, Jun, Ming, Mitrofanov, Litvak, Behar, Boynton, Deflores, Drake, Ehresmann, Fedosov, Golovin, **Hardgrove**, Harshman, Hassler, Kozyrev, Kuzmin, Lisov, Malakhov, Milliken, Mischna, Mokrousov, Nikiforov, Sanin, Starr, Varenikov, Vostrukhin, and Zeitlin. Water Equivalent Hydrogen Estimates from the First 200 Sols of Curiosity's Traverse (Bradbury Landing to Yellowknife Bay): Results from the Dynamic Albedo of Neutrons (DAN) Passive Mode Experiment. *Icarus* 262 (2015).
22. Sanin, Mitrofanov, Litvak, Lisov, Starr, Boynton, Behar, Deflores, Fedosov, Golovin, **Hardgrove**, Harshman, Jun, Kozyrev, Kuzmin, Malakhov, Milliken, Mischna, Moersch, Mokrousov, Nikiforov, Shvetsov, Tate, Tret'yakov, and Vostrukhin. Data Processing of the Active Neutron Experiment DAN for a Martian Regolith Investigation. *Nuclear Inst. and Methods in Physics Research*, A 789 (2015).
23. Lanza, Ollila, Cousin, Wiens, Clegg, Mangold, Bridges, Cooper, Schmidt, Berger, Arvidson, Melikechi, Newsom, Tokar, **Hardgrove**, Mezzacappa, Jackson, Clark, Forni, Maurice, Nachon, Anderson, Blank, Deans, Delapp, Léveillé, Mcinroy, Martinez, Meslin, and Pinet. Understanding the Signature of Rock Coatings in Laser-induced Breakdown Spectroscopy Data. *Icarus* 249 (2015).

24. F. Javier Martin-Torres, Maria-Paz Zorzano, Patricia Valentin-Serrano, Ari-Matti Harri, Maria Genzer, Osku Kempainen, Edgard G. Rivera-Valentin, Insoo Jun, James Wray, Morten Bo Madsen, Walter Goetz, Alfred S. McEwen, **Craig Hardgrove**, Nilton Renno, Vincent F. Chevrier, Michael Mischna, Rafael Navarro-Gonzalez, Jesus Martinez-Frias, Pamela Conrad, Tim McConnochie, Charles Cockell, Gilles Berger, Ashwin R. Vasavada, Dawn Sumner and David Vaniman, [Transient Liquid Water and Water Activity at Gale Crater on Mars](#), Nature - Geoscience, Vol. 8, 357-361
doi:10.1038/ngeo2412 (2015)
25. N. L. Lanza, W.W. Fischer, R.C. Wiens, J.P. Grotzinger, A.M. Ollila, A. Cousin, R.B. Anderson, B.C. Clark, R. Gellert, N. Mangold, S. Maurice, S. Le Mouélic, M. Nachon, M. Schmidt, J. Berger, S.M. Clegg, O. Forni, **C. Hardgrove**, N. Melikechi, H.E. Newsom, V. Sautter. High manganese concentrations in rocks at Gale crater, Mars. Geophysical Research Letters, Volume 41, Issue 16, pp. 5755-5763 (2014)
26. I.G. Mitrofanov, M.L. Litvak, A. Sanin, R. Starr, D.I. Lisov, R.O. Kuzmin, A. Behar, W.V. Boynton, **C. Hardgrove**, K. Harshman, I. Jun, R.E. Milliken, M.A. Mischna, J.E. Moersch, C.G. Tate, [Water and chlorine content in the Martian soil along the first 1900 m of the Curiosity rover traverse as estimated by the DAN instrument](#), Journal of Geophysical Research - Planets, Vol. 119, 7, 1579-1596 (2014).
27. M.L. Litvak, I.G. Mitrofanov, A.B. Sanin, D. Lisov, A. Behar, W.V. Boynton, L. Deflores, F. Fedosov, D. Golovin, **C. Hardgrove**, K. Harshman, I. Jun, A.S. Kozyrev, R.O. Kuzmin, A. Malakhov, R. Milliken, M. Mischna, J. Moersch, M. Mokrousov, S. Nikiforov, V.N. Shvetsov, K. Stack, R. Starr, C. Tate, V.I. Tret'yakov, A. Vostrukhin and the MSL Team, [Local Variations of Bulk Hydrogen and Chlorine-Equivalent Neutron Absorption Content Measured at the Contact Between the Sheepbed and Gillespie Lake Units in Yellowknife Bay, Gale Crater, Using the DAN Instrument Onboard Curiosity](#), Journal of Geophysical Research - Planets, Vol. 119 (2014).
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