

Curriculum Vita of Professor Alian Wang

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Education:

- Ph.D. (1987), Université des Sciences et Techniques de Lille, France.
major: **Spectrochimie**
- M.S. (1982), Peking University, China.
major: **Spectroscopy & Quantum Electronics**
- B.S. (1975), Shandong University, China.
major: **Optics**

Professional Experiences:

- May1993 – present, **Research Professor**, Research Associate Professor, Senior Research Scientist, Research Scientist, and Research Associate, at Washington University in St. Louis, Missouri, USA.
- Jan.1992 – April1993, **Research Associate**, Laboratoire des Spectrochimie Infrarouge et Raman, and Laboratoire des Dynamique des Interactions Moléculaires, Le Centre National de la Recherche Scientifique, France.
- Sept.1975 – Jan.1992, **Associate Professor**, Engineer, and Assistant Engineer, Chinese Academy of Geological Sciences, Ministry of Land and Resources, China.
- Since 2005, **Guest Professor** of Shandong University, China

Scientific and Technical Expertise:

- Since 1975: Molecular and atomic spectroscopy and their geological applications;
Since 1994: Laser Raman, FTIR, Vis-NearIR, LIBS spectroscopic instrumentations and environmental chambers for Mars, Moon, Venus, asteroids surface explorations;
Since 1994: Raman spectral features of Martian, lunar, and extraterrestrial materials, their thermodynamics and kinetics properties;
Since 2008: Field investigations at Mars analogue sites (Atacama, Tibet, Arctic) on surface/subsurface mineralogy, salt precipitation sequences, and biomarkers;

Professional Services:

- 2004–present, **Chairman and member** of GeoRaman International Science Advisory Committee (GRISAC); Chairman of 11th International GeoRaman Conference
- 1999–present, **Panel & External reviewer**, US-NSF and US-NASA's PIDDP, ASTID, MIDP, MFRP, and Cosmochemistry program.

1993–present, **Peer reviewer**, for international science journals, *e.g.*, Nature, Science, Nature-Geoscience, J. Geophys. Res (Planet), Space Science Review, Earth and Planetary Science Letter, Applied Spectroscopy, American Mineralogists, Physics and Chemistry of Minerals, European Journal of Mineralogy, Clay Minerals, Journal of Raman Spectroscopy, ICARUS, Meteoritics & Planetary Science, , Optical Engineering, etc.

Teaching and Academic Advising for graduate student, postdoctoral fellow

Since 1988, **Academic adviser for M. S. students** Wang WuYi and Gao HongLin at CAGS

Since 2006, **Academic adviser for PhD students** Z. C. Ling (Lewis), W. G. Kong (Gavin), Jian (Merc) Chen, Erbin (Irving) Shi, Hongkun (Quincy) Qu; at WUSTL

Since 2008, **Academic adviser for PostDoc fellows** Dr. Pablo Sobron Dr. H. W. Du (Bruce) Dr. X. H. Fu (Steve) Dr. Z. C. Wu (Daniel), at WUSTL

2007-2008, **Seminar Teacher**, *Planetary Spectroscopy* at EPSC-WUSTL.

1979 – 1980, **Teaching assistant** for General Physics at Peking University, China.

Awards:

2017, **Fellow, The Geological Society of America**

2014, **NASA Group Achievement Award** for Ten Year sustained exploration and scientific discovery on the surface of Mars with the Mars Exploration Rover.

2010, **JESSICA magazine** “The most Successful Women 2010”.

2008, **NASA Group Achievement Award** for the Mars Exploration Rover 3rd and 4th Extended Mission Team.

2007, **Award of Sir Arthur Clarke (United Kingdom)**, “Best Team Achievement” to Mars Exploration Rover team.

2005, **NASA Group Achievement Award** for the Mars Exploration Rover 2nd Extended Mission Team.

2005, **NASA Group Achievement Award** for the Mars Exploration Rover 1st Extended Mission Team.

2005, **NASA Group Achievement Award** for the Mars Exploration Rover Science Operations Team.

2004, **Science Magazine**, “2004 Science Breakthrough of the Year” to Mars Exploration Rover team.

2004, **Earth and Space Foundation**, “Exploration Award” to Mars Exploration Rover team.

Professional Affiliations:

American Geophysical Union (AGU, Planetary sciences)

Geological Society of America (GSA)

Society for Applied Spectroscopy (SAS)

Coblentz Society (Vibration Spectroscopy)

Publications (106 in peer-reviewed-journals)

1. Alian Wang (2022), Planetary Spectroscopy, *invited article by Oxford Research Encyclopedias*, accepted
2. Changela et al., (2022), Mars: new insights and unresolved questions, *International Journal of Astrobiology*, V20. P394-426
3. Erbin Shi, Alian Wang, Huafang Li, Ryan Ogliore, Zongcheng Ling, (2022), Gamma-CaSO₄ with Abnormally High Stability from a Hyperarid Region on Earth and from Mars, *Journal of Geophysical Research: Planets*, e2021JE007108, <https://doi.org/10.1029/2021JE007108>
4. Lingxi Zhang, Xiaohui Fu, Alian Wang, and Zongcheng Ling (2022), Crystallinity effects on vibrational spectral features of saponite: implications for characterizing poor crystalline phyllosilicates on Mars. *Icarus*, V379, <https://doi.org/10.1016/j.icarus.2022.114951>
5. W. M. Farrell, J. L. McLain, J. R. Marshall and A. Wang (2021), Will the Mars Helicopter Induce Local Martian Atmospheric Breakdown? *The Planetary Science Journal*, <https://doi.org/10.3847/PSJ/abe1c3>
6. Alian Wang, Yuanchao Yan, Darby Dyar, Jen Houghton, William M. Farrell, Bradley Jolliff, Scott McLennan, Erbin Shi, Hongkun Qu, (2020), Amorphization of S, Cl-salts by Martian Dust Activities, *J. Geophysical Research-Planets*, DOI: 10.1029/2020JE006701
7. Alian Wang, Yuanchao Yan, Bradley L. Jolliff, Scott M. McLennan, Kun Wang, Erbin Shi, and William M. Farrell (2020), Chlorine Release from Common Chlorides by Martian Dust Activity, *J. Geophysical Research-Planets*, 125, e2019JE006283, <https://doi.org/10.1029/2019JE006283>.
8. Fu Xiaohui, Liangchen Jia, Alian Wang, Cao HJ, Zongcheng Ling, Changqing Liu, Erbin Shi, Zhongchen Wu, Bo Li, Jiang Zhang (2020), Thermal stability of akaganeite and its desiccation process under conditions relevant to Mars, *Icarus*, 336, (2020) 113435 <https://doi.org/10.1016/j.icarus.2019.113435>
9. Meyer M. et al., (2019) Report of the Joint Workshop on Induced Special Regions, Life Sciences in Space Research, <https://doi.org/10.1016/j.lssr.2019.09.002>
10. Chen Jian, Bradley Jolliff, Alian Wang, et al., (2019), Petrogenesis and shock metamorphism of basaltic lunar meteorites Northwest Africa 4734 and 10597, *J. Geophysical Research*, <https://doi.org/10.1029/2019JE006084>
11. Alian Wang, Zongcheng Ling, Y. C. Yan, Alfred S. McEwen, Michael T. Mellon, Michael D. Smith, Bradley L. Jolliff, James Head (2019) The Potential Source Materials for Recurring Slope Lineae on Mars: Subsurface Hydrous Chlorides

- and Oxychlorine Salts (HyCOS), *ICARUS*, V333, Pages 464-480, <https://doi.org/10.1016/j.icarus.2019.06.024>
12. Alian Wang, Jie Wei, Randy Korotev (2019), Quantification of Fluorescence Emission from Extraterrestrial Materials and its Significance for Planetary Raman Spectroscopy, *J Raman Spectroscopy*. <https://doi.org/10.1002/jrs.5667>
 13. Erbin Shi, Alian Wang, Zongcheng Li, (2019) MIR, VNIR, NIR, and Raman spectra of magnesium chlorides with six hydration degrees: Implication for Mars and Europa, *J. Raman Spectroscopy* <https://doi.org/10.1002/jrs.5700>
 14. Sarah W Keenan, Jill D Pasteris, Alian Wang, Daniel E Warren, (2019), Heterogeneous bioapatite carbonation in western painted turtles is unchanged after anoxia, *Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology*, v233, p74-83.
 15. Z. C. Wu, Alian Wang, William M. Farrell, Y. C. Yan, Kun Wang, J. Houghton (2018), Forming perchlorates on Mars through plasma chemistry during dust events, *Earth and Planetary Science Letter*, V504, 94-105, <https://doi.org/10.1016/j.epsl.2018.08.040>.
 16. Alian Wang, Pablo Sobron, Mianping Zheng, Fanjing Kong, Yu-Yan Sara Zhao, (2018), DLT Saline Playa in a Hyperarid Region on Tibet Plateau-II: Preservation of Salts with high Hydration Degrees in Subsurface, *Astrobiology*, <https://www.liebertpub.com/doi/abs/10.1089/ast.2018.1829>
 17. Pablo Sobron, Alian Wang, David Meyer, Mianping Zheng, Fanjing Kong (2018), DLT Saline Playa in a Hyperarid Region on Tibet Plateau-III: Correlated Multiscale Surface Mineralogy and Geochemistry Survey, *Astrobiology*, <https://www.liebertpub.com/doi/pdf/10.1089/ast.2017.1777>
 18. Fanjing Kong, Mianping Zheng, Bin Hu, Alian Wang, Nina Ma, Pablo Sobron (2018), DLT Saline Playa in a Hyperarid Region on Tibet Plateau-I: Evolution and Environments, *Astrobiology*, <https://www.liebertpub.com/doi/full/10.1089/ast.2018.1830>.
 19. Pierre Haenecour, Christine Floss, Thomas J. Zega, Thomas K. Croat, Alian Wang, B. L. Jolliff and Paul Carpenter (2018), Presolar Silicates in the Matrix and Fine-grained Rims around Chondrules in Primitive CO3.0 Chondrites: Evidence for Pre-accretionary Aqueous Alteration of the Rims in the Solar Nebula, *GCA*. P379-405, <https://doi.org/10.1016/j.gca.2017.06.004>
 20. Yang Liu, Timothy A. Goudge, Jeffrey G. Catalano, Alian Wang, (2018), Spectral and Stratigraphic Mapping of Hydrated Minerals Associated with Interior Layered Deposits near the Southern Wall of Melas Chasma, Mars, *ICARUS*, p62 - 79, <https://doi.org/10.1016/j.icarus.2017.11.006>

21. I-Ming Chou, Alian Wang (2017), Application of laser Raman micro-analyses to Earth and Planetary Materials, *Journal of Asian Earth Sciences*, *V145*, 309-333
22. X. H. Fu, Alian Wang, M. J. Krawczynski (2017), Characterizing amorphous silicates in extraterrestrial materials I: polymerization effects on spectral features of silicate glasses, *JGR-Planet*. <https://doi.org/10.1002/2016JE005241>
23. William H. Farrand, Jeffrey R. Johnson, Melissa S. Rice, Alian Wang, James F. Bell III, (2016), VNIR Multispectral Observations of Aqueous Alteration Materials by the Pancams on the Spirit and Opportunity Mars Exploration Rovers, *American Mineralogists*, *Vol 101*, 2005-2019.
24. Z. C. Wu, Alian Wang, Z. C. Ling (2016), Spectroscopic Study of Perchlorates and Other Oxygen Chlorides in a Martian Environmental Chamber, *EPSL*, *452*, 123-132.
25. Pierre Haenecour, Christine Floss, Jordi José5, Sachiko Amari, Katharina Lodders, Manavi Jadhav, Alian Wang, and Frank Gyngard, (2016) Coordinated Analysis of two Graphite Grains from the Co3.0 Lap 031117 Meteorite: First Identification of a Co Nova Graphite and a Presolar Iron Sulfide Subgrain, *The Astrophysical Journal*, doi:10.3847/0004-637X/825/2/88
26. Alian Wang, Bradley Jolliff, Yang Liu, Kathryn Connor, (2016), Setting Constraints on the Nature and Origin of the two Major Hydrous Sulfates on Mars, kieserite and polyhydrated sulfate, *JGR-Planet* doi: 10.1002/2015JE004889.
27. Zongcheng Ling, Bradley. L. Jolliff, Alian Wang, Chunlai Li, Jianzhong Liu, Jiang Zhang, Bo Li, Lingzhi Sun, Jian Chen, Long Xiao, Jianjun Liu, Xin Ren, Wenxi Peng, Huanyu Wang, Xingzhu Cui, Zhiping He, Jianyu Wang.(2015) Correlated compositional and mineralogical investigations at the Chang'e-3 landing site, *Nature Communications*, DOI: 10.1038/ncomms9880.
28. Zongcheng Ling, Alian Wang (2015) Spatial distributions of secondary minerals in the Martian meteorite MIL 03346,168 determined by Raman spectroscopic imaging, *J. Geophys. Res.*, 120, 1141–1159, doi:10.1002/2015JE004805.
29. Stephen M. Seddio, Randy L. Korotev, Bradley L. Jolliff, Alian Wang (2015), Silica polymorphs in lunar granite: Implications for granite petrogenesis on the Moon, *American Mineralogist*, *V100*, 1533–1543.
30. Alian Wang, John J. Freeman, Bradley L. Jolliff, (2015), Understanding the Raman Spectral Features of Phyllosilicates, *Journal of Raman Spectroscopy*, *v10*, DOI: 10.1002/jrs.4680

31. Jie Wei, Alian Wang, James L. Lambert, David Wettergreen, Nathalie Cabrol, and Kimberley Warren-Rhodes, Kris Zacny, (2015), Automated subsurface soil analysis by the Mars Micro-beam Raman Spectrometer (MMRS) on-board Z e rover in the Atacama: a terrestrial test for planetary exploration, *Journal of Raman Spectroscopy*, v10,, DOI: 10.1002/jrs.4656
32. Liu Yang, Alian Wang, (2015), Dehydration of Na-jarosite, Ferricopiapite, and Rhomboclase at Temperatures of 50  C and 95  C: Implications for Martian Ferric Sulfates, *Journal of Raman Spectroscopy*, v10,, DOI: 10.1002/jrs.4655
33. Wang Alian, R. L. Korotev, B. L. Jolliff, Z. C. Ling (2015), Raman Imaging of Extraterrestrial Materials, *Planetary and Space Science*, V112, P23-34, [doi:10.1016/j.pss.2014.10.005](https://doi.org/10.1016/j.pss.2014.10.005)
34. Wang Alian, Yuhang Zhou (2014) Experimental Comparison of the Pathways and Rates of the Dehydration of Al-, Fe-, Mg-, and Ca-Sulfates under Mars Relevant Conditions, *ICARUS*, 234, 162-173
35. T. M. McCollom, B. L. Ehlmann, Alian Wang, B. M. Hynek, B. Moskowitz, and T. S. Berqu , (2014) Detection of Iron Substitution in Natroalunite and Potential Implications for Mar, *Am. Minerals.*, 99, 948-964.
36. Sobron P, Lefebvre C, Leveille R, Koujelev A, Haltigin T, Du H, Wang A, Cabrol N, Zacny K, and Craft J. (2013) Geochemical profile of a layered outcrop in the Atacama analogue using laser-induced breakdown spectroscopy: Implications for Curiosity investigations in Gale. *Geophysical Research Letters*, 40, 1965-1970.
37. Takir D., J.P. Emery, H. Y. McSween Jr., C. A. Hibbitts, R. N. Clark, N. Pearson, and Alian Wang (2013), *Nature and degree of aqueous alteration in CM and CI carbonaceous chondrites, Meteoritics & Planetary Science* 1–20, doi: 10.1111/maps.12171.
38. Wang Alian, William C. Feldman, Michael T. Mellon, Mianping Zheng, (2013) The Preservation of Subsurface Sulfates with Mid-to-high Degree of Hydration in Equatorial Regions on Mars, *ICARUS*, 226, 980-991.
39. W. G. Kong, B. L. Jolliff, Alian Wang (2013) Ti distribution in grain size fractions of Apollo soils 1084 and 71501, *ICARUS*, 226, 891-89.
40. Special report 1: Understanding Martian sulfates, *By International Innovation*, October 2013.
41. Special report 2 : Ready to fly: Raman Spectroscopy in Planetary Analysis, *by Spectroscopy* , Dec 21, 2013
42. *Special report 3: Successful dry run for the 2020 Mars Mission*, by WUSTL Newsroom, July 2013

43. *Special report 4: Will this work on Mars? Testing the limits in Atacama Desert*, by The Weather Channel, June 2013
44. Chou I-Ming, Robert R. Seal II, Alian Wang (2012), The stability of sulfate and hydrated sulfate minerals near ambient conditions and their significance in environmental and planetary sciences, *Journal of Asian Earth Sciences*, <http://dx.doi.org/10.1016/j.jseaes.2012.11.027>
45. Wang Alian, Ling Z. C. Freeman J. J. (2012) Stability field and Phase Transition Pathways of Hydrous Ferric Sulfates in the Temperature Range 50 °C to 5 °C: Implication for Martian Sulfates, *Icarus*, 218, 622-643, doi:10.1016/j.icarus.2012.01.003.
46. Sobron P., Wang A. (2012) LIBS spectral data processing and calibration of sulfate targets with application to Mars exploration. *Spectrochimica Acta Part B*, 68, 1-16, doi:10.1016/j.sab.2012.01.002.
47. Wang Alian, J. J. Freeman, I-Ming Chou, B. L. Jolliff (2011), Stability of Mg-sulfates at -10°C and the Rates of Dehydration/Rehydration Processes under Mars Relevant Conditions, *J. Geophys. Res.*, Res., 116, E12006, doi:10.1029/2011JE003818.
48. Sobron P., Alian Wang (2011), A planetary environment and analysis chamber for combined in-situ spectroscopic measurements on selected materials under planetary relevant environments, *J. Raman Spectroscopy*, DOI 10.1002/jrs.3017.
49. Kong, W. G., Alian Wang, and I-M. Chou (2011), Determination of phase boundary between kornelite and pentahydrated Ferric Sulfate by humidity buffer technique and Raman spectroscopy at 0.1 Mpa. *Chemical Geology*, Vol 284, 333-338.
50. Wang Alian, and Z. C. Ling (2011), Ferric Sulfates on Mars – A Combined Mission Data Analysis of Salty Soils at Gusev Crater and Laboratory Experimental Investigations. *J. Geophys. Res.*, 116, E00F17, doi:10.1029/2010JE003665.
51. Ling Z. C., Alian Wang, Bradley L. Jolliff (2011), Mineralogy and Geochemistry of four Lunar Soils by Laser-Raman Study, *Icarus*, 211, 101-113, doi:10.1016/j.icarus.2010.08.02.
52. Kong W. G., Alian Wang, John J. Freemaⁿ and Pablo Sobron (2011), A Comprehensive Spectroscopic Study of Synthetic Fe²⁺, Fe³⁺, Mg²⁺, Al³⁺ Copiapite, *J. Raman Spectroscopy*, doi:10.1002/jrs.2790.

53. Ling Z. C., Alian Wang (2010), A Systematic Spectroscopic Study of Eight Hydrated Ferric Sulfates Relevant to Mars, *Icarus*, 209, 422-433, doi:/10.1016/j.icarus.2010.05.009.
54. Rice M.S., J.F. Bell III, E.A. Cloutis, A. Wang, S.W. Ruff, M.A. Craig, D.T. Bailey, J.R. Johnson, P.A. de Souza Jr., W.H. Farrand (2010), Silica-rich deposits and hydrated minerals at Gusev Crater, Mars: Vis-NIR spectral characterization and regional mapping, *Icarus*, 205, p375-395.
55. R. E. Arvidson, J. F. Bell III, P. Bellutta, N. A. Cabrol, J. G. Catalano, J. Cohen, L. S. Crumpler, D. J. Des Marais, T. A. Estlin, W. H. Farrand, R. Gellert, J. A. Grant, R. N. Greenberger, E. A. Guinness, K. E. Herkenhoff, J. A. Herman, K. D. Iagnemma, J. R. Johnson, G. Klingelhöfer, R. Li, K. A. Lichtenberg, S. A. Maxwell, D. W. Ming, R. V. Morris, M. S. Rice, S. W. Ruff, A. Shaw, K. L. Siebach, P. A. de Souza, A. W. Stroupe, S. W. Squyres, R. J. Sullivan, K. P. Talley, J. A. Townsend, A. Wang, J. R. Wright, A. S. Yen (2010), Spirit Mars Rover Mission: Overview and selected results from the northern Home Plate Winter Haven to the side of Scamander crater, *Journal of Geophysical Research*, V115, DOI: 10.1029/2010JE003633
56. Wang Alian, John J. Freeman, Bradley, L. Jolliff (2009), Phase Transition Pathways of the Hydrates of Magnesium Sulfate in the Temperature Range 50 °C to 5 °C: Implication for Sulfates on Mars, *J. Geophys. Res.*, 114, doi:10.1029/2008JE003266.
57. Wang Alian, J. F. Bell III, Ron Li, J. R. Johnson, W. Farrand, E. A. Cloutis, R. E. Arvidson, L. Crumpler, S. W. Squyres, S. M. McLennan, K. Herkenhoff, S. W. Ruff, A. T. Knudson, Wei Chen, R. Greenberger, and the Athena Science Team (2008), Light-Toned Salty Soils and Co-existing Si-rich Species Discovered by the Mars Exploration Rover Spirit in Columbia Hills, *J. Geophys. Res.*, 113, E12S40, doi:10.1029/2008JE003126.
58. R. E. Arvidson, S.W. Squyres, J.F. Bell III, N.A. Cabrol, L. Crumpler, R. Gellert, S. Gorevan, J.A. Grant, E. Guinness, K.E. Herkenhoff, J.R. Johnson, G. Klingelhöfer, M. Lemmon, R. Li, T. McCoy1, J. Moersch, H.Y. McSween, D.W. Ming, R.V. Morris, S. Ruff, M. Smith, A. Wang, J.G. Ward, S. Wiseman, M. Wolff, A. Yen, R. Greenberger (2008), Overview of the Spirit Mars Exploration Rover Mission to Gusev Crater, Columbia Hills: Independence Outcrop to Home Plate, *J. Geophys. Res.*, 113, E06S01, doi:10.1029/2008JE003188.
59. S.W. Squyres, R.E. Arvidson, S. Ruff, R. Gellert, R.V. Morris, D. W. Ming, L. Crumpler, J.D. Farmer, D.J. Des Marais, A. Yen, S.M. McLennan, W. Calvin, J.F. Bell, III, B.C. Clark, A. Wang, T.J. McCoy, M.E. Schmidt, P.A. de Souza, Jr. (2008) Discovery of Silica-Rich Deposits on Mars by the Spirit Rover, *Science*, vol320, p1063-1067.

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61. Johnson J. R., J.F. Bell III, E. Cloutis, M. Staid, W.H. Farrand, T. McCoy, M. Rice, A. Wang, A. Yen (2007), Mineralogic Constraints on Sulfur-rich Soils from Pancam Spectra at Gusev Crater, Mars. *Geophysical Research Letters*, Vol. 34, L13202, doi:10.1029/2007GL029894.
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63. Wang Alian, Freeman J. F., Jolliff B. L., Chou I. M, (2006) Sulfates on Mars: a Systematic Raman Spectroscopic Study of Hydration States of Magnesium Sulfates, *Geochim. Cosmochim. Acta*, V70, p6118-6135.
64. Wang Alian, Randy L. Korotev, Bradley L. Jolliff, Larry A. Haskin, Larry Crumpler, William H. Farrand, Ken E. Herkenhoff, Paulo de Souza Jr., Alastair G. Kusack, Joel A. Hurowitz, Nicholas J. Tosca, (2006), Evidence of Phyllosilicates in Woolly Patch, an Altered Rock Encountered at West Spur, Columbia Hills, by the *Spirit* Rover, , *J. Geophys. Res.*, 111, E02S16, doi:10.1029/2005JE002516
65. Wang Alian, L. A. Haskin, S. W. Squyres, B. L. Jolliff, L. Crumpler, R. Gellert, C. Schröder, K. Herkenhoff, J. Hurowitz, N. J. Tosca, W. H. Farrand, Robert Anderson, A. T. Knudson, (2006), Sulfate Deposition in Subsurface Regolith in Gusev Crater, Mars, *J. Geophys. Res.* 111, E02S17, doi:10.1029/2005JE002513.
66. R. E. Arvidson, S. W. Squyres, R. C. Anderson, J. F. Bell III, J. Brückner, N. A. Cabrol, W. M. Calvin, M. H. Carr, P. R. Christensen, B. C. Clark, L. Crumpler, D. J. Des Marais, C. d’Uston, T. Economou, J. Farmer, W. H. Farrand, W. Folkner, M. Golombek, S. Gorevan, J. A. Grant, R. Greeley, J. Grotzinger, E. Guinness, B. C. Hahn, L. Haskin, K. E. Herkenhoff, J. A. Hurowitz, S. Hviid, J. R. Johnson, G. Klingelhöfer, A. H. Knoll, G. Landis, C. Leff, M. Lemmon, R. Li, M. B. Madsen, M. C. Malin, S. M. McLennan, H. Y. McSween, D. W. Ming, J. Moersch, R. V. Morris, T. Parker, J. W. Rice Jr., L. Richter, R. Rieder, D. S. Rodionov, C. Schröder, M. Sims, M. Smith, P. Smith, L. A. Soderblom, R. Sullivan, S. D. Thompson, N. J. Tosca, A. Wang, H. Wänke, J. Ward, T. Wdowiak, M. Wolff, A. Yen, (2006), Overview of the Spirit Mars Exploration Rover Mission to Gusev Crater: Landing Site to the Methuselah Outcrop in the Columbia Hills, *J. Geophys. Res.*, 111, E02S01, doi:10.1029/2005JE002499.
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- Processes in the Columbia Hills of Gusev Crater, Mars, *J. Geophys. Res.*, *111*, E02S12, doi:10.1029/2005JE002560.
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