

**Timothy David Glotch**  
Department of Geosciences  
Stony Brook University  
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### **Education**

Ph.D., 2004: Geological Sciences, Arizona State University  
B.A., 1999: Astrogeophysics, Colgate University

### **Employment**

2007-present: Assistant Professor, Stony Brook University  
2006-2007: Caltech Postdoctoral Scholar at JPL  
2005-2006: Postdoctoral Scholar, California Institute of Technology  
2004-2005: Postdoctoral Research Associate, Arizona State University  
2001-2004: Graduate Research Assistant, Arizona State University  
1999-2001: Graduate Teaching Assistant, Arizona State University

### **Courses Taught**

GEO 102: The Earth  
GEO 106: Planetary Geology  
GEO 330/530: Geology of Mars  
GEO 604: Geology of the Moon  
GEO 604: Mineralogy and Geochemistry of Mars  
GEO 607: Geology of Saturn's Moons

### **Advising**

Ms. Congcong Che (current), Ph.D. student  
Ms. Hedi Jensen (current), M.S. student  
Ms. Jessica Arnold (current), Ph.D. student  
Ms. Lonia Friedlander (current), Ph.D. student  
Ms. Elizabeth Sklute (current), Ph.D. student

1 M.S. and 3 Ph.D. defense committees  
7 Ph.D. candidacy exam committees

### **Honors and Awards**

2004: NASA Group Achievement Award for Mars Exploration Rovers  
2003: NASA Group Achievement Award for 2001 Odyssey THEMIS  
2001-2004: NASA Graduate Student Researcher Program Fellow  
1999: Founders Award, Colgate University Department of Physics and Astronomy

### **Professional Service**

External reviewer for NSF EAR Petrology and Geochemistry program  
External reviewer for NASA MDAP, MFRP, and NLSI programs  
NASA MFRP, MDAP, PIDDP, MIDP, SALMON, LASER, and Participating Scientist review panels

Reviewer for journals *JGR-Planets*, *Icarus*, *Geology*, *American Mineralogist*, *Earth and Planetary Science Letters*, *Meteoritics and Planetary Science*, *Spectroscopy Letters*  
1999-Present: Numerous public outreach and education presentations

### **Professional Membership**

American Geophysical Union  
Geological Society of America  
Mineralogical Society of America  
Clay Minerals Society

### **Invited Talks:**

University of Toronto—October, 2010  
American Museum of Natural History—April 2009  
Stony Brook University—March, 2007; February 2008  
Dartmouth College—February, 2007  
Brown University—April, 2006  
Colgate University—September, 2005

### **Book Chapters**

- [3]Bell, J. F. III, **T. D. Glotch**, V. Hamilton, T. McConnochie, A. McEwen, and P. Christensen (2008), Visible to Near-IR Multispectral Orbital Observations of Mars, In: J. F. Bell, III (Ed.) *The Martian Surface: Composition, Mineralogy, and Physical Properties*, 636 pp., Cambridge University Press, Cambridge.
- [2]Christensen, P. R., J. L. Bandfield, D. Rogers, **T. D. Glotch**, V. E. Hamilton, M. B. Wyatt, and R. Clark (2008), Global Mineralogy Mapped from the Mars Global Surveyor Thermal Emission Spectrometer, In: J. F. Bell, III (Ed.) *The Martian Surface: Composition, Mineralogy, and Physical Properties*, 636 pp., Cambridge University Press, Cambridge.
- [1]Ruff, S. W., P. R. Christensen, **T. D. Glotch**, D. L. Blaney, J. E. Moersch, and M. B. Wyatt (2008), The Mineralogy of Gusev Crater and Meridiani Planum Derived from the Miniature Thermal Emission Spectrometers on the Spirit and Opportunity Rovers, In: J. F. Bell, III (Ed.) *The Martian Surface: Composition, Mineralogy, and Physical Properties*, 636 pp., Cambridge University Press, Cambridge.

### **Publications (including in prep)** \* denotes student author

- [41]**Glotch, T. D.**, B. T. Greenhagen, J. L. Bandfield, and D. A. Paige (2011) Observations of lunar swirls by the Diviner Lunar Radiometer Experiment: Evidence for formation by solar wind standoff due to magnetic fields, *Icarus*, manuscript in preparation.
- [40]**Glotch, T. D.**, and A. D. Rogers (2011), Remnants of CO<sub>2</sub>-rich magmatism on Mars, *J. Geophys. Res.*, manuscript in preparation.

- [39]Smith, A. and 60 others (including **T. D. Glotch**) (2011), Lunar Net – A proposal in response to an ESA M3 call in 2010 for a medium sized mission, *Experiment. Astron.*, in review.
- [38]Che, C.\*, and **T. D. Glotch** (2011), The effect of high temperatures on the mid-to-far-infrared emission and near-infrared reflectance spectra of phyllosilicates and natural zeolites: Implications for Martian exploration, *Icarus*, in review.
- [37] **Glotch, T. D.**, P. G. Lucey, J. J. Hagerty, B. R. Hawke, T. A. Giguere, J. A. Arnold\*, J.-P. Williams, and D. A. Paige (2011), The Mairan Domes: Silicic volcanic constructs on the Moon, *Geophys. Res. Lett.*, in review.
- [36]Wilson, J. H., S. M. McLennan, **T. D. Glotch**, E. R. Rasbury (2011), Pedogenic hematitic concretions from the Mesozoic New Haven Arkose, Connecticut: Implications for understanding Martian diagenetic processes, *Chem. Geol.*, in review.
- [35]Jensen, H. B.\*, and **T. D. Glotch** (2011), Investigation of the near infrared spectral character of putative Martian chloride deposits, *J. Geophys. Res.*, in review.
- [34]Lane, M. D., **T. D. Glotch**, M. D. Dyar, C. M. Pieters, R. Klima, T. Hiroi, J. L. Bishop, and J. Sunshine (2011), Midinfrared spectroscopy of synthetic olivines: Thermal emission, attenuated total reflectance, and spectral and diffuse reflectance studies of forsterite to fayalite, *J. Geophys. Res.*, 116, E08010, doi:10.1029/2010JE003588.
- [33]Jolliff, B. L., S. A. Wiseman, S. J. Lawrence, T. N. Tran, M. S. Robinson, B. R. Hawke, F. Scholten, J. Oberst, H. Hiesinger, C. van der Bogert, B. T. Greenhagen, **T. D. Glotch**, and D. A. Paige (2011), Non-mare silicic volcanism on the lunar farside at Compton-Belkovich, *Nature Geosciences* , 4, 566-571.
- [32]Che, C.\*, **T. D. Glotch**, D. L. Bish, J. R. Michalski, and W. Xu (2011), Spectroscopic study of the dehydration and dehydroxylation of phyllosilicate and zeolite minerals, *J. Geophys. Res.*, 116, E05007, doi:10.1029/2010JE003740.
- [31]Dyar, M. D., **T. D. Glotch**, M. D. Lane, B. Wopenka, J. M. Tucker, S. J. Seaman, G. J. Marchand, R. Klima, T. Hiroi, J. L. Bishop, C. Pieters, and J. Sunshine (2011), Spectroscopy of Yamato 984028, *Polar Science*, 4, 530-549.
- [30]**Glotch, T. D.** (2010), News and Views: Hidden Martian Carbonates, *Nature Geoscience*, 3, 745-746.
- [29]Paige, D. A., M. A. Siegler, J. A. Zhang, P. O. Hayne, B. T. Greenhagen, E. J. Foote, K. A. Bennett, A. R. Vasavada, B. T. Greenhagen, J. T. Schofield, D. J. McCleese, M. C. Foote, E. DeJong, B. G. Bills, W. Hartford, B. C. Murray, C. C. Allen, K. Snook, L. A. Soderblom, S. Calcutt, F. W. Taylor, N. E. Bowles, J. L. Bandfield, R. C. Elphic, R. Ghent, **T. D. Glotch**, M. B. Wyatt, and P. G. Lucey (2010), Diviner

Lunar Radiometer observations of cold traps in the Moon's south polar region, *Science*, 330, 479-482.

- [28]**Glotch, T. D.**, P. G. Lucey, J. L. Bandfield, B. T. Greenhagen, I. R. Thomas, R. C. Elphic, N. Bowles, M. B. Wyatt, C. C. Allen, K. Donaldson-Hanna, and D. A. Paige (2010), Highly silicic compositions on the Moon, *Science*, 329, 1510-1513.
- [27]Greenhagen, B. T., P. G. Lucey, M. B. Wyatt, **T. D. Glotch**, C. C. Allen, J. A. Arnold\*, J. L. Bandfield, N. E. Bowles, K. L. Donaldson Hanna, P. O. Hayne, I. R. Thomas, and D. A. Paige (2010), Global silicate mineralogy of the Moon from the Diviner Lunar Radiometer, *Science*, 329, 1507-1509.
- [26]**Glotch, T. D.**, J. L. Bandfield, L. L. Tornabene, H. B. Jensen\*, and F. P. Seelos (2010), Distribution and formation of chlorides and phyllosilicates in Terra Sirenum, Mars, *Geophys. Res. Lett.*, 37, L16202, doi:10.1029/2010GL044557.
- [25]Lichtenberg, K. A., R. E. Arvidson, R. V. Morris, S. L. Murchie, J. L. Bishop, D. Fernandez-Remolar, **T. D. Glotch**, E. N. Dobrea, J. F. Mustard, J. Andrews-Hanna, and L. H. Roach (2010), Stratigraphy of hydrated sulfates in the sedimentary deposits of Aram Chaos, Mars, *J. Geophys. Res.*, 115, E00D17, doi:10.1029/2009JE0003353.
- [24]Farrand, W. H., **T. D. Glotch**, J. W. Rice, J. Hurowitz, and G. Swayze (2009), Discovery of jarosite-bearing surfaces within the Mawrth Vallis region of Mars: Implications for the geologic history of the region, *Icarus*, 204, 478-488.
- [23]**Glotch, T. D.**, and G. R. Rossman (2009), Mid-infrared spectra and optical constants of six iron oxide/oxyhydroxide phases, *Icarus*, 204, 663-671.
- [22]Bleacher, J. E., L. S. Glaze, R. Greeley, E. Hauber, S. M. Baloga, S. E. H. Sakimoto, D. A. Williams, and **T. D. Glotch** (2009), Spatial and alignment analyses for a field of small volcanic vents south of Pavonis Mons and implications for the Tharsis province, Mars, *J. Volc. Geotherm. Res.*, 185, 96-102.
- [21]Dyar, M. D., E. C. Sklute, O. N. Menzies, P. A. Bland, D. Lindsley, **T. Glotch**, M. D. Lane, M. W. Schaeffer, B. Wopenka, R. Klima, J. L. Bishop, T. Hiroi, C. Pieters, and J. Sunshine (2009), Spectroscopic characteristics of synthetic olivine: An integrated multi-wavelength and multi-technique approach, *Am. Miner.*, 94, 883-898.
- [20]Calvin, W. M. and 18 others (including **T. D. Glotch**) (2008), Hematite spherules at Meridiani: Results from MI, Mini-TES and Pancam, *J. Geophys. Res.*, 113, E12S37.
- [19]**Glotch, T. D.**, and M. D. Kraft (2008), Thermal transformations of akaganéite and lepidocrocite to hematite: Assessment of possible precursors to Martian crystalline hematite, *Phys. Chem. Min.*, 35, 569-581.

- [18]Osterloo, M. M., V. E. Hamilton, J. L. Bandfield, **T. D. Glotch**, A. M. Baldridge, P. R. Christensen, L. L. Tornabene, and F. S. Anderson (2008), Chloride-bearing materials in the southern highlands of Mars, *Science*, 319, 1651-1654.
- [17]Grant, J.A. and 10 others (including **T. D. Glotch**) (2008), HiRISE imaging of impact megabreccia and sub-meter aqueous strata in Holden Crater, Mars, *Geology*, 36, 195-198.
- [16]**Glotch, T. D.**, G. R. Rossman, and O. Aharonson (2007), Mid-infrared (5-100  $\mu\text{m}$ ) reflectance spectra and optical constants of 10 phyllosilicate minerals, *Icarus*, 192, 605-62.
- [15]**Glotch, T. D.**, and A. D. Rogers (2007), Aqueous deposition of hematite and sulfate-rich light-toned layered deposits in Aureum and Iani Chaos, Mars, *J. Geophys. Res.*, 112, E06001, doi:10.1029/2006JE00286.
- [14]Squyres, S. W. and 38 others (including **T. D. Glotch**) (2006), Overview of the Opportunity Mars Exploration Rover mission to Meridiani Planum: Eagle Crater to Purgatory Ripple, *J. Geophys. Res.*, 111, E12S12, doi:10.1029/2006JE002771.
- [13]**Glotch, T. D.**, and J. L. Bandfield (2006), Determination and interpretation of surface and atmospheric Mini-TES spectral endmembers at the Meridiani Planum landing site, *J. Geophys. Res.*, 111, E12S06, doi:10.1029/2005JE002671.
- [12]**Glotch, T. D.**, J. L. Bandfield, P. R. Christensen, W. M. Calvin, S. M. McLennan, B. C. Clark, A. D. Rogers, and S. W. Squyres (2006), The mineralogy of the light-toned outcrop at Meridiani Planum as seen by the Miniature Thermal Emission Spectrometer and implications for its formation, *J. Geophys. Res.*, 111, E12S03, doi:10.1029/2005JE002672.
- [11]Squyres, S. W. and 17 others (including **T. D. Glotch**) (2006), Two years at Meridiani Planum: Results from the Opportunity Rover, *Science*, 313, 1403-1407.
- [10]Squyres, S. W. and 20 others (including **T. D. Glotch**) (2006), Bedrock formation at Meridiani Planum, *Nature*, 443, E1-E2.
- [9]**Glotch, T. D.**, P. R. Christensen, and T. G. Sharp (2006), Fresnel modeling of hematite crystal surfaces and application to martian hematite spherules, *Icarus*, 181, 408-418.
- [8]McLennan, S. M. and 31 others (including **T. D. Glotch**) (2005), Provenance and diagenesis of the evaporate-bearing Burns formation, Meridiani Planum, Mars, *EPSL*, 240, 95-121.

- [7]**Glotch, T. D.** and P. R. Christensen (2005), Geologic and mineralogic mapping of Aram Chaos: Evidence for a water-rich history, *J. Geophys. Res.*, 110, E09006, doi:10.1029/2004JE002389.
- [6]Soderblom, L. A. and 42 others (including **T. D. Glotch**) (2004), Soils of Eagle Crater and Meridiani Planum at the Opportunity Rover Landing Site, *Science*, 306, 1723-1726.
- [5]Christensen, P. R., M.B. Wyatt, **T. D. Glotch**, and 24 others (2004), Initial Results from the Miniature Thermal Emission Spectrometer Experiment at the Opportunity Landing Site on Meridiani Planum, *Science*, 306, 1733-1739.
- [4]Christensen, P. R. and 24 others (including **T. D. Glotch**) (2004), Initial Results from the Miniature Thermal Emission Spectrometer Experiment at the Spirit Landing Site in Gusev Crater, *Science*, 305, 837-842.
- [3]**Glotch, T. D.**, R. V. Morris, P. R. Christensen, and T. G. Sharp (2004), Effects of precursor mineralogy on the thermal infrared emission spectra of hematite: Application to martian hematite mineralization. *Journal of Geophysical Research*, 109, E07003, doi:10.1029/2003JE002224.
- [2]Bandfield, J. L., **T. D. Glotch**, and P. R. Christensen (2003), Spectroscopic identification of carbonates in the martian dust, *Science*, 301, 1084-1087.
- [1]Bottke, W. F. Jr., S. G. Love, D. Tytell, and **T. Glotch** (2000), Interpreting the elliptical crater populations on Mars, Venus, and the Moon. *Icarus*, 145, 108-121.

### **Selected Abstracts**

- Glotch, T. D.**, P. G. Lucey, and B. T. Greenhagen (2010), Diviner observations of lunar swirls: Implications for space weathering, *NASA Lunar Science Institute Forum*.
- Glotch, T. D.**, P. G. Lucey, J. L. Bandfield, B. T. Greenhagen, I. R. Thomas, R. C. Elphic, N. E. Bowles, M. B. Wyatt, C. C. Allen, K. L. Donaldson Hanna, and D. A. Paige (201), Identification of highly silicic features on the Moon, *Lunar Planet Sci. XLI*, abstract 1780.
- Glotch, T. D.**, and A. D. Rogers (2009), Reexamination of global carbonate abundances using TES data, *Lunar Planet. Sci. XL*, abstract 1605.
- Glotch, T. D.**, M. M. Osterloo, V. E. Hamilton, J. L. Bandfield, A. M. Baldrige, P. R. Christensen, L. L. Tornabene, F. S. Anderson, C. Che, and F. P. Seelos (2008), Analysis of chloride salt deposits on Mars, *Geochim. Cosmochim. Acta*, 72, Suppl., A314.

- Glotch, T. D.** (2008), Mid-IR optical constants of six iron oxide/oxyhydroxide minerals, *Lunar Planet Sci. XXXIX*, abstract 1912.
- Glotch, T. D.,** and M. D. Kraft (2007), Thermal transformations of lepidocrocite and akaganéite to hematite: Examination of possible precursors to martian crystalline hematite. *Seventh Intl. Conf. Mars*, abstract 3148.
- Glotch, T. D.,** J. L. Bandfield, and M. Osterloo (2007), A spectrally unique unit dispersed though the southern highlands of Mars, *Lunar Planet. Sci. XXXVIII*, abstract 1820, 2007
- Glotch, T. D.,** S. M. Chemtob, and G. R. Rossman (2007), Attenuated total reflection as an in situ infrared spectroscopic method for mineral identification, *Lunar Planet. Sci. XXXVIII*, abstract 1731.
- Glotch, T. D.** (2006), Olivine and pyroxene-rich deposits in Holden Crater, Mars, *AGU Fall Meeting*, abstract 10074.
- Glotch, T. D.,** G. R. Rossman, and J. R. Michalski (2006), Estimated mid-infrared (200-2000  $\text{cm}^{-1}$ ) optical constants of some silica polymorphs, *Div. Plant. Sci.* 38, Abstract 62.05.
- Glotch, T. D.,** J. L. Bandfield, P. R. Christensen, W. M. Calvin, S. M. McLennan, and B. C. Clark (2006), Mineralogy of the light-toned outcrop at Meridiani Planum as seen by Mini-TES, *Lunar Planet. Sci. XXXVII*, abstract 2021.
- Glotch, T. D.,** J. L. Bandfield, and P. R. Christensen (2005), Factor analysis and target transformation of Mini-TES spectra: Recovery of scene endmembers at Meridiani Planum, *Lunar Planet. Sci. XXXVI*, abstract 2174.
- Glotch, T. D.,** D. Rogers, and P. R. Christensen (2005), A newly discovered hematite-rich unit in Aureum Chaos: Comparison of hematite and associated units with those in Aram Chaos, *Lunar Planet. Sci. XXXVI*, abstract 2159.
- Glotch, T. D.,** J. L. Bandfield, and P. R. Christensen (2004), Target transformation and factor analysis of Mini-TES spectra and comparison to TES and laboratory hematite spectra, *AGU Fall Meeting*, abstract 8222.
- Glotch, T. D.,** R. V. Morris, T. G. Sharp, and P. R. Christensen (2003), Fine-grained goethite as a precursor for martian gray hematite. *Sixth Intl. Conf. Mars*, abstract 3188.
- Glotch, T. D.,** and P. R. Christensen (2003), The geology of Aram Chaos. *Lunar Planet. Sci. XXXIV*, abstract 2008.

**Glotch, T. D.,** R. V. Morris, and P. R. Christensen (2002), Effect of aluminum substitution on the emissivity spectra of hematite. *Lunar Planet. Sci. XXXIII*, abstract 1847.

**Glotch, T. D.,** J. R. Holloway, and P. R. Christensen (2001), Experimental replication of the surface of the Sinus Meridiani hematite region. *Lunar Planet. Sci. XXXII*, abstract 2020.