Jesse Tarnas

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Education:

Brown University

PhD Student, Department of Earth, Environmental, and Planetary Sciences
Advisor: Prof. Jack Mustard
Committee Members: Prof. Ralph Milliken & Prof. Stephen Parman
Anticipate PhD completion in 2021
MA Planetary Geoscience '18
Awards: Graduate Travel Grant (2), SSERVI grant for 2017 Sudbury Field Camp, Mars Student Travel Grant for 4th Landing Site Workshop for the Mars 2020 Rover Mission
Workshops: JPL Planetary Science Summer Seminar 2019, NASA Volcanology Workshop 2019, Sudbury Field Camp 2017.

Wesleyan University

BA Physics '16
BA Astronomy '16 (Honors)
Minor in Planetary Science
Awards: CT Space Grant Undergraduate Directed Campus Scholarship, Howards Hughes Research Fellowship, THINK STEM Scholarship, William James & Dorothy Bading Lanquist Scholarship, CT Space Grant Travel Award.
Thesis: *Transit, Secondary Eclipse, and Phase Curve Analysis to Characterize Kepler Exoplanets.*

Research Experience:

Graduate Researcher, Jack Mustard Group, Brown University, Fall 2016 – Present
- Modeling radiolytic H_2 production, transportation, and dissolution on Mars during the Noachian.
- Serpentine Fe-oxidation state characterization using VNIR reflectance spectroscopy.
- Development of novel data analysis methods for hyperspectral datasets.
- Characterization of hydrothermally-associated minerals in CRISM data with novel analysis methods.

Research Associate, Friedemann Freund Group, NASA Ames Space Academy, NASA Ames Research Center, Summer 2015
- Conducting experiments relevant to earthquake forecasting research.
- Measuring peroxy defect content of different rock types using Seebeck Effect.
- Modeling radio/microwave propagation through different rock substrates using MATLAB.
- Working to develop radar sounding smallsat system with the rest of NASA Ames Space Academy group.
- Assisting in development of Global Earthquake Forecasting Network by GeoCosmo Science Center.

Research Assistant, Seth Redfield Group, Wesleyan University, Spring 2012-Spring 2016
- Applying Python transit, secondary eclipse, and phase curve model to Kepler & K2 data to characterize of transiting and nontransiting exoplanets.
- Searching for transits of exoplanets orbiting white dwarf stars using the 24" Perkin Telescope.
- Reducing data using customized IDL and IRAF routines.
- Constructing variable input model of a white dwarf exoplanet transit using IDL.
- Constructing model of exoplanet atmosphere Rayleigh scattering using Python.
- Conducted research during summer 2013 through Howard Hughes Research Fellowship.
- Operated WIYN 3.5m telescope at Kitt Peak with Professor Redfield

Research Assistant, James Greenwood Group, Wesleyan University, Spring 2013-Summer 2014
- Synthesized lunar glass using Deltech furnace.
- Analyzing samples with scanning electron microscope and ion microprobe.
- Developing experimental design for testing chondrule formation theory.
- Creating anaerobic furnace environment.

Research Assistant, Reinhold Blümel Group, Wesleyan University, Fall 2012-Summer 2013
- Generated data from numerical simulations of ions in a Paul trap.

Publications:

- **Tarnas, J. D.**; Mustard, J. F.; Sherwood Lollar, B.; Bramble, M. S.; Cannon, K. M.; Palumbo, A. M.; Plesa, A.-C. Radiolytic H_2 production on Noachian Mars: Implications for habitability and atmospheric warming, *EPSL* 502: 133-145 (2018).
- **Tarnas, J. D**.; Nam, Y. S.; Blümel, R. Universal heating curve of damped Coulomb plasmas in a Paul trap. *Physical Review A* 88, 041401(R) (2013).
- V. Stamenković, L. W. Beegle, K. Zacny,…, **J. D. Tarnas**, …, The next frontier for planetary and human exploration, *Nature Astronomy* https://doi.org/10.1038/s41550-018-0676-9 (2019)

Conference Abstracts

- **Tarnas, J.D.**; Mustard, J. F., Sherwood Lollar, B.; Cannon, K. M.; Palumbo, A. M., Plesa, A.-C.; Bramble, M.S. An insufficient methane budget for warming Noachian and Hesperian Mars, *LPSC XLV*, 2551 (2019).
- **Tarnas, J.D.**; Mustard, J.F.; Lin, H.; Goudge, T.A.; Amador, E.S.; Bramble, M.S.; Zhang, X. Hydrated silica in the Jezero deltas, *LPSC XLV*, 2029 (2019).
- Mustard, J.F.; **Tarnas, J.D.**; Parente, M. Laboratory Testing of the Factor Analysis-Target Transformation Method for Mineral Detection at Low Abundance from Visible-Infrared Hyperspectral Data, *LPSC XLV*, 3008 (2019).
- Pascuzzo, A.C.; **Tarnas, J.D.**; Mustard, J.F.; Lin, H. VNIR Characterization of the Martian North Polar Ice Cap 2): Constraining the Surface Compositions, *LPSC XLV*, 3063.
- Parente M., Arvidson, R.E., Itoh, Y., Lin, H., Mustard, J.F., Saranathan, A.M., Seelos, F.P., **Tarnas, J.D.** Convergence on Mineral Detections over Gale Crater, NE Syrtis and Jezero Crater using Advanced Data Processing Techniques for CRISM Hyperspectral Imaging Data, *LPSC XLV*, 3112 (2019).
- Tokle, L.; Palumbo, A.; Deutsch… **Tarnas, J.**; … Vatsal, V. Scientific Exploration of Mare Imbrium with OrbitBeyond Inc.: Characterizing the Regional Volcanic History of the Moon, *LPSC XLV*, 2484 (2019).
- Lin, H.; Zhang, X.; Wu, X.; **Tarnas, J.D**.; Mustard, J.F. Target Transformation Constrained Sparse Unmixing (TTCSU) Algorithm for Retrieving Hydrous Minerals on Mars: Application to Southwest Melas Chasma, *International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences*, 42: 1003-1008 (2018).
- **Tarnas, J.D.**; Mustard, J. F., Sherwood Lollar, B.; Bramble, M.S.; Cannon, K. M.; Palumbo, A. M., Plesa, A.-C. H_2 and CH_4 Production, Storage, and Release over ~4.5 Gyr of Martian History: Implications for Atmospheric Warming, Habitability, and ISRU, *AGU*, 437871 (2018)
- **Tarnas, J. D.**; Mustard, J. F., Sherwood Lollar, B.; Bramble, M.S.; Cannon, K. M.; Palumbo, A. M., Plesa, A.-C. Production of H_2 on Mars Through Radiolysis and Implications for Habitability, *Goldschmidt 2018*, 2018004452.
- **Tarnas, J. D.**; Mustard, J. F., Sherwood Lollar, B.; Bramble, M.S.; Cannon, K. M.; Palumbo, A. M. Radiolytic H_2 Production on Noachian Mars: Implications for Subsurface Habitability, *Fourth Conference on Early Mars*, 3039 (2017).
- **Tarnas, J. D.**; Mustard, J. F.; Sherwood Lollar, B.; Bramble, M. S. Radiolytic Hydrogen Production on Noachian Mars, *LPSC XLVIII*, 2030 (2017).
- **Tarnas, J. D.**; Mustard, J. F.; Sherwood Lollar, B.; Bramble, M. S. Radiolytic Hydrogen Production on Noachian Mars, *AbSciCon 2017*, 3381 (2017).
- Mustard, J. F.; **Tarnas, J. D.** Hydrogen production from the upper 15 km of martian crust via serpentinization: implications for habitability, *LPSC XLVIII*, 2384 (2017).
- **Tarnas, J.**, Redfield, S. Transit, Secondary Eclipse, and Phase Curve Modeling to Characterize Kepler Exoplanet Candidates. *AAS Meeting #227*, 138.14 (2016).
- Persaud, D.; Wu, T.; **Tarnas, J.**; Preudhomme, M.; Jurg, M.; Chalumeau, C.; Buckley, H.; Lombard-Poirot, N. HOMER: A smallsat ground penetrating radar sounding fleet to map planetary surfaces at high resolution, *LPSC XLVII*, 3051 (2016).
- Tregloan-Reed, J.; **Tarnas, J.**, Plante, Z.; Freund, F.; Determination of the amount of peroxy in granite rock using the Seebeck Effect. *AGU Fall Meeting*, 84075 (2015).
- Wu, T.; Persaud, D.; Preudhomme, M.; Jurg, M.; Smith, M.K.; Buckley, H.; **Tarnas, J.**; Chalumeau, C.; Poirot-Lombard, N.; Mann, B. Subsurface Feature Mapping of Mars using a High Resolution Ground Penetrating Radar System. *AGU Fall Meeting*, 76961 (2015).

Chaired Sessions:

Astrobiology I, LPSC 2018.