

# Jesse D. Tarnas, Ph.D.

Blue Origin Space Resources Program  
Planetary Scientist & Instrument Specialist  
Los Angeles, CA

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## Professional Experience

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**Planetary Scientist & Instrument Specialist**  
Blue Origin Space Resources Program

February 2022-present

**Blue Alchemist Lead Test Engineer**  
Blue Origin Space Resources Program

January 2023-present

**NASA Postdoctoral Fellow**, NASA Jet Propulsion Laboratory November 2020-January 2022  
Advisor: Dr. Kathryn Stack Morgan, *JPL Research Scientist* and *Mars 2020 Rover Mission Deputy Project Scientist*

**Mars 2020 Rover Mission Science Team Collaborator**

November 2020-July 2022

**Mars 2020 Rover Mission Operations**

November 2020-January 2022

*Tactical Science Lead*

*Ingenuity Helicopter Science Liaison*

*SuperCam Science Payload Uplink Lead*

*SuperCam Campaign Implementation Science Payload Uplink Lead*

*Targeting Scientist*

## Journal Referee

Earth and Space Science, Planetary and Space Science, Geophysical Research Letters, Nature Scientific Reports, Journal of Geophysical Research: Planets, Astrobiology, Icarus, International Journal of Astrobiology

## Technical, Scientific, and Management Expertise

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*Technical Expertise:* Technology maturation, test engineering, remote sensing & geospatial data analysis, spectroscopy, mission operations, planetary surface operations, hyperspectral image analysis, target detection, vacuum chamber integration & operation, test article fabrication, fabrication & assembly of ceramics & metals, high temperature hardware, furnace operation, high power system assembly & operation, instrument operation, flight hardware operation, Bayesian analysis, numerical modeling, observational astronomy, planetary landing site selection & analysis, lunar illumination & ephemeris calculation, flight system requirements definition, Python, MATLAB

*Scientific Expertise:* Planetary science, space resources, geosciences, high temperature geochemistry, aqueous geochemistry, planetary surface processes, thermodynamics, astronomy, lunar environment, geologic history of the Moon & Mars, deep subsurface biogeochemistry, asteroids & meteorites, field geology, volcanology, impact processes, mission formulation & design

*Project Management Expertise:* Work breakdown structure development, cost estimation, resource allocation, prioritization, scrum & agile methodologies, risk management

## Education

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**Ph.D. Earth, Environmental and Planetary Sciences**, Brown University February 2021

Dissertation: “Water-rock Reactions on Earth and Mars: Insights from Remote Sensing, Meteorites, and Subsurface Exploration”

Advisor: Prof. John Mustard

**Sc.M. Earth, Environmental and Planetary Sciences**, Brown University May 2018

Thesis: “Radiolytic H<sub>2</sub> Production on Noachian Mars: Implications for Habitability and Atmospheric Warming”

Advisor: Prof. John Mustard

**B.A. Physics and Astronomy (double major)**, Wesleyan University May 2016

Thesis: “Transit, Secondary Eclipse, and Phase Curve Analysis to Characterize Kepler Exoplanets”

Advisor: Prof. Seth Redfield

Honors in Astronomy

## First Author Publications

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Characteristics, origins, and biosignature preservation potential of carbonate-bearing rocks within and outside of Jezero crater, **J.D. Tarnas**, K.M. Stack, M. Parente, J.F. Mustard, A.H.D. Koepfel, K.R. Moore, B.H.N. Horgan, F.P. Seelos, E.A. Cloutis, P.B. Kelemen, D. Flannery, A.J. Brown, K.R. Frizzell, P. Pinet, *JGR-Planets* (2021) 126, 11.

Earth-like habitable environments in the subsurface of Mars, **J.D. Tarnas**, J.F. Mustard, B. Sherwood Lollar, V. Stamenković, K.M. Cannon, J.-P. Lorand, T.C. Onstott, J.R. Michalski, O. Warr, A.M. Palumbo, A.-C. Plesa, *Astrobiology* (2021), 21, 7, [doi.org/10.1089/ast.2020.2386](https://doi.org/10.1089/ast.2020.2386)

Successes and challenges of factor analysis target transformation applications to visible-to-near-infrared hyperspectral data, **J.D. Tarnas**, J.F. Mustard, X. Wu, E. Das, K.M. Cannon, C.B. Hundal, A.C. Pascuzzo, J.R. Kellner, M. Parente, *Icarus* (2021), 114402, [doi.org/10.1016/j.icarus.2021.114402](https://doi.org/10.1016/j.icarus.2021.114402)

Orbital identification of hydrated silica in Jezero crater, Mars, **J.D. Tarnas**, J.F. Mustard, H. Lin, T.A. Goudge., E.S. Amador-French, M.S. Bramble, C.H. Kremer, X. Zhang, Y. Itoh, M. Parente, *Geophysical Research Letters* (2019), 46, 22, [doi.org/10.1029/2019GL085584](https://doi.org/10.1029/2019GL085584)

Radiolytic H<sub>2</sub> production on Noachian Mars: Implications for habitability and atmospheric warming, **Tarnas, J. D.**; Mustard, J. F.; Sherwood Lollar, B.; Bramble, M. S.; Cannon, K. M.; Palumbo, A. M.; Plesa, A.-C., *Earth and Planetary Science Letters* (2018), 502, 133-145, [doi.org/10.1016/j.epsl.2018.09.001](https://doi.org/10.1016/j.epsl.2018.09.001)

Universal heating curve of damped Coulomb plasmas in a Paul trap, **Tarnas, J. D.**; Nam, Y. S.; Blümel, R., *Physical Review A* (2013), 88, 041401(R), [doi.org/10.1103/PhysRevA.88.041401](https://doi.org/10.1103/PhysRevA.88.041401)

## Fellowships, Grants, and Awards

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**NASA Space Technology Mission Directorate Tipping Point** July 2023

“In-Situ Resource Utilization (ISRU)-Based Power on the Moon”

**NASA Group Achievement Award** May 2023

Pre-Landing Strategic Science Group

**NASA Science Mission Directorate Mars Data Analysis Program (MDAP)** May 2022  
“A Global Map of Serpentine on Mars”

**NASA Postdoctoral Fellowship** October 2020  
**Dissertation Fellowship**, Brown University July 2020  
**Doctoral Research Grant**, Brown University May 2019  
**THINK STEM Fund Scholarship**, Hawaii Community Foundation May 2015  
**William James & Dorothy Bading Laquist Fund Scholarship**, Hawaii Community Foundation  
**Undergraduate Directed Campus Scholarship**, Connecticut Space Grant December 2013

### Invited Presentations

Johns Hopkins Applied Physics Laboratory, Oct. 28<sup>th</sup>, 2021  
GSA Connects Mars 2020 Rover Panel, Oct. 13<sup>th</sup>, 2021  
International Mars Relay Coordination Working Group, Oct. 6<sup>th</sup> 2021  
European Organization for Nuclear Research (CERN) Colloquium, Sept. 16<sup>th</sup>, 2021  
Hawaii Institute for Geophysics and Planetology, University of Hawaii at Manoa, Jan. 25<sup>th</sup> 2020

### Workshops

JPL Planetary Science Summer Seminar Summer 2019  
NASA Planetary Volcanology Field Workshop Summer 2019  
SSERVI Sudbury Field Camp Fall 2017  
NASA Ames Space Academy Summer 2015

### Service and Science Outreach

**Speaker**, Brown Alumni Club May 31<sup>st</sup>, 2021  
**Speaker**, Hawaii Public Libraries NASA@My Library April 7<sup>th</sup>, 2021  
**Speaker**, Parker School March 25<sup>th</sup>, 2021  
**NASA proposal reviewer** 2020-present  
**Member**, Brown University Department of Earth, Environmental and Planetary Sciences Diversity Working Group 2020-present  
**Speaker**, Parker School December 7<sup>th</sup>, 2018  
**Graduate student representative**, Brown University Department of Earth, Environmental and Planetary Sciences external review May 2019  
**Speaker**, Van Vleck Observatory Space Night November 2015  
**Telescope Operator**, Van Vleck Observatory Public Observing Nights Spring 2015  
**Tutor**, Woodrow Wilson Middle School 2016-2017

### Select Research Press

“**Martian Crust Could Sustain Life Through Radiation**”, Nikk Ogasa, *Scientific American*

“**Earth’s Underground Worlds May Run on Radioactive Decay**”, Jordana Cepelewicz and Quanta Maganize, *The Atlantic*

“**Life could be hiding deep under Mars**”, Leto Sapunar, *Popular Science*

“Meteorites show modern Mars’ subsurface has ingredients to support life”, Rebecca Trager, *Chemistry World*

“Mars Might Supporting Microbial Life, Deep Underground”, Paul Scott Anderson, *EarthSky*

“How to Plan a Space Mission”, David Brown, *The New Yorker*

“The Mars 2020 rover will visit the perfect spot to find signs of life, new studies show”, Sarah Kaplan, *The Washington Post*

“The Mars 2020 rover will search for fossils and signs of ancient life”, Ashley Strickland, *CNN*

“The landing site for NASA’s Mars 2020 rover might be home to fossilized life”, Neel V. Patel, *MIT Technology Review*

“Mars 2020’s landing site could be a good place to hunt for fossils”, Erika Carlson, *Astronomy Magazine*

“The Martian Chronicler”, Shannon McDonnell, *Providence Monthly*

## Co-Author Publications

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Reflectance of Jezero crater floor: 2. Mineralogical interpretation, L. Mandon, ..., **J.D. Tarnas**, ..., *JGR-Planets* (2023).

Aqueously altered igneous rocks sampled on the floor of Jezero crater, Mars, K.A. Farley, K.M. Stack, D.L. Shuster, B.H.N. Horgan, J.A. Hurowitz, **J.D. Tarnas**, ..., *Science* (2022), 377, 6614.

Compositionally and density stratified igneous terrain in Jezero crater, Mars, R.C. Wiens, A. Udry, ... **J.D. Tarnas**,..., *Science Advances* (2022), 8, 34.

An olivine cumulate outcrop on the floor of Jezero crater, Mars, Y. Liu, ..., **J.D. Tarnas**,..., *Science* (2022) 377, 6614.

Compressed CO<sub>2</sub> Hard Rock Drill for Mars, A.S. Howe, K. Sherrill, D. Ruffatto, L.P.C. Tosi, **J.D. Tarnas**, B.H. Wilcox, *IEEE Aerospace Conference* (2022).

The Circum-Isidis Capping Unit: An Extensive Regional Ashfall Deposit Exposed in Jezero Crater, C.B. Hundal, J.F. Mustard, C.H. Kremer, **J.D. Tarnas**, A.C. Pascuzzo, *GRL* (2022), 49, 9.

Evidence for a delta-lake system and ancient flood deposits at Jezero crater, Mars, from the Perseverance rover, N. Mangold, S. Gupta, O. Gasnault, G. Dromart, **J.D. Tarnas**,...K.H. Williford, *Science* (2021), 374, 711-717.

Imaging Mars Analog Minerals’ Reflective Spectra and Testing Mineral Detection Algorithms with Hyperspectral Data, X. Wu, J.F. Mustard, **J.D. Tarnas**, X. Zhang, E. Das, Y. Liu, *Icarus* (2021), 369, [doi.org/10.1016/j.icarus.2021.114644](https://doi.org/10.1016/j.icarus.2021.114644)

Crustal Groundwater Volumes Greater than Previously Thought, G. Fergason, J.C. McIntosh, O. Warr, B. Sherwood Lollar, C.J. Ballentine, J.S. Famiglietti, J.-H. Kim, J.R. Michalski, J.F. Mustard, **J.D. Tarnas**, J.J. McDonnell, *Geophysical Research Letters* (2021), 48, 16, [doi.org/10.1029/2021GL093549](https://doi.org/10.1029/2021GL093549)

Stratigraphic Relationships in Jezero Crater, Mars –Constraints on the Timing of Fluvial-Lacustrine Activity from Orbital Observations, S. Holm-Alwmark, K.M. Kinch, M.D. Hansen, S. Shahrzad, K. Svennevig, W.J. Abbey, R.B. Anderson, F.J. Calef III, S. Gupta, E. Hauber, B.H.N. Horgan, L.C. Kah, J. Knade, N.B. Miklusicak, K.M. Stack, V.Z. Sun, **J.D. Tarnas**, and C. Quantin-Nataf, *JGR-Planets* (2021), 126, 7.

Joint Hapke Model and Spatial Adaptive Sparse Representation with Iterative Background Purification for Martian Serpentine Detection, X. Wu, X. Zhang, J.F. Mustard, **J.D. Tarnas**, H. Lin, Y. Liu, *Remote Sensing* (2021), 13(3), 500, [doi.org/10.3390/rs13030500](https://doi.org/10.3390/rs13030500)

Bridge to the stars: A mission concept to an interstellar object, K. Moore, S. Courville,...**J.D. Tarnas**,..., C., Budney, *Planetary and Space Science* (2021), 105137, [doi.org/10.1016/j.pss.2020.105137](https://doi.org/10.1016/j.pss.2020.105137)

Dynamic Aperture Factor Analysis/Target Transformation (DAFA/TT) for serpentine and Mg-carbonate mapping on Mars with CRISM near-infrared data, Honglei Lin, **J. D. Tarnas**, J. F. Mustard, Xia Zhang, Yong Wei, Weixing Wan, F. Klein, and J.R. Kellner, *Icarus* (2021), 114168, [doi.org/10.1016/j.icarus.2020.114168](https://doi.org/10.1016/j.icarus.2020.114168)

Mars Extant Life: What's Next? Conference Report, B.L. Carrier, D.W. Beaty, M.A. Meyer,...**J.D. Tarnas**,..., J. Xu, *Astrobiology* (2020), 20, 6, [doi.org/10.1089/ast.2020.2237](https://doi.org/10.1089/ast.2020.2237)

Abiotic Sources of Molecular Hydrogen on Earth, F. Klein, **J.D. Tarnas**, W. Bach, *Elements* (2020), 16, 19-24, [doi.org/10.2138/gselements.16.1.19](https://doi.org/10.2138/gselements.16.1.19)

Scientific Exploration of Mare Imbrium with OrbitBeyond, Inc.: Characterizing the Regional Volcanic History of the Moon, A.M. Palumbo, A.N. Deutsch, M.S. Bramble, **J.D. Tarnas**,..., V. Vatsal, *New Space* (2019), 7, 3, [doi.org/10.1089/space.2019.0016](https://doi.org/10.1089/space.2019.0016)

The next frontier for planetary and human exploration, V. Stamenković, L. W. Beegle, K. Zacny,..., **J. D. Tarnas**,...,R. Woolley, *Nature Astronomy* (2019), 3, 116-120, [doi.org/10.1038/s41550-018-0676-9](https://doi.org/10.1038/s41550-018-0676-9)

## Planetary Science and Astrobiology Decadal Survey Papers

Deep Trek: Science of Subsurface Habitability and Life on Mars, A Window into Subsurface Life in the Solar System, Lead Team: Vlada Stamenkovic, Kennda Lynch, Penelope Boston, **Jesse Tarnas**, Co-authors: Charles Edwards, Barbara Sherwood Lollar,...,Ryan Timoney, <https://hdl.handle.net/20.500.11753/1677>

Deep Trek: Mission Concepts for Exploring Subsurface Habitability and Life on Mars, A Window into Subsurface Life in the Solar System, Lead: Charles Edwards, Co-authors: Vlada Stamenkovic, Penelope Boston, Kennda Lynch, **Jesse Tarnas**, Barbara Sherwood Lollar,...,Ryan Timoney, <https://hdl.handle.net/20.500.11753/1677>

The evolution of habitable environments on terrestrial planets: Insights and knowledge gaps from studying the geologic record of Mars, Lead: Briony Horgan, Co-authors: Janice Bishop,..., **Jesse Tarnas**,...,Christina Viviano, <https://hdl.handle.net/20.500.11753/1672>

## Conference Session and Workshop Leadership

**Primary session convener**, New Mars Underground: Astrobiology, Planetary Science, and Space Resources at the Dawn of Mars Sample Return, AGU Fall Meeting (2021). Co-conveners: Rachel Harris & Ana-Catalina Plesa.

**Session co-convenor**, New Mars Underground (and Beyond) 3.0: AGU Fall Meeting (2020). Primary convenor: Rachel Harris, co-convenor: Ana-Catalina Plesa.

**Meeting co-lead**, Canadian Institute for Advanced Research (CIFAR) Launch Pad meeting on abiotic CH<sub>4</sub> production. Co-lead: Oliver Warr.

**Session co-chair**, Astrobiology I: Looking for Life on Mars, Microbial Impact of Human Exploration, Curation and Contamination Measurements. 49<sup>th</sup> Lunar and Planetary Science Conference (2018). Co-chair: Amy Williams.

## Conference Papers and Presentations

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Subsurface water-rock-gas interactions, habitability, and planetary evolution, 2020 Conference of the National Society of Black Physicists, NOV 2020, **Tarnas, J.**

Abiotic CH<sub>4</sub> Production in the Subsurface of Terrestrial Planets, Goldschmidt 2020, JUN 2020, Presented, **Tarnas, J.**; Mustard, J.; Sherwood Lollar, B.; Stamenkovic, V.; Warr, O.

Constraining the origin of hydrated silica in Jezero crater and its accessibility by NASA's Mars 2020 rover, 51<sup>st</sup> Lunar and Planetary Science Conference, MAR 2020, Meeting cancelled, **Tarnas, J.D.**; Mustard, J.F.; Parente, M.; Seelos, F.P.; Itoh, Y.; Saranathan, A.M.

Abiotic H<sub>2</sub>, CH<sub>4</sub>, and SO<sub>4</sub> production on Earth and Mars: atmospheric warming agents and redox energy sources for ancient and modern subsurface martian life, 51<sup>st</sup> Lunar and Planetary Science Conference, MAR 2020, Meeting cancelled, **Tarnas, J.D.**; Mustard, J.F.; Sherwood Lollar, B.; Stamenkovic, V.; Warr, O.; Cannon, K.M.; Palumbo, A.M.; Plesa, A.-C.

CRISM "Fandango" Progress Report: Validated Derived Products for the Perseverance Jezero Mapping Team, Perseverance Rover Science Team Meeting, Virtual, MAR 2020, Presented, Arvidson, R.; Seelos, F.; Parente, M.; **Tarnas, J.**; Christian, J.; Itoh, Y.; Mustard, J.; O'Sullivan, J.; Pollite, D.; Saranathan, A.; Frizzell, K.

Bridge to the stars: a mission concept to an interstellar object, 51<sup>st</sup> Lunar and Planetary Science Conference, MAR 2020, Meeting cancelled, Moore, K.;...; **Tarnas, J.**;... Mitchell, K.

Mars' subsurface environment: where to search for groundwater? , 51<sup>st</sup> Lunar and Planetary Science Conference, MAR 2020, Meeting cancelled, Plesa, A.-C.; Stamenkovic, V.; Breuer, D.; Hauber, E.; **Tarnas, J.D.**; Mustard, J.F.; Mischna, M.; and the TH<sub>2</sub>OR and VALKYRIE Teams

Hyperspectral target detection and application to low abundance serpentine mapping, 51<sup>st</sup> Lunar and Planetary Science Conference, MAR 2020, Meeting cancelled, Wu, X.; Mustard, J.F.; Zhang, X.; **Tarnas, J.D.**

Laboratory testing of mineral detection algorithms for minerals at low abundance using visible-infrared hyperspectral data, 51<sup>st</sup> Lunar and Planetary Science Conference, MAR 2020, Meeting cancelled, Das, E.; **Tarnas, J.D.**; Mustard, J.F.; Wu, X.

Laboratory testing of mineral detection and abundance algorithms: factor analysis detection and nonlinear mixture modeling, 51<sup>st</sup> Lunar and Planetary Science Conference, MAR 2020, Meeting cancelled, Mustard, J.F.; **Tarnas, J.D.**; Wu, X.; Das, E.; Parente, M.

"Mars Extant Life: What's Next?" conference report, 51<sup>st</sup> Lunar and Planetary Science Conference, MAR 2020, Meeting cancelled, Carrier, B.L.;... **Tarnas, J.D.**; Webster, K.D.

Abiotic CH<sub>4</sub> flux from the Precambrian Shield on Earth and during the Noachian Hesperian and Amazonian periods on Mars, 2019 AGU Fall Meeting, San Francisco, CA, DEC 2019, Presented, **Tarnas, J.D.**; Mustard, J.F.; Sherwood Lollar, B. Warr, O.; Cannon, K.M.; Palumbo, A.M., Plesa-A.C.

Water-rock Alteration and Geochemical Conditions in the Hawai'i Scientific Drilling Program Core: Implications for Understanding the 3-D architecture of Volcanic Subsurface, 2019 AGU Fall Meeting, San Francisco, CA, DEC 2019, Presented, Mustard, J.F.; **Tarnas, J.D.**; Wu, X.

Deep groundwaters on Earth as analogs for modern martian habitat, Mars Extant Life: What's Next?, Carlsbad, NM, NOV 2019, Presented, **Tarnas, J.D.**; Mustard, J.F.; Sherwood Lollar, B.; Warr, O.; Palumbo, A.M.; Plesa, A.-C

A Sparsity Divergence Constrained Factor Analysis and Target Transformation Method and Application to Hydrous Minerals Detection of Hyperspectral Imagery, 2019 AGU Fall Meeting, San Francisco, CA, SEP 2019, Presented, Wu, X.; **Tarnas, J.D.**; Zhang, X.; Mustard, J.F.

Mars could have been warmed by eccentricity variations or a subsurface biosphere, Ninth International Mars Conference, Pasadena, CA, JUL 2019, Presented, **Tarnas, J.D.**; Mustard, J.F.; Sherwood Lollar, B.; Cannon, K.M.; Palumbo, A.M.; Plesa, A.-C.

Mineral detections over Jezero crater using advanced data processing techniques for CRISM data—the CRISM “Fandango”, Ninth International Conference on Mars, Pasadena, CA, JUL 2019, Presented, Parente, M.; Arvidson, R.; Itoh, Y.; Lin, H.; Mustard, J.F.; Saranathan, A.M.; Seelos, F.P.; **Tarnas, J.D.**

A geologic record of the first billion years of Mars history at the Mars 2020 landing site, Ninth International Conference on Mars, Pasadena, CA, JUL 2019, Presented, Mustard, J.F.; Bramble; M.S., Kremer, C.H.; **Tarnas, J.D.**; Pascuzzo, A.; Head, J.W.

Is Abiotic Methane Production Sufficient for Warming Noachian and Hesperian Mars?, 2019 Astrobiology Science Conference, Bellevue, WA, JUN 2019, Presented, **Tarnas, J.D.**; Mustard, J.F.; Sherwood Lollar, B.; Cannon, K.M.; Palumbo, A.M.; Plesa, A.-C.

An insufficient methane budget for warming Noachian and Hesperian Mars, 50th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2019, Presented, **Tarnas, J.D.**; Mustard, J. F., Sherwood Lollar, B.; Cannon, K. M.; Palumbo, A. M., Plesa, A.-C.; Bramble, M.S.

Convergence on Mineral Detections over Gale Crater, NE Syrtis and Jezero Crater using Advanced Data Processing Techniques for CRISM Hyperspectral Imaging Data, 50th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2019, Presented, Parente M., Arvidson, R.E., Itoh, Y., Lin, H., Mustard, J.F., Saranathan, A.M., Seelos, F.P., **Tarnas, J.D.**

Hydrated silica in the Jezero deltas, 50th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2019, Presented, **Tarnas, J.D.**; Mustard, J.F.; Lin, H.; Goudge, T.A.; Amador, E.S.; Bramble, M.S.; Zhang, X.

Laboratory Testing of the Factor Analysis-Target Transformation Method for Mineral Detection at Low Abundance from Visible-Infrared Hyperspectral Data, 50th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2019, Presented, Mustard, J.F.; **Tarnas, J.D.**; Parente, M.

Scientific Exploration of Mare Imbrium with OrbitBeyond Inc.: Characterizing the Regional Volcanic History of the Moon, 50th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2019, Presented, Tokle, L.; Palumbo, A.; Deutsch... **Tarnas, J.**; ... Vatsal, V

VNIR Characterization of the Martian North Polar Ice Cap 2): Constraining the Surface Compositions, 50th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2019, Presented, Pascuzzo, A.C.; **Tarnas, J.D.**; Mustard, J.F.; Lin, H.

Dynamic Aperture Factor Analysis/Target Transformation (DAFA/TT) application to CRISM data, APL CRISM Mapping Meeting, Laurel, MD, JAN 2019, Presented, **Tarnas, J.D.**; Lin, H.; Mustard, J.F.; Zhang, X.

H<sub>2</sub> and CH<sub>4</sub> Production, Storage, and Release over ~4.5 Gyr of Martian History: Implications for Atmospheric Warming, Habitability, and ISRU, American Geophysical Union Fall Meeting, Washington, D.C., DEC 2018, Presented, **Tarnas, J.D.**; Mustard, J. F., Sherwood Lollar, B.; Bramble, M.S.; Cannon, K. M.; Palumbo, A. M., Plesa, A.-C.

Dynamic Aperture Factor Analysis/Target Transformation (DAFA/TT) analysis of CRISM data, CRISM virtual meeting, Providence, RI, SEP 2018, Presented, **Tarnas, J.D.**; Lin, H.; Mustard, J.F.; Zhang, X.;

Production of H<sub>2</sub> on Mars Through Radiolysis and Implications for Habitability, Goldschmidt 2018, Boston, MA, AUG 2018, Presented, **Tarnas, J. D.**; Mustard, J. F., Sherwood Lollar, B.; Bramble, M.S.; Cannon, K. M.; Palumbo, A. M., Plesa, A.-C.

Target Transformation Constrained Sparse Unmixing (TTCSU) Algorithm for Retrieving Hydrated Minerals on Mars: Application to Southwest Melas Chasma, International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences; ISPRS TC III Mid-term Symposium “Developments, Technologies and Applications in Remote Sensing”, Beijing, China, MAY 2018, Presented, Lin, H.; Zhang, X.; Wu, X.; **Tarnas, J.D.**; Mustard, J.F.

Characterization of serpentine and carbonate in Mars 2020 landing site candidates using Integrated Dynamic Aperture Target Transformation and Sparse Unmixing (IDATTSU), 49th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2018, Under Review, **Tarnas, J.D.**; Lin, H.; Mustard, J.F.; Zhang, X.

Dynamic Aperture Target Transformation (DATT): A Novel and Valuable Method for Mineral Detection on Mars, 49th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2018, Presented, Lin, L.H.; **Tarnas, J.D.**; Mustard, J.F.; Zhang, X.; Wu, X.

Hydrated silicates and carbonates mapping in candidate Mars 2020 rover landing sites with integration of Dynamic Aperture Target Transformation and Sparse Unmixing (IDATTSU), 49th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2018, Presented, Zhang, X.; Lin, H.; Mustard, J.F.; **Tarnas, J.D.**

Radiolytic H<sub>2</sub> Production, Transport, and Dissolution on Noachian Mars, 49th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2018, Presented, **Tarnas, J.D.**; Mustard, J.F.; Sherwood Lollar, B.; Bramble M.S.; Cannon, K.M.; Palumbo, A.M.; Plesa, A.-C.

Radiolytic H<sub>2</sub> Production on Noachian Mars: Implications for Subsurface Habitability, 4th International Conference on Early Mars, Flagstaff, AZ, OCT 2017, Presented, **Tarnas, J. D.**; Mustard, J. F., Sherwood Lollar, B.; Bramble, M.S.; Cannon, K. M.; Palumbo, A. M.

Radiolytic Hydrogen Production on Noachian Mars, 2017 Astrobiology Science Conference, Mesa, AZ, APR 2017, Presented, Tarnas, J. D.; Mustard, J. F.; Sherwood Lollar, B.; Bramble, M. S.



Hydrogen production from the upper 15 km of martian crust via serpentinization: implications for habitability, 48th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2017, Presented, Mustard, J. F.; **Tarnas, J. D.**

Radiolytic Hydrogen Production on Noachian Mars, 48th Lunar and Planetary Science Conference, Woodlands, TX, MAR 2017, Presented, **Tarnas, J. D.**; Mustard, J. F.; Sherwood Lollar, B.; Bramble, M. S.

HOMER: A smallsat ground penetrating radar sounding fleet to map planetary surfaces at high resolution, 47th LPSC, Woodlands, TX, MAR 2016, Presented, Persaud, D.; Wu, T.; **Tarnas, J.**; Preudhomme, M.; Jurg, M.; Chalumeau, C.; Buckley, H.; Lombard- Poirot, N

Transit, Secondary Eclipse, and Phase Curve Modeling to Characterize Kepler Exoplanet Candidates, 227th Meeting of the American Astronomical Society, Kissimmee, FL, JAN 2016, Presented, **Tarnas, J.**, Redfield, S.

Subsurface Feature Mapping of Mars using a High Resolution Ground Penetrating Radar System, 2015 AGU Fall Meeting, San Francisco, CA, DEC 2015, Presented, Wu, T.; Persaud, D.; Preudhomme, M.; Jurg, M.; Smith, M.K.; Buckley, H.; **Tarnas, J.**; Chalumeau, C.; Poirot-Lombard, N.; Mann, B.

Determination of the amount of peroxy in granite rock using the Seebeck Effect, 2015 AGU Fall Meeting, San Francisco, CA, DEC 2015, Presented, Tregloan-Reed, J.; **Tarnas, J.**, Plante, Z.; Freund, F.