Usha Farey Lingappa (she/her)

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EDUCATION

2015 – 2021	California Institute of Technology PhD, Geobiology
2008 – 2012	Hampshire College BA, self-designed major in Astrobiology

RESEARCH POSITIONS

2021 – present	University of California Berkeley Postdoctoral Scholar, Institute for Quantitative Biosciences
2015 – 2021	California Institute of Technology Graduate Research Fellow, Division of Geological and Planetary Sciences
2012 – 2015	NASA Ames Research Center/SETI Institute Ames Associate, Division of Space Sciences and Astrobiology
2009 – 2015	Prosetta Biosciences Program Manager, Rabies Drug Discovery (2014-2015) Assistant Research Scientist, Biochemistry Team (2012-2015) Intern, Biochemistry Team (summer 2009, summer 2010)
2009 – 2011	Hampshire College Undergraduate Researcher, School of Natural Sciences
2010	Cerro Tololo Inter-American Observatory Research Assistant

AWARDS

2018	Society of Exploration Geophysicists JaWS Entrepreneurial Pitch Contest (1st place)
2017	Oral Presentation Award (1st place), Gordon Research Conference on Photosynthesis
2017	Metzner Prize (2nd place), Caltech Art of Science Competition
2017	Beverly Green Award (1st place oral presentation), Western Photosynthesis Conference
2016 – 2019	NSF Graduate Research Fellowship
2015 – 2016	Caltech CEMI Fellowship
2013	Poster Presentation Award (2nd place), Intl. Conference on Antiviral Research
2012	Earl Ubell Science Communication Award

SCIENTIFIC PRESENTATIONS

Conference abstract titles and authors listed at end of CV

Talks

2022	Invited seminar, Microsoft Research Health Futures Group
2022	Science Journey Lecture Series, Caltech Public Programming
2019	Yuk Lunch Seminar Series, Caltech Planetary Sciences
2018	MicroMorning Seminar Series, Caltech Center for Environmental Microbial Interactions
2018	Berkeley Symposium on Photosynthesis, Carbon, and the Environment, Berkeley, CA
2017	Gordon Research Conference on Photosynthesis, Sunday River, ME
2017	Western Photosynthesis Conference, Marshall, CA

2013	Bay Area Symposium on Viruses, Berkeley, CA

Posters

2019	American Geophysical Union Fall Meeting, San Francisco, CA
2019	Workshop on Cyanobacteria, Boulder, CO
2018	International Society on Photosynthesis Research Conference, Vancouver, BC
2017	Southern California Geobiology Symposium, Los Angeles, CA
2016	American Geophysical Union Fall Meeting, San Francisco, CA
2013	International Conference on Antiviral Research, San Francisco, CA
2012	American Society for Cell Biology Meeting, San Francisco, CA
2010	International Conference on Antiviral Research, San Francisco, CA

FIELDWORK

2022	Gill Tract Community Farm and UC Botanical Garden, CA, USA
2021	Big Pine Key and Marquesas Keys, FL, USA
2019	Great Salt Lake, UT, USA
2019	Et-then Group and Pethei Group, NWT, Canada
2017	Transvaal Supergroup, NC, South Africa
2017	Black Point Lava Flow, AZ, USA
2017	Chapin Wash Formation and Pinal Creek, AZ, USA
2016, 17, 18, 19	Little Ambergris Cay, Turks and Caicos Islands
2016	Van Horn Formation, TX, USA
2016	Little Hot Creek, CA, USA
2011, 2013	Mars Desert Research Station, UT, USA
2010	San Pedro de Atacama, Chile
2009, 16, 17, 18	Death Valley, CA, USA

ART EXHIBITIONS

2020	Contributor to *Incendiary Traces* by Hillary Mushkin Prepared for COLA exhibition, LA Municipal Art Gallery (2020, cancelled due to covid) Included in *Plein Air*, MoCA Tucson (2022)
2017	Contributor to *Art of Science*, Red Door Café, Caltech, Pasadena CA also shown at the Armory Center for the Arts, Pasadena, CA
2016	*Blueshift*, PRACTICE Gallery, Philadelphia, PA (collaboration with Ian Etter)
2012	*That's Life*, Centrum Gallery, Hampshire College, Amherst, MA (collaboration with Casey Andrews)

OTHER OUTREACH & SCI COMM

[in production]	Featured scientist, BBC Earth/NOVA documentary series
2018 – 2021	Caltech Letters (online publication, www.caltechletters.org) Graphics Director (2019 – 2021) Staff Artist (2018 – 2021)
2012 – 2016	Science illustrator, Institute for Science and Interdisciplinary Studies
2010 – present	Volunteer for various science outreach events/enrichment programs/schools Including with: TechBoston Academy, El Cerrito High School, Gateway High

School, Hamilton Elementary School, Muir High School, Blair High School, ACE Middle School, Nava Elementary School, Techbridge, NexGeneGirls, NASA ARC Women's Influence Network, SETI Institute.

TEACHING & MENTORSHIP

2017 – 2019	Research mentor, Caltech • Summer 2019: Joshua Phelan, undergraduate from CSU Fullerton • Summer 2018: Jenny Ji, high school student from Troy Tech • Summer 2017: Kabir Mohammed, undergraduate from Caltech • 2nd place, Vodopia-Hasson poster competition
2016 – 2020	Teaching assistant, Caltech • Ge197: Special topics in Geobiology: Photosynthesis • Ge11b/Ge104: Earth and the Biosphere/Introduction to Geobiology
2014 – 2015	Girlz Climb On mentor, Girl Ventures
2010 – 2012	Teaching assistant, Hampshire College • NS-212: Organic Chemistry I • NS-257: Astrobiology • NS-227: Life on Mars • NS-101: Gene Cloning (molecular biology bootcamp) • NS-204: Physics I

ACADEMIC SERVICE

2021	Peer reviewer, *Earth and Planetary Science Letters*
2016, 2019	Organizer and Session Chair, Southern California Geobiology Symposium, Caltech
2017 – 2018	Organizer, Geoclub Seminar Series, Caltech
2009 – 2010, 2011 – 2012	Voting student rep, School of Natural Science Faculty Meetings, Hampshire College
2008 – 2010	Community Council Subcommittee for Public Health and Safety, Hampshire College Co-Chair (2009 – 2010) Member (2008 – 2009)

PATENTS

Trower, E J, **U F Lingappa**, J P Grotzinger, W W Fischer. "Microabrasive compositions containing ooids." US Patent US10407601 (2018).

PUBLICATIONS

*equal contribution

Lingappa, U F, N T Stein, K S Metcalfe, T M Present, V J Orphan, A H Knoll, J P Grotzinger, E J Trower*, M L Gomes*, W W Fischer*. "Early impacts of climate change on a coastal marine microbial mat ecosystem." *Science Advances* 8:eabm7826 (2022).

Yu, H, G L Chadwick, **U F Lingappa**, J R Leadbetter. "Comparative studies on cultivated and uncultivated, freshwater and marine "Ca. Manganitrophaceae" genomes implicates their worldwide reach in manganese chemolithoautotrophy." *mBio* e0342121 (2022).

Kim, B*, **U F Lingappa***, J S Magyar, D R Monteverde, J S Valentine, W W Fischer, J Cho. "Challenges of measuring soluble Mn(III) in natural samples." *Molecules* 27:1661 (2022).

Lingappa, U F, C M Yeager, A Sharma, N L Lanza, D P Morales, G Xie, A D Atencio, G L Chadwick, D R Monteverde, J S Magyar, S M Webb, J S Valentine, B M Hoffman, W W Fischer. "An ecophysiological explanation for manganese enrichment in rock varnish." *Proceedings of the National Academy of Sciences* 118(25):e2025188118 (2021).

Douglas, M M, **U F Lingappa**, M P Lamb, J C Rowland, A J West, G Li, P C Kemeny, A J Chadwick, A Piliouras, J Schwenk, W W Fischer. "Impact of river channel lateral migration on microbial communities across a discontinuous permafrost floodplain." *Applied and Environmental Microbiology* 01339-21 (2021).

Present, T M, M L Gomes, E J Trower, N T Stein, **U F Lingappa**, J Naviaux, M T Thorpe, M D Cantine, W W Fischer, A H Knoll, J P Grotzinger. "Non-lithifying microbial ecosystem dissolves peritidal lime sand." *Nature Communications* 12:3037 (2021).

Liu, Y, W W Fischer, C Ma, Y Guan, J R Beckett, O Tschauner, Y Guan, **U F Lingappa**, S M Webb, V B Prakapenka, N L Lanza, C B Agee. "Manganese oxides in Martian meteorites Northwest Africa (NWA) 7034 and 7533." *Icarus* 364:114471 (2021).

Ward, L M, **U F Lingappa**, J Grotzinger, W Fischer. "Microbial mats in the Turks and Caicos Islands reveal diversity and evolution of phototrophy in the Chloroflexota order Aggregatilineales." *Environmental Microbiome* 15:9 (2020).

Smith, B P, M Ingalls, E J Trower, **U F Lingappa**, T M Present, J S Magyar, W W Fischer. "Physical Controls on Carbonate Intraclasts: Modern Flat Pebbles from Great Salt Lake, Utah." *Journal of Geophysical Research: Earth Surface* 125:e2020JF005733 (2020).

Gomes, M, L A Reidman, S O'Reilly, **U F Lingappa**, K Metcalfe, D A Fike, J P Grotzinger, W W Fischer, A H Knoll. "Taphonomy of biosignatures in microbial mats on Little Ambergris Cay, Turks and Caicos Islands." *Frontiers in Earth Science* 8:576712 (2020).

Lingappa, U F, D Monteverde, J Magyar, J S Valentine, W W Fischer. "How manganese empowered life with dioxygen (and vice versa)." *Free Radical Biology and Medicine* 140:113-125 (2019).

- Featured on NASA Astrobiology Portal, April 2019. [https://astrobiology.nasa.gov/news/how-manganese-played-a-pivotal-role-in-photosynthesis-and-oxidation-protection/]

Lingappa, U F, W W Fischer. "Oxygenic Photosynthesis." Entry in: Gargaud M et al. (eds) *Encyclopedia of Astrobiology*. Springer, Berlin, Heidelberg (2019).

Trower, E J, M Cantine, M Gomes, **U F Lingappa**, S O'Reilly, T M Present, N Stein, J V Strauss, M P Lamb, J P Grotzinger, A H Knoll, W W Fischer. "Active ooid growth driven by sediment transport in a high energy shoal, Little Ambergris Cay, Turks and Caicos Islands." *Journal of Sedimentary Research* 88(9):1132-1151 (2018).

Lingappa, U F*, X Wu*, A Macieik, S F Yu, A Atuegbu, J Francis, C Nichols, A Calayag, H Shi, J A Ellison, E K T Harrell, V Asundi, J R Lingappa, M D Prasad, W I Lipkin, D Dey, C R Hurt, V R Lingappa, W J Hansen, C E Rupprecht. 2013. "Host-rabies virus protein-protein interactions as druggable antiviral targets." *Proceedings of the National Academy of Sciences* 110(10):E861-868 (2013).

- Featured in *Cell* Select Leading Edge, May 2013. [https://www.cell.com/cell/pdf/S0092-8674(13)00515-1.pdf]

CONFERENCE ABSTRACTS

Present, T, **U Lingappa**, M Ingalls, J Grotzinger. "Recognition of Paleoproterozoic alkaline environments." Simons Collaboration on the Origins of Life Annual Symposium, online, 2020.

Gomes, M, C Howard, E J Trower, E C Sibert, T M Present, **U Lingappa**. "Carbon isotope signatures in microbial mat carbonates—how do different carbonate components record information about local versus global carbon cycling?" GSA connects online, 2020.

Lingappa, U F, W W Fischer, E J Trower. "Ecophysiology of ooid microborings excavated by endolithic Cyanobacteria." AGU fall meeting, 2019.

Trower, E, T Mahseredjian, I Overeem, M Gomes, C Howard, **U Lingappa**, T Present, E Sibert. "Grain-Trapping by Microbial Mats—A Key Mechanism of Sediment Accumulation in Mangroves?" AGU fall meeting, 2019.

Magyar, J, **U Lingappa**, D Monteverde, J Valentine, A Sharma, B Hoffman, W Fischer. "Cyanobacterial Mn(II) as Defense Against Oxidative Stress." Goldschmidt, 2019.

Marti-Arbona, R, N Lanza, M Teshima, **U Lingappa**, W Fischer, C Yeager. "Rock Varnish: Implications for Biosignatures on Mars." Goldschmidt, 2019.

Lanza, N L, W W Fischer, C Yeager, **U Lingappa**, A M Ollila, P J Gasda, S N Lamm, M Salvatore, S M Clegg, R C Wiens. "Targeting Manganese Minerals on Mars as Potential Biosignatures." Mars Extant Life, 2019.

Yeager, C, N Lanza, R Marti-Arbona, M Teshima, **U Lingappa**, W Fischer. "Terrestrial Rock Varnish: Implications for Biosignatures on Mars." Mars Extant Life, 2019.

Fischer, W, **U Lingappa**, E Trower, J Magyar, S Slotznick, J Johnson, S Webb, C Ma, Y Guan, B Rasmussen, Y Liu. "Chemical Imaging Approaches to Untangle Depositional and Post-Depositional Processes in Ancient Rocks on Earth and Mars." Goldschmidt, 2018.

Lingappa, U, W Fischer, N Lanza, J Challacome, C Yeager. "Microbial inhabitants of rock varnish: visitors or niche specialists." Goldschmidt, 2018.

Magyar, J, **U Lingappa**, D Monteverde, J Valentine, W Fischer. "Manganese Speciation in Modern Cyanobacteria and its Relationship to the Evolution of Photosynthesis." Goldschmidt, 2018.

Lingappa, U, H Johnson, J Hemp, J Magyar, D Monteverde, J Valentine, W Fischer. "Manganese oxidation by Cyanobacteria and the evolution of photosystem II." International Society of Photosynthesis Research Conference on Microbial Photosynthesis, 2018.

Hemp, J, R Soo, P Shih, L Ward, **U Lingappa**, L Pace, P Hugenholtz, W Fischer. "Evolution of photosynthesis." International Symposium on Photosynthetic Prokaryotes, 2018.

Trower, E, M Cantine, M Gomes, **U F Lingappa**, S O'Reilly, T M Present, N Stein, J V Strauss, M P Lamb, J P Grotzinger, A H Knoll, W W Fischer. "Physical, Chemical, and Microbial Controls on Growth and Degradation of Ooids on Ambergris Shoal, Little Ambergris Cay, Turks and Caicos Islands, British Overseas Territories." AAPG annual meeting, 2018.

Grotzinger, J, M Gomes, **U Lingappa**, N Stein, E Trower, J Alleon, A M Bahniuk, M Cantine, H Grotzinger, K Metcalfe, D K Morris, S O'Reilly, E Orzechowski, D Quinn, C Sanders, E Sibert, J Strauss, M Tarika, M Thorpe, W Fischer, A Knoll. "Diverse and Spatially Extensive Microbial Mat and Ooid Sand Depositional System, Little Ambergris Cay, Turks and Caicos Islands." AAPG annual meeting, 2018.

Present, T M, E Trower, M Gomes, **U Lingappa**, N Stein, M Thorpe, M Tarika, J Alleon, A M Bahniuk, D K Morris, E Orzechowski, C Sanders, E Sibert, W Fischer, A Knoll, J Grotzinger. "Sedimentology and Geochemistry of Ooid Sands Buried Beneath Microbial Mats, Little Ambergris Cay, Turks and Caicos Islands." AAPG annual meeting, 2018.

Stein, N, D Quinn, J Grotzinger, W Fischer, B Ehlmann, M Gomes, A Hayden, **U Lingappa**, A Knoll, E Trower. "Distribution of and Environmental Impacts on Microbial Mat Ecosystems of Little Ambergris Cay, Turks and Caicos." AAPG annual meeting, 2018.

Lingappa, U, M Gomes, K Metcalfe, L Riedman, S O'Reilly, N Stein, E Trower, T M Present, W Fischer, A Knoll, J Grotzinger. "Ecology and Biogeochemistry of Microbial Mats on Little Ambergris Cay." AAPG annual meeting, 2018.

Magyar, J, **U Lingappa**, W Fischer. "Insights into Ancient Manganese Biogeochemistry from Studies of Modern Photosystem II." Gordon Research Conference on Metals in Biology, 2018.

Stein, N, J P Grotzinger, A Hayden, D P Quinn, L Trower, **U Lingappa**, T M Present, M Gomes, E A Orzechowski, W W Fischer. "Impact of Hurricane Irma on Little Ambergris Cay, Turks and Caicos." AGU fall meeting, 2017.

Liu, Y, C Ma, Y Guan, J R Beckett, **U F Lingappa**, S M Webb, W W Fischer, A Allwood. "Diverse fluid activities on Mars: Zn-bearing silicate and oxide in Martian breccia meteorite Northwest Africa (NWA) 7533." LPSC, 2017.

Gomes, M, L A Riedman, S O'Reilly, **U Lingappa**, K Metcalfe, N Stein, E A Orzechowski, J V Strauss, H Grotzinger, D P Quinn, L Trower, D Fike, J Grotzinger, A Knoll. "Linking the Modern to the Ancient with Morphological and Geochemical Signatures in Microbial Mats." Goldschmidt, 2017.

Lingappa, U and W W Fischer. "Manganese and the Evolution of Photosystem II." Gordon Research Conference on Photosynthesis, 2017.

Lingappa, U, H A Johnson, J Hemp, J S Valentine, W W Fischer. "Manganese Oxidation by Cyanobacteria and the Evolution of Photosystem II." Western Photosynthesis Conference, 2017.

Gomes, M, **U Lingappa**, K Metcalfe, S S O'Reilly, L A Riedman, M Cantine, B Ireland, R Phillips, N Stein, E A Orzechowski, J V Strauss, H M Grotzinger, D P Quinn, L Trower, D Fike, W W Fischer, J P Grotzinger, A H Knoll. "Linking the modern to the ancient with a comprehensive geobiological understanding of biosignature preservation in microbial mats." AGU fall meeting, 2016.

Grotzinger, J P, A H Knoll, W W Fischer, M Cantine, M L Gomes, H M Grotzinger, **U Lingappa**, K Metcalfe, S S O'Reilly, E A Orzechowski, D P Quinn, L A Reidman, N Stein, J V Strauss, L Trower. "Context, Biogeochemistry, and Morphology of Diverse and Spatially Extensive Microbial Mats, Little Ambergris Cay, Turks and Caicos Islands, BWI." AGU fall meeting, 2016.

Stein, N T, D P Quinn, J P Grotzinger, W W Fischer, A H Knoll, M Cantine, M L Gomes, H M Grotzinger, **U Lingappa**, K Metcalfe, S S O'reilly, E A Orzechowski, L A Reidman, J V Strauss, L Trower. "UAV, DGPS, and Laser Transit Mapping of Microbial Mat Ecosystems on Little Ambergris Cay, BWI." AGU fall meeting, 2016.

Trower, L, M Cantine, S S O'Reilly, J V Strauss, M L Gomes, H M Grotzinger, J P Grotzinger, A H Knoll, M P Lamb, **U Lingappa**, K Metcalfe, E A Orzechowski, D P Quinn, L A Reidman, N Stein, W W Fischer. "Evidence of Active Ooid Growth from Little Ambergris Cay, Turks and Caicos Islands, BWI." AGU fall meeting, 2016.

E A Orzechowski, J V Strauss, A H Knoll, W W Fischer, M Cantine, K Metcalfe, D P Quinn, N Stein, M L Gomes, H H Grotzinger, **U Lingappa**, S O'Reilly, L A Reidman, L Trower, J P Grotzinger. "Age and Construction of Little Ambergris Cay Bedrock Rim, Southeastern Caicos Platform, British West Indies." AGU fall meeting, 2016.

YoungSmith, D, M Brann, **U Lingappa**, E K Rankin-Gee, B Bebout, O Marcu. "The role of oxidative stress in the evolution of multicellularity." Search for Life Beyond the Solar System: Exoplanets, Biosignatures & Instruments conference, 2014.

Lingappa, U. "Anti-rabies drug discovery targeting host-virus protein-protein interactions." Bay Area Symposium on Viruses, 2013.

Lingappa, U F, X Wu, A Macieik, K Paulvannan, D Solas, A Atuegbu, K Tsutsui, V R Lingappa. "Molecular dissection of the timing and mechanism of action of a small molecule with robust activity against host factors that participate in rabies virus capsid assembly." International Conference on Antiviral Research, 2013.

Rankin-Gee E K, M Lera, **U Lingappa**, B Bebout, O Marcu. "Molecular and biochemical responses of *Volvox carteri* to oxidative stress." American Society for Cell Biology meeting, 2012.

Lingappa, V R, **U Lingappa**, E Borst, J Pajda, I Brown, S Long, B Rami, A Nalca, W I Lipkin, C Rupprecht, M Messerle, C R Hurt, W Hansen. "Overlap in virus specificity leads to the discovery of small molecules active against rabies virus, monkey pox virus, and cytomegalovirus." International Conference on Antiviral Research, 2010.