Signatures of Life in the Universe

The Second Annual Scialog Conference
June 9–12, 2022, Westward Look Resort
Tucson, Arizona

scialog2022®

HEISING-SIMONS FOUNDATION

RESEARCH CORPORATION *for* SCIENCE ADVANCEMENT

THE KAVLI FOUNDATION

Objectives

Engage in dialogue with the goal of accelerating high-risk/high-reward research.

Identify and analyze bottlenecks to advancing fundamental science for finding signatures of life in the Universe and develop approaches for breakthroughs.

Build a creative, better-networked, collegial community that is more likely to produce breakthroughs.

Form teams to write proposals to seed novel projects based on highly innovative ideas that emerge at the conference.

Most importantly, enjoy the discussions about where this field should go and how we can work together to get there.

Process

Brainstorming is welcome; don't be afraid to say what comes to mind.

Consider the possibility of unorthodox or unusual ideas without immediately dismissing them.

Discuss, build upon and constructively criticize each other's ideas –in a spirit of cooperative give and take.

Make comments concise to avoid monopolizing the dialogue.

Diversity, Inclusion and No Harassment

Research Corporation for Science Advancement fosters an environment for listening and considering new ideas from a diverse group, with respect for all participants without regard to gender, race, ethnicity, sexual orientation, age or any other aspect of how we identify ourselves other than as fellow scientists.

RCSA does not tolerate any form of harassment, which could include verbal or physical conduct that has the purpose or effect of substantially interfering with anyone else's participation or performance at this conference, or of creating an intimidating, hostile, or offensive environment; any such harassment may result in dismissal from the conference.

Read RCSA's Code of Conduct

From the President

Welcome to the 2022 *Scialog: Signatures of Life in the Universe* meeting, cosponsored by Research Corporation and the Heising-Simons Foundation, with additional support from The Kavli Foundation. This is the second annual Scialog meeting on this theme and the first in person. We hope the face-to-face exchanges, including informal times, will offer an even richer experience than last year's virtual meeting. We hope you find the experience of writing team proposals "on-the-spot" exciting and rewarding.

The goal of this Scialog is to catalyze theorists, computational and data scientists, observers and experimentalists across multiple disciplines to collaborate on developing new and innovative projects to accelerate fundamental science to drive advances in understanding the habitability of planets, the origins of life, and its signatures in the Universe.

Scialog's overarching purpose is to advance cutting-edge science of great significance to humanity by catalyzing innovative, basic research leading to fundamental discoveries. Our focus is on scientists in the early years of their independent careers. Through the unique Scialog process, we seek to lay the foundation for an ongoing, highly creative, cross-disciplinary community of scientists that will prove adept at identifying exciting areas for research advances for decades to come.

To that end, under the guidance of Program Directors **Richard Wiener**, **Andrew Feig**, and **Silvia Ronco** from Research Corporation, and **Emily Schaller** and **Gabriele Betancourt-Martinez** from the Heising-Simons Foundation, we hope you will be engaged in passionate discussions with colleagues, many of whom you will have met for the first time at Scialog. The process may even push you out of your comfort zone with the goal of stimulating new and better ideas. The result, we expect, will be a meeting unlike others that you attend. We are confident that you will find the next few days to be extremely worthwhile.

This is your opportunity to air that wild idea you have been reluctant to share with others, or to discuss a nagging hunch that does not yet have sufficient supporting data, or to take a leap on a high-impact/high-risk project instead of concentrating all your effort on somewhat more "incremental" studies. This is the time to come up with, and be open to, completely new ideas that may truly change humanity's understanding of our place in the Universe.

We hope this second meeting on this topic yields a crop of outstanding team proposals, which will make our job of determining who receives funding very challenging. I wish you every success in exploring new and compelling ideas over the next few days.

Have a terrific meeting!

Daniel Linzer
President
Research Corporation for Science Advancement

From the Program Director

This year Research Corporation and the Heising-Simons Foundation are cosponsoring the second annual meeting of *Scialog: Signatures of Life in the Universe*, with additional support from The Kavli Foundation. Research Corporation's highly interactive Scialog meetings have the goal of catalyzing new collaborations based on blue-sky ideas among Scialog Fellows who constitute a highly select group of exemplary early career U.S. and Canadian scientists. The emphasis is on dialogue, networking, and building new collaborations to pursue novel, high-risk discovery research.

Research Corporation and the Heising-Simons Foundation chose to focus on *Signatures of Life in the Universe* because we believe this critical area of science requires major breakthroughs in fundamental understanding of exoplanets, planetary science, and origins of life that will lead to a new era of discovery and a deeper appreciation for our place in the Universe. Just as firmly, we believe these breakthroughs can best be accelerated by scientists across multiple disciplines, including astrobiology, astronomy, biogeochemistry, microbiology, and planetary science, working collaboratively on novel, high-risk projects, particularly with theorists, observers, and experimentalists.

We have two outstanding speakers to set the stage for breakout discussions: **Tori Hoehler**, NASA Ames; and **Niki Parenteau**, NASA Ames.

We have a team of terrific discussion facilitators: **Rebecca Bernstein**, Carnegie Institution; **Jonathan Fortney**, University of California, Santa Cruz; **Tim Lyons**, University of California, Riverside; and **Vikki Meadows**, University of Washington, along with Tori and Niki.

Program representatives **Emily Schaller** and **Gabriele Betancourt-Martinez**, Heising-Simons Foundation; **Chris Martin**, Kavli Foundation; and **Buell Januzzi**, Steward Observatory, University of Arizona are looking forward to interacting with Fellows and Facilitators.

Scialog meetings focus on dialogue and team building with the goal of creating novel strategies and collaborative approaches. An important feature is the opportunity for Scialog Fellows to form teams and write proposals to pursue particularly creative ideas that emerge through the dialogue. We hope this competition is exciting, but regardless of which proposals are funded, the primary purpose is to catalyze a deeper and more meaningful exchange of ideas than ordinarily occurs at scientific conferences. Our intent is for this process to help participants gain new insights and connections that significantly advance fundamental science to enable major advances in understanding the origin of life on Earth and the search for life beyond our planet.

We hope each participant finds the Scialog experience of great value. Please do not hesitate to provide feedback on how to make the conference better. My fellow Program Directors, **Andrew Feig** and **Silvia Ronco**, the RCSA staff, and I are here to help make the meeting a great experience!

Richard Wiener
Senior Program Director
Research Corporation for Science Advancement

Conference Agenda
June 9–12, 2022

Thursday, June 9

2:00 pm	**Registration Opens**	Sonoran Foyer
2:00 – 5:00 pm	**Snacks and Informal Discussions**	Sonoran Foyer
5:00 – 6:30 pm	**Poster Session and Reception**	Javelina/Sonoran Terrace
6:00 – 6:30 pm	**Meeting for Discussion Facilitators**	Sonoran Ballroom
6:30 – 8:30 pm	**Dinner and Welcome** Dan Linzer, President, RCSA Gabriele Betancourt-Martinez and Emily Schaller, Program Officers, Heising-Simons Foundation Christopher Martin, Director, Physical Sciences, The Kavli Foundation **Conference Overview, Outcomes and Proposal Guidelines** Richard Wiener, Senior Program Director, RCSA **Introductions/Ice Breakers**	Sonoran Rooftop Patio
8:30 – 11:00 pm	**Starlight Cafe**	Sonoran Rooftop Patio

Friday, June 10

7:00 – 8:00 am	**Breakfast**	Sonoran Rooftop Patio
8:00 – 8:45 am	**Keynote Presentation** *Groundwork for Life Detection: New Challenges and New Opportunities* Tori Hoehler, NASA Ames	Sonoran Ballroom
8:45 – 9:00 am	**Breakout Session Overview and Instructions**	Sonoran Ballroom
9:00– 10:15 am	**Breakout Session I**	Mesa, Canyon, Palm, Desert, Sonoran Ballroom
10:15 – 10:35 am	**Report Out**	Sonoran Ballroom
10:35 – 11:15 am	**Conference Photo and Morning Break**	Stairs Near the Main Pool
11:15 – 11:45 am	**Mini Breakout Session I** (Fellows) **Facilitator Debrief** (Facilitators)	All Spaces Sonoran Ballroom
11:45 am – 1:00 pm	**Lunch**	Sonoran Rooftop Patio
1:00 – 1:45 pm	**Keynote Presentation** *Leveraging Research and Analysis to Maximize the Scientific Return of Exoplanet Missions* Niki Parenteau, NASA Ames Victoria Meadows, University of Washington	Sonoran Ballroom
1:45 – 3:00 pm	**Breakout Session II**	Mesa, Canyon, Palm, Desert, Sonoran Ballroom
3:00 – 3:20 pm	**Report Out**	Sonoran Ballroom
3:20 – 3:50 pm	**Mini Breakout Session II** (Fellows)	All Spaces
3:50 – 5:15 pm	**Afternoon Break**	Sonoran Foyer
5:15 – 6:45 pm	**Poster Session and Reception**	Javelina/Sonoran Terrace
6:45 – 7:45 pm	**Dinner**	Sonoran Rooftop Patio
7:45 – 8:30 pm	**2021 Team Award Panel Discussion**	Sonoran Ballroom
8:30 – 11:00 pm	**Starlight Cafe**	Sonoran Rooftop Patio

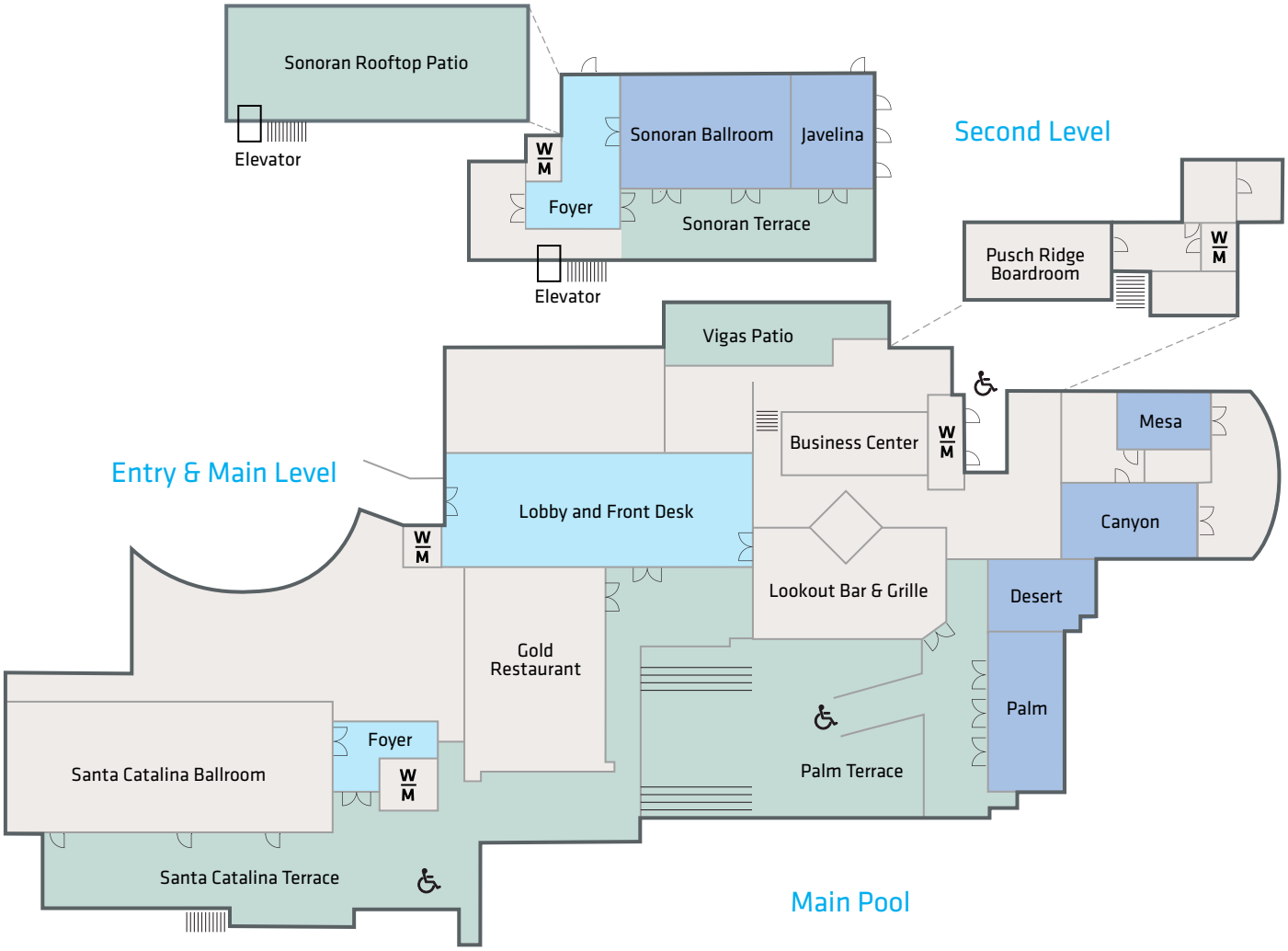
Saturday, June 11

6:45 – 7:30 am	**Optional Guided Nature Walk**	WL Trail–Meet on Vigas Patio
7:00 – 8:00 am	**Breakfast**	Sonoran Rooftop Patio
8:00 – 8:45 am	**2021 Team Award Panel Discussion**	Sonoran Ballroom
8:45 – 9:15 am	**Mini Breakout Session III** (Fellows)	All spaces
9:15 – 9:45 am	**Morning Break**	Sonoran Foyer
9:45 – 11:00 am	**Breakout Session III**	Mesa, Canyon, Palm, Desert, Sonoran Ballroom
11:00 – 11:20 am	**Report Out**	Sonoran Ballroom
11:20 – 11:50 am	**Mini Breakout Session IV** (Fellows)	All Spaces
	Facilitator/Guest Debrief	Sonoran Ballroom
11:50 – 1:00 pm	**Lunch**	Sonoran Rooftop Patio
1:00 – 5:45 pm	**Team Formation, Informal Discussions and Proposal Writing**	All spaces
5:45 – 6:30 pm	**Reception**	Sonoran Terrace
6:30 – 7:30 pm	**Dinner**	Sonoran Rooftop Patio
7:30 – 11:00 pm	**Starlight Cafe**	Sonoran Rooftop Patio

Sunday, June 12

6:30 – 7:30 am	**Breakfast**	Sonoran Rooftop Patio
7:30 – 11:00 am	**Presentation of Proposals**	Sonoran Ballroom
	Assessment Survey and Wrap-up	
11:00 – 12:00 pm	**Lunch** (available to go)	Sonoran Foyer

Westward Look Resort



Keynote Speakers

Groundwork for Life Detection: New Challenges and New Opportunities

Tori Hoehler
NASA Ames

Abstract: "*Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology 2023-2032*" places the search for evidence of life on Mars and the Ocean Worlds front and center in the next decade and beyond. In so doing, it levies significant responsibility to crystallize scientifically rigorous, concrete, and target-specific approaches to life detection. In parallel, the novelty of the measurements needed for life detection and the rigorous standards of evidence we will demand of them require new approaches in the conception, maturation, and deployment of instruments and instrument suites. I will offer my perspectives on the opportunities created by this "inflection point" in the trajectory of the field and hope to hear yours in return.

Leveraging Research and Analysis to Maximize the Scientific Return of Exoplanet Missions

Niki Parenteau
NASA Ames

Abstract: The remote detection of signs of life beyond our solar system is fast becoming a reality, and for the first time, astrobiology goals have driven the design of the astrophysics flagship mission in the *"Pathways to Discovery in Astronomy and Astrophysics for the 2020s"* decadal survey. While different science cases were considered in the mission concept studies, there still exists a high need for precursor science that will help inform mission designs and trades. In particular, opportunities exist for small scale research and analysis projects to address science gaps and to infuse knowledge from different chemical and biological disciplines, and to integrate lessons learned from the solar system in situ biosignature community. This is a chance to further incorporate astrobiology into the mission cycle, and perspectives on potential research topics will be given from a biological viewpoint to seed an open conversation on key research needs.

2022 Proposal Guidelines

Scialog: Signatures of Life in the Universe

1. Awards are intended to provide seed funding for teams of two to three Scialog Fellows formed at this conference for high-risk, high-impact projects.
2. The application package should be submitted as a single PDF file. Pages one and two should describe the project and role of each team member. A third page may be used for references. No budget is necessary.
3. Awards will be in the amount of $50K direct funding per team member, plus a small percentage for overhead. Grant duration will be one year.
4. No Scialog Fellow can be a member of more than two teams. If a Scialog Fellow is a member of two teams, other members of the teams must be different. No team can submit more than one proposal.
5. No Scialog Fellow who previously has won a Scialog SLU Collaborative Award can be a member of more than one team. The other team members must be different from the members of the previously awarded team (Applies to Years 2 and 3).
6. Teams cannot include members who have previously collaborated with one another. If you are unsure of your status (e.g., prospective team members were part of a large collaboration but did not significantly interact), please check for clarification with an RCSA program director.
7. Teams are encouraged (but not required) to:
   a. Include members with different research approaches and methods.
   b. Include members from different disciplines.
8. Proposals must be submitted electronically by **6:30 a.m. PST Sunday, June 12, 2022**. Instructions for submission will be provided at the meeting.
9. Awards are anticipated to start around **September 1, 2022**.

2021 Collaborative Awards

Can the Search for Oxygenated Atmosphere Biosignatures Lead to False Negatives?
Greg Fournier, Earth, Atmosphere and Planetary Sciences, Massachusetts Institute of Technology
Stilianos Louca, Biology, University of Oregon

Methane from Nontraditional Abiotic Sources and Potential for False Biosignature Positives
Jennifer Glass, Earth and Atmospheric Sciences, Georgia Institute of Technology
Edwin Kite, Geophysical Sciences, University of Chicago
Smadar Naoz, Physics and Astronomy, University of California, Los Angeles

How may Biosignatures in Icy Ocean Worlds be Affected by Plume Ejection?
Marc Neveu, Astronomy / Planetary Environments Laboratory,
NASA Goddard Space Flight Center / University of Maryland
Ziming Yang, Chemistry, Oakland University

Synthetic Mineral Geo-Electrodes for Detecting Life on Ocean Worlds
Laurie Barge, Planetary Sciences, NASA Jet Propulsion Laboratory
Jeffrey Marlow, Biology, Boston University

Long Term Controls on the Scope of Earth's Biosphere
Rika Anderson, Biology, Carleton College
Noah Planavsky, Geology and Geophysics, Yale

Water, Water Everywhere ... Drops to Drink but Nothing to Eat? A Model for the Evolution of Ocean Chemistry on Waterworlds
Bradford Foley, Geosciences, Pennsylvania State University
Kimberly Lau, Geosciences, Pennsylvania State University
Stephanie Olson, Earth, Atmospheric, and Planetary Science, Purdue University

Could Nucleic Acid-Based Life Survive on Oxygen-Rich M Dwarf Planets?
Aaron Engelhart, Genetics, Cell Biology, and Development, University of Minnesota
Meredith MacGregor, Astrophysical and Planetary Sciences, University of Colorado Boulder
Laura Schaefer, Geological Sciences, Stanford University

Stochastic Simulation of Evolving Planetary Biospheres
Edwin Kite, Geophysical Sciences, University of Chicago
Stilianos Louca, Biology, University of Oregon
Chris Reinhard, Earth and Atmospheric Sciences, Georgia Institute of Technology

Scialog Fellows

Zach Adam zadam2@wisc.edu
Geoscience, University of Wisconsin - Madison
I study the high energy organic synthesis and the micropaleontology of the earliest eukaryotes.

Laurie Barge laura.m.barge@jpl.nasa.gov
Planetary Sciences, NASA Jet Propulsion Laboratory / California Institute of Technology
I am interested in prebiotic chemistry and habitability on all planets that may have had water / rock reactions, including Mars, ocean worlds, and the early Earth. I'm interested in the probability of detecting life based on different origin of life planetary histories.

Paul Bracher paul.bracher@slu.edu
Chemistry, Saint Louis University
Our research is centered on elucidating how life can develop from abiotic mixtures of chemicals. We are particularly interested in the universal enrichment of potassium by life, the potential for life on Saturn's moon Titan, deliquescence, and organosulfur chemistry.

Jared Broddrick jared.t.broddrick@nasa.gov
Space Biosciences, NASA Ames Research Center
I'm interested in framing habitability from the perspective of electrons moving in the system.

Ilse Cleeves lic3f@virginia.edu
Astronomy, University of Virginia
Our group combines theoretical models of the chemical composition of planet-forming disks with observations of molecular gas and ice to understand what factors lead to efficient or inefficient planet formation.

Nick Cowan nicolas.cowan@mcgill.ca
Physics and Earth and Planetary Sciences, McGill University
My research group uses telescopes on the ground and in space, and the occasional model, to study the climate of extrasolar planets. Our strengths include mapping the atmospheres and surfaces of exoplanets, comparative planetology and volatile cycling.

Katherine de Kleer dekleer@caltech.edu
Division of Geological and Planetary Sciences, California Institute of Technology
Characterizing the surfaces, atmospheres, and interior processes of Solar System worlds from multi-wavelength telescope data.

Aaron Engelhart enge0213@umn.edu
Genetics, Cell Biology, and Development, University of Minnesota
@aaronengelhart studies the interactions between primitive biopolymers (biopolymers, especially nucleic acids, and lipid assemblies) and their geochemical environments in the emergence of life.

Brad Foley bjf5382@psu.edu
Geosciences, Pennsylvania State University
The long-term interior and tectonic evolution of rocky planets. How interior evolution influences the surface environment and ultimately habitability.

Kate Follette kfollette@amherst.edu
Physics and Astronomy, Amherst College
I de-twinkle stars in order to take pictures of baby planets.

Greg Fournier g4nier@mit.edu
Earth, Atmosphere and Planetary Sciences, Massachusetts Institute of Technology
I investigate the deep evolutionary history of microbial life and metabolisms using phylogenomics, to investigate the conditions and habitability of the Early Earth.

Jennifer B. Glass jennifer.glass@eas.gatech.edu
Earth and Atmospheric Sciences, Georgia Institute of Technology
Jennifer Glass studies chemical and enzymatic mechanisms underpinning cycling of greenhouse gases, particularly methane and nitrous oxide. With Scialog funding, Glass collaborates with Smadar Naoz and Edwin Kite to explore abiotic methane formation on carbon-rich planets.

Scialog Fellows Continued

Heather V. Graham heather.v.graham@nasa.gov
Astrochemistry Laboratory,
NASA Goddard Space Flight Center
Organic geochemist focused on biosignature definition that starts with first principles and the fundamental effects that distinguish life from the abiotic. Profoundly curious about the nature, evolution, the history of life, and the vast connections within biological systems.

Christopher Hamilton chamilton@arizona.edu
Lunar and Planetary Laboratory, University of Arizona
Planetary volcanology, terrestrial analog studies, planetary surface exploration, and habitability.

Sonny Harman sonny.harman@nasa.gov
Planetary Systems Branch,
NASA Ames Research Center
One of the best ways to find life on other worlds is to look at their atmospheres—but they are affected by interactions with the planet itself and the host star. I use 1-D & 3-D numerical models to better understand those interactions and how they impact what we'll see.

Keith Hawkins keithhawkins@utexas.edu
Astronomy, University of Texas at Austin
I am interested in the chemodynamical nature of our Galaxy and its stars. I am particularly interested in the chemistry of exoplanet host stars and the Galactic habitable zone.

Amy Hofmann amy.e.hofmann@jpl.nasa.gov
Science Division, Planetary Sciences Section,
NASA Jet Propulsion Laboratory
Isotope geo/cosmochemist, equal-opportunity planetary scientist, mission concept developer and flight instrument designer.

Sarah Hörst sarah.horst@jhu.edu
Earth and Planetary Science, Johns Hopkins University
I am interested in understanding the role of atmospheres in the origin, evolution, and detection of life. I want to know how far organic chemistry proceeds in the absence of life in atmospheres.

Dan Huber huberd@hawaii.edu
Institute for Astronomy, University of Hawaii
Stellar astrophysics, exoplanet discovery and characterization, galactic stellar populations.

Edwin S. Kite kite@uchicago.edu
Geophysical Sciences, University of Chicago
Early Mars, small-radius exoplanets, icy moons.

Joshua Krissansen-Totton joshkt@uw.edu
Earth and Space Sciences, University of Washington
I am interested in the atmospheric evolution of terrestrial planets, with a focus on the questions most relevant to understanding habitability and biosignatures.

Fang Liu fang.liu@emory.edu
Chemistry, Emory University
My lab develops quantum chemistry and machine learning methods to provide a faster and deeper understanding of chemical reactions related to the formation of life, especially those at high pressure or triggered by light.

Meredith MacGregor
meredith.macgregor@colorado.edu
Astrophysical and Planetary Sciences,
University of Colorado Boulder
My research program leverages multi-wavelength astronomical observations to explore the formation and potential habitability of planetary systems. I'm especially interested in the interplay between all parts of planetary systems—disks, stars, and planets.

Shannon MacKenzie shannon.mackenzie@jhuapl.edu
Planetary Exploration, Johns Hopkins University,
Applied Physics Laboratory
I study icy satellites: how their surfaces and interiors evolve and what that history means for habitability. I am a Co-Investigator on Dragonfly and recently led a mission concept study for a flagship to search for signs of life at Enceladus, Enceladus Orbilander.

Jeffrey Marlow jjmarlow@bu.edu
Biology, Boston University
How do complex microbial communities interact with their microscale environments—both biotic and abiotic—to build the biosphere we see today?

Scialog Fellows Continued

Sarah Maurer smaurer@ccsu.edu
Chemistry and Biochemistry,
Central Connecticut State University
Chemical evolution to form protocells and the transition from chemical to biological systems using interdisciplinary, collaborative, and inclusive approaches.

Stephanie Olson stephanieolson@purdue.edu
Earth, Atmospheric, and Planetary Science,
Purdue University
I study the history of life on Earth, planetary habitability, and exoplanet biosignatures.

Joe O'Rourke jgorourk@asu.edu
Earth and Space Exploration, Arizona State University
How processes in the deep interiors of planetary bodies made of rock, metal, and/or ice help keep their (near-) surfaces habitable for billions of years ... or not.

Frances Rivera-Hernández friverah@gatech.edu
Earth and Atmospheric Sciences,
Georgia Institute of Technology
My research is mainly focused on studying sedimentary deposits and terrains to constrain the hydrology, climate, and habitability of planetary bodies.

Leslie A. Rogers larogers@uchicago.edu
Astronomy and Astrophysics, University of Chicago
I study the formation, interior structure, and evolution of exoplanets. I aim to elucidate the physics of planet interiors, to discover bulk composition trends in the growing census of known exoplanets, and to connect these trends back to distinct planet formation pathways.

Eddie Schwieterman eschwiet@ucr.edu
Earth and Planetary Sciences,
University of California, Riverside
I'm interested in characterizing Earth-sized planets in the habitable zones of their host stars, especially in search of remotely detectable biosignatures. I use computational methods including climate, photochemical, and radiative transfer modeling of planetary atmospheres.

Amanda Stockton astockto@gatech.edu
Chemistry and Biochemistry,
Georgia Institute of Technology
My group explores big questions of astrobiology: how does life begin and evolve, what are the limits of life on Earth, and is there life beyond Earth? We use microfluidics as our main tool in addressing these questions.

Chen Sun csun@jsg.utexas.edu
Geological Sciences, The University of Texas at Austin
Interested in the origin and distribution of volatiles, influences of volatile (re)cycling on planetary magmatism and habitability, generation/differentiation of various types of magmas, and planetary differentiation (e.g., formation of crust, lithosphere, and core).

Johanna Teske jteske@carnegiescience.edu
Earth and Planets Laboratory,
Carnegie Institution for Science
I am an observational astronomer interested in understanding the origin and scope of exoplanet compositional diversity, particularly for 1-3 Rearth planets, and the resulting implications for habitability.

Andrew Vanderburg andrewv@mit.edu
Physics, Massachusetts Institute of Technology
Exoplanet detection and characterization, aided by novel data analysis methods.

Ji Wang wang.12220@osu.edu
Astronomy, The Ohio State University
I am an astronomer looking for biosignatures in the atmospheres of exoplanets with current and future telescopes; I am also developing novel devices to achieve the goal of biosignature detection.

Ziming Yang zimingyang@oakland.edu
Chemistry, Oakland University
Organic-inorganic interactions in hydrothermal systems.

Discussion Facilitators

Rebecca Bernstein rab@carnegiescience.edu
Carnegie Observatories,
Carnegie Institution for Science
Galaxy evolution, stellar abundances, design and development of large telescopes and spectrographs.

Jonathan Fortney jfortney@ucsc.edu
Astronomy and Astrophysics,
University of California, Santa Cruz
Models of planetary atmospheres, interiors, and thermal evolution. Exoplanet/solar system synergies. Exoplanet/brown dwarf synergies. Connecting planetary composition to planet formation. Characterizing transiting and directly imaged planets.

Tori Hoehler tori.m.hoehler@nasa.gov
Exobiology Branch, NASA Ames Research Center
Tori Hoehler studies bioenergetics in application to ecology, habitability, and the detectability of life.

Tim Lyons timothy.lyons@ucr.edu
Earth and Planetary Sciences,
University of California, Riverside
Geobiology, astrobiology, biogeochemistry, trace metal and isotope cycles and ecological relationships, co-evolving environments and life over billions of years of Earth history, and the search for life beyond our solar system.

Victoria Meadows meadows@uw.edu
Astronomy, University of Washington
Dr. Victoria Meadows leads the NASA Virtual Planetary Laboratory, and uses computer modeling and data from Solar System planets and early Earth analogs to determine how to recognize whether a distant extrasolar planet is able to harbor life or has life on it.

Niki Parenteau mary.n.parenteau@nasa.gov
Exobiology Branch, NASA Ames Research Center
I characterize in situ and remotely detectable biosignatures relevant to understanding the early evolution of life on Earth, and life detection on Mars, ocean worlds, and exoplanets.

Guests

Gabriele Betancourt-Martinez
gbetancourt@hsfoundation.org
Science, Heising-Simons Foundation

Buell T. Jannuzi buelljannuzi@arizona.edu
Steward Observatory and Department of Astronomy,
University of Arizona
Astrophysics, New Instrumentation/Observatories Required to enable the detection of life on other planets.

Christoper Martin cmartin@kavlifoundation.org
Physical Sciences, The Kavli Foundation
Advancing science for the benefit of humanity.

Emily Schaller eschaller@hsfoundation.org
Science, Heising-Simons Foundation
I am a planetary astronomer who is now a Science Program Officer at the Heising-Simons Foundation.

Emma Zajdela emmazajdela@u.northwestern.edu
Applied Math, Northwestern University

Notes

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Notes

Heising-Simons Foundation

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