Signatures of Life in the Universe

The Third Annual Scialog Conference
March 16–19, 2023

scialog2023®

HEISING-SIMONS FOUNDATION

THE KAVLI FOUNDATION

RESEARCH CORPORATION *for* SCIENCE ADVANCEMENT

Scialog: Signatures of Life in the Universe

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, ability 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

Scialog: Signatures of Life in the Universe

From the President

Welcome to the 2023 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 third annual Scialog meeting on this theme and the second in person. 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, **Emily Schaller** and **Gabriele Betancourt-Martinez** from the Heising- Simons Foundation, and **Greg Mack** from the Kavli 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 third 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 an outstanding speaker to set the stage for breakout discussions: **Lisa Kaltenegger**, Cornell University.

We have a team of terrific discussion facilitators: **Daniel Apai**, University of Arizona; **Jonathan Fortney**, University of California, Santa Cruz; **Tori Hoehler**, NASA Ames; **Tim Lyons**, University of California, Riverside; **Niki Parenteau**, NASA Ames; **Beth Willman**, LSSTC; and Lisa Kaltenegger.

Program representatives who are looking forward to interacting with Fellows and Facilitators include: **Emily Schaller** and **Gabriele Betancourt-Martinez**, Heising-Simons Foundation; **Greg Mack**, Kavli Foundation; and **Buell Januzzi**, University of Arizona.

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
March 16 – 19, 2023

Thursday, March 16

2:00 pm	**Registration Opens**	Sonoran Foyer
2:00 – 5:00 pm	**Snacks & 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 – 7:30 pm	**Dinner**	Sonoran Rooftop Patio
7:30 – 8:30 pm	**Welcome** Dan Linzer, President, RCSA Gabriele Betancourt-Martinez and Emily Schaller, Program Officers, Heising-Simons Foundation Gregory Mack, Science Program Officer, The Kavli Foundation **Conference Overview, Outcomes and Proposal Guidelines** Richard Wiener, Senior Program Director, RCSA **Introductions/Ice Breakers**	Sonoran Ballroom
8:30 – 11:00 pm	**Starlight Cafe**	Sonoran Rooftop Patio

Friday, March 17

7:00 – 8:00 am	**Breakfast**	Sonoran Rooftop Patio
8:00 – 8:45 am	**Keynote Presentation** *Other Earth(s) – and Earth seen as an Alien Planet* **Lisa Kaltenegger, Cornell University**	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 Meeting**	All Spaces Sonoran Ballroom
11:45 – 1:00 pm	**Lunch**	Sonoran Rooftop Patio
1:00 – 2:15 pm	**Breakout Session II**	Mesa, Canyon, Palm, Desert, Sonoran Ballroom
2:15 – 2:35 pm	**Report Out**	Sonoran Ballroom
2:35 – 3:05 pm	**Mini Breakout Session II** (Fellows)	All spaces
3:05 – 5:15 pm	**Afternoon Break, Informal Discussions and Leisure Time**	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	**Previous Team Awards Discussion**	Sonoran Ballroom
8:30 – 11:00 pm	**Starlight Cafe**	Sonoran Rooftop Patio

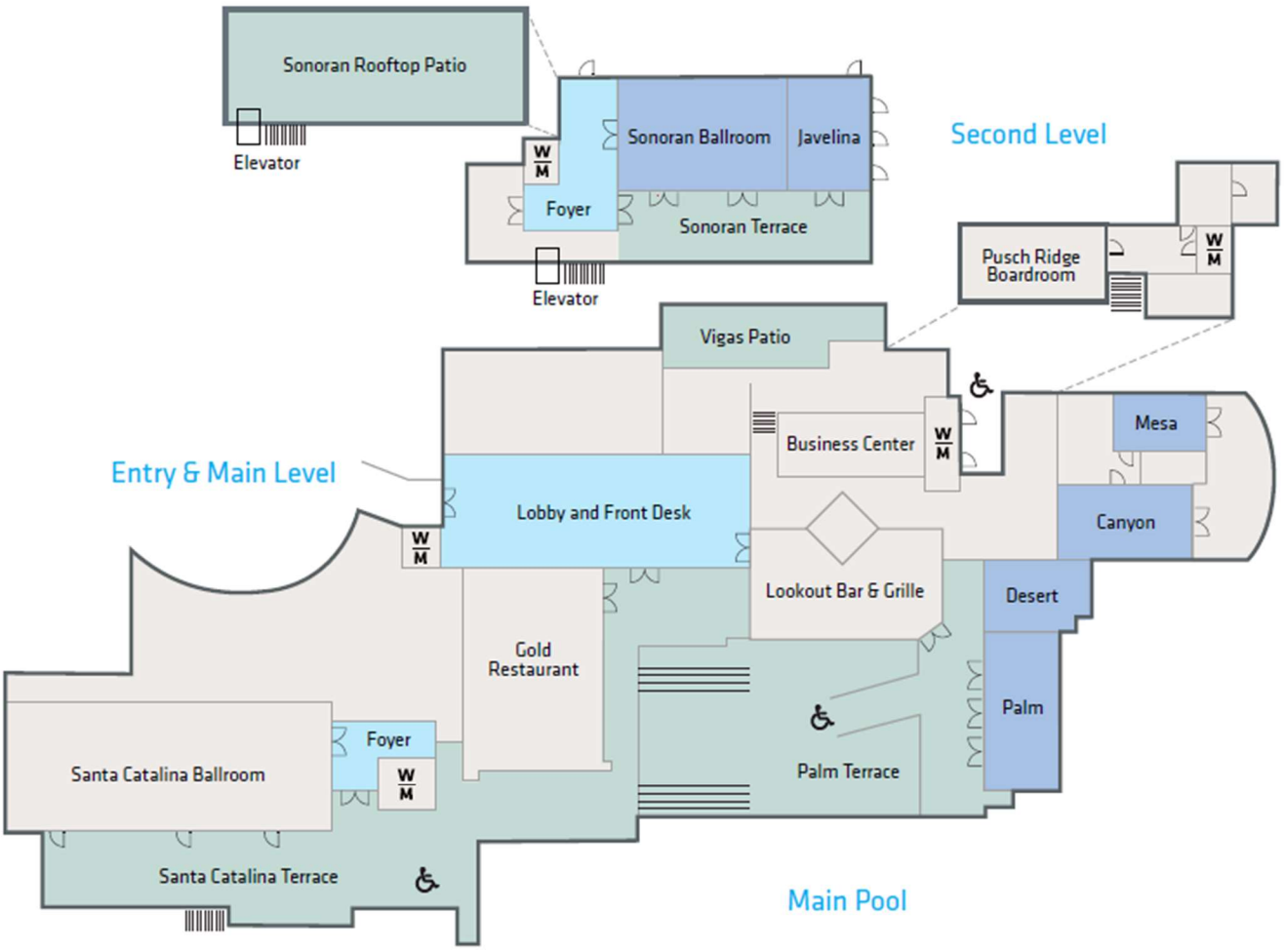
Saturday, March 18

6:45 – 7:30 am	**Optional Guided Nature Walk**	Meet on Vigas Patio
7:00 – 8:00 am	**Breakfast**	Sonoran Rooftop Patio
8:00 – 8:45 am	**Previous Team Awards 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 and Funding Partners Discussion	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, March 19

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 Speaker

Other Earth(s) – and Earth Seen as an Alien Planet

Lisa Kaltenegger
Director of the Carl Sagan Institute at Cornell University, Ithaca, USA

Abstract:

With more than 5200 exoplanets detected and a few dozen of those having the potential to be habitats, the search for life in the cosmos is entering an exciting new phase.

Looking at our own “Pale Blue Dot” – its change through time, the diversity of its biosphere – gives us a key for our search. In this talk, I will discuss some of the newest results and ideas in this ongoing adventure of humankind.

Email: lkaltenegger@astro.cornell.edu

Website: https://carlsaganinstitute.cornell.edu/

Lisa Kaltenegger is the Director of the Carl Sagan Institute to Search for Life in the Cosmos at Cornell and Associate Professor in Astronomy. Lisa earned a degree in astrophysics in 1999 from Karl Franzens University in Graz, Austria; a master’s in physics and engineering in 2001 from the Graz University of Technology; and a doctorate in astrophysics in 2005 from Karl Franzens University. She is a pioneer and world-leading expert in modeling potential habitable worlds and their detectable spectral fingerprint. Her research focuses on rocky planets circling other stars, with a focus on potentially Earth-like exoplanets in the Habitable Zone. Lisa Kaltenegger serves among others on the National Science Foundation's Astronomy and Astrophysics Advisory Committee (AAAC), and on NASA senior review of operating missions. She is a Science Team Member of NASA's TESS Mission as well as the NIRISS instrument on JWST. Lisa was named one of America’s Young Innovators by Smithsonian Magazine, an Innovator to Watch by TIME Magazine and was selected as one of the European Commission’s Role Models for Women in Science and Research. Among her international awards are the Invited Discourse lecture at the IAU General Assembly in Hawaii, the Heinz Meier Leibnitz Prize for Physics of Germany, the Doppler Prize for Innovation in Science of Austria, and the Barry-Jones Inauguration Award of the Royal Astrobiology Society and Open University in Britain.

2022 Team Awards

Enceladus Plume Chemistry: From Lab to Telescope
Katherine de Kleer, Geological and Planetary Sciences, Caltech
Sarah Hörst, Earth and Planetary Science, Johns Hopkins University
Sarah Maurer, Chemistry and Biochemistry, Central Connecticut State University

Computational and Experimental Investigations of Martian Brines as Prebiotic Environments
Aaron Engelhart, Genetics, Cell Biology, and Development, University of Minnesota
Fang Liu, Chemistry, Emory University

From Exoplanets to Microbes: Using Astronomical Image Processing Techniques to Detect Microbes in Astrobiological Contexts
Kate Follette, Physics and Astronomy, Amherst College
Jeffrey Marlow, Biology, Boston University

Brimstone Life: Hypothetical Sulfur Worlds and Their Possible Biosignatures
Paul Bracher, Chemistry, Saint Louis University
Ilse Cleeves, Astronomy, University of Virginia

Methylated Organometallic Gases as Potential Biosignatures
Eddie Schwieterman, Earth and Planetary Sciences, University of California, Riverside
Ziming Yang, Chemistry, Oakland University

Volatile Reservoirs and the Habitability of M-Earths
Nick Cowan, Earth & Planetary Sciences and Physics, McGill University
Joseph O'Rourke, Earth and Space Exploration, Arizona State University
Leslie Rogers, Astronomy & Astrophysics, University of Chicago
Chenguang Sun, Geological Sciences, University of Texas at Austin

Assessing False Positive Biosignatures and Prebiotic Synthesis Generated by Two Candidate Autocatalytic Reaction Sets of Aqueous Sulfur
Zachary Adam, Geoscience, University of Wisconsin – Madison
Fang Liu, Chemistry, Emory University

Mars Sample Return: Connecting Martian Environmental Geochemistry to Returned Samples
Laurie Barge, Planetary Sciences, NASA Jet Propulsion Laboratory
Frances Rivera-Hernández, Earth and Atmospheric Sciences, Georgia Institute of Technology

2023 Proposal Guidelines

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.

6. Scialog Fellows who have previously won two Scialog SLU Collaborative Awards are not eligible to be funded members of a team, but they can participate as a non-funded team member.

7. 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.

8. Teams are encouraged (but not required) to:
    a. Include members with different research approaches and methods.
    b. Include members from different disciplines.

9. Proposals must be submitted electronically by **6:30 a.m. PST Sunday, March 19, 2023**. Instructions for submission will be provided at the meeting.

10. Awards are anticipated to start around **July 1, 2023**.

Scialog Fellows

Jaehan Bae jbae@ufl.edu
Astronomy, University of Florida
My research focuses on understanding planet formation by studying young, forming planets. I make theoretical predictions for observable signatures planets produce in planet-forming disks and use observational data and machine learning techniques to search for such signatures.

Sarah Ballard sarahballard@ufl.edu
Astronomy, University of Florida
My research program focuses upon patterns of planetary formation and evolution around small stars, including the raw occurrence of planets, their dynamical properties, and the nature of their atmospheres.

Daniella Bardalez Gagliuffi dbardalezgagliuffi@amherst.edu
Physics and Astronomy, Amherst College
I am interested in identifying observables that can help us trace back the formation and evolution history of planetary systems. To this end, I use a combination of techniques to characterize planetary orbits and a data-driven approach to model their atmospheres.

Laurie Barge laura.m.barge@jpl.nasa.gov
Planetary Sciences / Astrobiology, NASA Jet Propulsion Laboratory
I am interested in assessing the potential for prebiotic chemistry and life on other worlds (Mars and ocean worlds); in particular, understanding how complex organic chemistry can be driven by minerals in water/rock reaction systems.

Jenny Bergner jbergner@berkeley.edu
Chemistry, University of California, Berkeley
I am interested in the chemistry at play in planet-forming environments, and how this shapes the composition and potential habitability of newly formed planets.

Maitrayee Bose mbose2@asu.edu
School of Earth and Space Exploration, Arizona State University
I investigate the origin, nature and distribution of elements (e.g., H, Li, B, C, N, O, P, S) in meteorite and comet samples, which are building blocks of planets. I am also interested in understanding water-rock reactions in ocean worlds.

Paul Bracher paul.bracher@slu.edu
Chemistry, Saint Louis University
Our research at SLU 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.

Scialog Fellows Continued

Morgan Cable morgan.l.cable@jpl.nasa.gov
Planetary Science, NASA Jet Propulsion Laboratory/California Institute of Technology
My research focuses on organic and biomarker detection via in situ and remote sensing. Currently I study the unique organic chemistry of Titan, hypervelocity sampling at Enceladus, and conducts field work in extreme places on Earth.

Ilse Cleeves lic3f@virginia.edu
Astronomy, University of Virginia
How creative can nature be? Planet-forming environments display a wide array of chemical species in gas and solid phase. Depending on when planets form, many outcomes are possible. Mostly working in data+models, but sometimes we also dabble in lab experiments.

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

Solange Duhamel duhamel@arizona.edu
Molecular and Cellular Biology, University of Arizona
Microbial life in nutrient and energy limited environments as analog for life beyond Earth.

Aaron Engelhart enge0213@umn.edu
Genetics, Cell Biology, and Development, University of Minnesota
My research group performs laboratory-based investigations of early informational biopolymers (RNA, DNA, peptides, and precursor polymers) and compartments (liposomes and immobilized polymers) and their interactions in early life on Earth, Mars, and elsewhere.

Brad Foley bjf5382@psu.edu
Geosciences, Pennsylvania State University
I am a geophysicist and planetary scientist interested in the long-term interior and tectonic evolution of rocky planets. Specifically I study how interior evolution and tectonic state influences volatile cycling and habitability.

Kate Follette kfollette@amherst.edu
Physics and Astronomy, Amherst College
I'm an observational astronomer interested in the physics of planet formation and growth. I use high-contrast imaging techniques to find and characterize young (proto)planets. This includes studying their interaction with the dusty debris surrounding young stars.

Greg Fournier g4nier@mit.edu
Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology
I study microbial evolution using phylogenetics, and am interested in the co-evolution and timing of microbial metabolisms and the earth system, pre-LUCA history of cellular life, and the origins of translation.

Scialog Fellows Continued

Peter Gao pgao@carnegiescience.edu
Earth and Planets Laboratory, Carnegie Institution for Science
I am interested in the physics, chemistry, and observability of planetary atmospheres and how they depend on planetary interiors and planet formation and evolutionary processes.

Chris Glein christopher.glein@swri.org
Space Science Division, Southwest Research Institute
My chief interests are exploration to assess habitability and search for life on ocean worlds, compositions of subsurface oceans on icy worlds, origin of volatiles and planetary atmospheres in the solar system, and the role of abiotic organic geochemistry in the search for life.

Heather Graham heather.v.graham@nasa.gov
Astrochemistry Division, NASA Goddard Space Flight Center
I am an organic geochemist specializing in tools and techniques for biosignature and life detection. My work focuses on developing new metrics for life detection that rely on general theories of biology rather than specific analogous terrestrial features.

Christopher Hamilton chamilton@arizona.edu
Lunar and Planetary Laboratory, University of Arizona
Planetary Volcanism, Impact Cratering, and Astrobiology

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
Galactic and stellar astronomy with an emphasis on stellar chemodynamics

Amy Hofmann amy.e.hofmann@jpl.nasa.gov
Planetary Science, Jet Propulsion Laboratory/California Institute of Technology
Isotope geochemist interested in the fundamental chemical physics that govern isotopic fractionation. My research combines laboratory experiments, analytical measurements, and computational chemistry to investigate various processes and the isotopic signatures that they impart.

Sarah Hörst sarah.horst@jhu.edu
Earth and Planetary Sciences, Johns Hopkins University
I am interested in the complex organic chemistry occurring in the atmosphere of Titan. I am also interested in complex organics in the solar system (and the universe!), whether they are produced in an atmosphere or on a surface.

Scialog Fellows Continued

Renyu Hu renyu.hu@jpl.nasa.gov
Astrophysics & Space Sciences, Jet Propulsion Laboratory
Atmospheres of planets and exoplanets from Earth-sized to Jupiter-sized. Remote sensing of exoplanets using transit spectroscopy, phase curve mapping, and direct imaging. Evolution of planetary atmospheres and isotope geochemistry. Search for habitable planets and biosignatures.

Nagissa Mahmoudi nagissa.mahmoudi@mcgill.ca
Earth & Planetary Sciences, McGill University
I work at the interface of microbiology and geochemistry to decipher the role that microbes play in global biogeochemical cycles that support life on Earth.

Sarah Maurer smaurer@ccsu.edu
Chemistry and Biochemistry, Central Connecticut State University
I study prebiotic chemistry, including understanding how non-biological organic mixtures change through energetic processes, self-assemble, and the functions these mixtures can achieve with a specific interest in membrane formation.

Smadar Naoz snaoz@astro.ucla.edu
Physics and Astronomy, University of California, Los Angeles
I am a theoretical astrophysicist working in the field of dynamics. My research covers a wide range of topics, from the first galaxies to the dynamics and gravitational interactions of compact objects, stars, and planets.

Marc Neveu marc.f.neveu@nasa.gov
Astronomy / Planetary Environments Laboratory, University Maryland/NASA Goddard Space Flight Center
I seek to understand whether oceans on other worlds harbor life by simulating their physics and chemistry, through laboratory studies, and by developing future space missions to explore these ocean worlds.

Stephanie Olson stephanieolson@purdue.edu
Earth, Atmospheric, and Planetary Science, Purdue University
I use 3D climate and (bio)geochemical models to explore habitability and biosignatures. I am particularly interested in factors influencing the physiochemical properties of marine habitats and biospheric productivity, both of which affect the production and fate biosignatures.

Joe O'Rourke jgorourk@asu.edu
School of Earth and Space Exploration, Arizona State University
My research is centered on understanding how processes deep within planets control surface conditions over geologic time. I'm interested in any world made of ice, rock, and metal—Earth, Moon, Venus, Mars, Europa, Titan, protoplanets, exoplanets, etc.

Sukrit Ranjan sukrit@arizona.edu
Lunar & Planetary Laboratory/Department of Planetary Sciences, University of Arizona
Modeling the surface-atmosphere system of abiotic rocky exoplanets, with emhasis on early Earth and habitable exoplanets. Astrobiology, Photochemistry, Prebiotic Chemistry, Early Earth, Exoplanets

Scialog Fellows Continued

Becky Rapf rrapf@trinity.edu
Chemistry, Trinity University
I am interested in how complex aqueous environments affect the chemistry leading to life, and the role of air-water interfaces and photochemistry in controlling both planetary atmospheres and the production of biomolecules.

Morgan Raven raven@ucsb.edu
Earth Science, University of California, Santa Barbara
I am a biogeochemist and geobiologist, focusing on interactions between the sulfur cycle and organic matter in habitable environments over human to geological timescales.

Malena Rice malena.rice@yale.edu
Astronomy, Yale University
I am broadly interested in the formation and dynamical evolution of planetary systems, with a particular emphasis on examining the joint constraints drawn from studies of planets, stars, and minor planets.

Tyler Robinson tdrobin@arizona.edu
Lunar and Planetary Laboratory, University of Arizona
I am interested in the detection and characterization of habitable and inhabited environments, planetary atmospheres, and the design of exoplanet-focused space missions.

Leslie Rogers larogers@uchicago.edu
Astronomy & Astrophysics, University of Chicago
I use numerical models of planet interior structure and evolution to understand the rich physics governing planet interiors, to discover bulk composition trends in the growing census of known exoplanets, and to connect these composition trends back to planet formation pathways.

Sarah Rugheimer srugheim@yorku.ca
Physics and Astronomy, York University
I am work on how we can observe a robust biosignature in an exoplanet atmosphere. My focus has been on how spectral type and stellar activity will influence photochemistry and the detectable spectral features in terrestrial planets.

Colette Salyk cosalyk@vassar.edu
Physics and Astronomy, Vassar College
I study the formation of planets using ground- and space-based telescopes. In particular, I'm interested in understanding what aspects of the planet formation process are universal, vs. which result in the diversity of (exo)planets we know of today.

Laura Schaefer lkschaef@stanford.edu
Earth and Planetary Sciences, Stanford University
I study the early evolution of rocky planet atmospheres and interiors and their evolution through time.

Scialog Fellows Continued

Eddie Schwieterman eschwiet@ucr.edu
Earth and Planetary Sciences, University of California, Riverside
I simulate the climate, atmospheric chemistry, and spectral appearance of terrestrial planets in order to assess their habitability and potential biosignatures.

Jake Simon jbsimon@iastate.edu
Physics & Astronomy, Iowa State University
I simulate the formation of planetesimals in planet-forming disks and compare the properties of these planetesimals with observations from the Solar System. I also study the gas and dust dynamics in planet-forming disks to understand the very earliest stages of planet formation.

Amanda Stockton astockto@gatech.edu
Chemistry and Biochemistry, Georgia Institute of Technology
My work focuses on developing methods and equipment for field analysis. This includes instrument development, including for kinetic penetrator probes and under-ice vehicles. Field work has taken my group to volcanoes, hydrothermal systems deserts, and hypersaline lakes.

Chenguang Sun csun@jsg.utexas.edu
Geological Sciences, University of Texas at Austin
Magmatism and habitability, generation/differentiation of various types of magmas, and planetary differentiation (e.g., formation of crust, lithosphere, and core)

Zoe Todd ztodd@uw.edu
Chemistry / Astronomy, University of Wisconsin–Madison
I am interested in understanding how astronomical and planetary environments may allow for the chemical/biochemical origins and evolution of life.

Jason Wang jason.wang@northwestern.edu
Physics and Astronomy, Northwestern University
I study planets by directly imaging them, watching them orbit, and measuring their compositions. I also develop new instrumentation that has the potential to study terrestrial planets in the habitable zones of other stars in the future.

Songhu Wang sw121@iu.edu
Astronomy, Indiana University
My research aims to comprehend the process of planet formation by analyzing the characteristics and distribution of exoplanets

Amy Williams amywilliams1@ufl.edu
Geological Sciences, University of Florida
My research interests include the formation and preservation of physical and molecular biosignatures in terrestrial environments as an analog for putative biosignature formation on Mars. I am a member of the NASA Mars Curiosity and Perseverance rover science teams.

Scialog Fellows Continued

Xinting Yu xinting.yu@utsa.edu
Physics and Astronomy, University of Texas at San Antonio
The main focus of my research is characterizing the behavior of planetary materials using experimental material science techniques. My experimental works also interface theoretical modeling to understand atmospheric/surface processes in and outside the solar system.

Discussion Facilitators

Daniel Apai apai@arizona.edu
Astronomy and Planetary Sciences, University of Arizona
Astrobiology, planetary atmospheres and habitability, strategy and technology for exoplanet surveys

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
Microbial ecology and bioenergetics, habitability, life detection

Lisa Kaltenegger lkaltenegger@astro.cornell.edu
Astronomy and Planetary Science, Carl Sagan Institute at Cornell University
Are we alone in the cosmos? My research focuses on new worlds orbiting other stars, especially rocky planets and super-Earths in the Habitable Zone. I model potentially habitable worlds and their detectable spectral fingerprint (atmospheric modeling, machine learning, lab work).

Tim Lyons timothy.lyons@ucr.edu
Earth and Planetary Sciences, University of California, Riverside
Primary research interests include marine and lacustrine biogeochemistry, astrobiology, geobiology, ancient climate, co-evolution of Earth's early life and environments, and the search for life beyond our solar system.

Niki Parenteau mary.n.parenteau@nasa.gov
Exobiology Branch, NASA Ames Research Center
Research interests: Microbial biosignatures (in situ: microfossils, lipid biomarkers, C isotopes; remotely detectable: biogenic gases, reflectance spectra), microbial ecology, phototroph physiology, geobiology, astrobiology.

Beth Willman Bwillman@lsstc.org
LSSTC
Astrophysics with wide-field surveys, near-field cosmology, dark matter

Guests

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Complex systems. Self organization.

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Development of observational capabilities/facilities that will enable the search for signs/evidence of life beyond the planet Earth.

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Gregory Mack is the science program officer for astrophysics at The Kavli Foundation. He has held roles at the National Academies, American Physical Society, NSF, and Ohio Wesleyan University. His Ph.D. from The Ohio State University is in theoretical particle astrophysics.

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Science, Heising-Simons Foundation
I am a planetary astronomer and Science Program Officer at the Heising-Simons Foundation.

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My research focuses on mathematical models of complex systems, with applications to topics including scientific collaboration at conferences, fashion trends, and coupled oscillators.

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