Signatures of Life in the Universe

The First Annual Scialog Conference
June 10–11, 2021

scialog2021®

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.

From the President

Welcome to the 2021 *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 first of three Scialog meetings on this theme.

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 over-arching 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** (Research Corporation) and **Joe Marschall** (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 the world.

We hope this first 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 first 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 be accelerated by Earth and planetary scientists, chemists and physicists, astronomers and astrobiologists, microbiologists and biochemists, and computer and data scientists working collaboratively on novel, high-risk projects, particularly with theorists, observers, and experimentalists combining efforts.

We have outstanding keynote speakers to set the stage for breakout discussions:

Tim Lyons, University of California, Riverside
Victoria (Vikki) Meadows, University of Washington

We have a team of terrific discussion facilitators: **Daniel Apai** (University of Arizona), **Shawn Domagal-Goldman** (NASA Goddard), **Tori Hoehler** (NASA Ames), **Lisa Kaltenegger** (Cornell University), **Niki Parenteau** (NASA Ames), **Dimitar Sasselov** (Harvard University), and **Anat Shahar** (Carnegie Institution), along with **Tim** and **Vikki**.

Program representatives **Cyndi Atherton** and **Joe Marschall** (Heising-Simons Foundation), **Chris Martin** and **David Steuerman** (Kavli Foundation), **Jamie Bender** (Brinson Foundation), **Paula Driedger** (CIFAR), and **France Cordova**, **Diane Matar**, and **Elizabeth Weiss** (Science Philanthropy Alliance) 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 Weiner
Program Director
Research Corporation for Science Advancement

Conference Agenda (Optional activities in green)
June 10-11, 2021

Thursday, June 10 *(all times listed in Pacific time zone)*

8:00 – 8:30 am	**Early login, Informal dialog, BYO breakfast/lunch**	Zoom Main Room & Breakout Rooms
8:30 – 8:40 am	**Welcome** Dan Linzer, President, *RCSA* Cyndi Atherton, Director, *Science, Heising-Simons Foundation*	Zoom Main Room
8:40 – 8:55 am	**Conference Overview & Desired Outcomes** Richard Wiener, *RCSA*	Zoom Main Room
8:55 – 9:30 am	**Small Group Ice Breakers**	Zoom Breakout Rooms
9:30 – 10:05 am	**Keynote Presentation & Discussion** Victoria Meadows, *University of Washington* Timothy Lyons, *UC Riverside*	Zoom Main Room
10:05 – 10:20 am	**Break**	
10:20 – 10:30 am	**Directions for Breakout Sessions**	Zoom Main Room
10:30 – 11:45 am	**Breakout Session I**	Zoom Breakout Rooms
11:45 am – 12:15 pm	**Report Out**	Zoom Main Room
12:15 – 12:30 pm	**Directions for Mini Breakout Sessions**	Zoom Main Room
12:30 – 1:30 pm	**Lunch**	Zoom Main Room
1:30 – 2:15 pm	**Mini Breakout Session I (Fellows only)**	Gather Rooms
2:15 – 2:30 pm	**Break**	
2:30 – 3:15 pm	**Mini Breakout Session II (Fellows only)**	Gather Rooms
3:15 – 5:00 pm	**Break**	
5:00 – 7:00 pm	**Social Mixer**	Gather Rooms

Conference Agenda (Optional activities in green)
June 10-11, 2021

Friday, June 11 *(all times listed in Pacific time zone)*

8:00 – 8:30 am	**Early login, Informal dialog, BYO breakfast/lunch**	Zoom Main Room
8:30 – 8:40 am	**Check-in regarding Thursday Sessions**	Zoom Main Room
8:40 – 9:00 am	**Proposal Writing and Team Formation**	Zoom Main Room
9:00 – 10:15 am	**Breakout Session II**	Zoom Breakout Rooms
10:15– 10:45 am	**Report Out**	Zoom Main Room
10:45 – 11:00 am	**Break**	
11:00 am – 12:15 pm	**Breakout Session III**	Zoom Breakout Rooms
12:15 – 12:45 pm	**Report Out**	Zoom Main Room
12:45 – 1:00 pm	**Wrap-up**	Zoom Main Room
1:00 – 2:00 pm	**Lunch**	Zoom Main Room
2:00 – 2:45 pm	**Mini Breakout Session III (Fellows only)**	Gather Rooms
2:45 – 3:00 pm	**Break**	
3:00 – 3:45 pm	**Mini Breakout Session IV (Fellows only)**	Gather Rooms
3:45 – 5:00 pm	**Break**	
5:00 – 7:00 pm	**Social Mixer**	Gather Rooms

Keynote Presentations

Are we alone? How Earth's early oceans and atmosphere help guide the search for life beyond our solar system

Timothy Lyons, *University of California, Riverside*

Life and life-sustaining environments, including oceans, have existed on a dynamic Earth for more than four billion years despite the multitude of challenges expected at the hands of stellar, solar system, and planetary evolution. Each of our many past planetary states was associated with a particular atmospheric composition, and those atmospheres contained gases such as oxygen and methane that were produced by Earth's early life. Using ancient Earth to understand when and how these biosignature gases accumulated is allowing us to select targets and techniques for exploring the many Earth-like planets beyond our solar system.

More generally, the presentation will include an overview of the co-evolution of life and its environments on Earth over billions of years touching on key evolutionary innovations, the steps and dynamics of biospheric oxygenation, potential tectonic controls, and nutrient cycling—among other first-order relationships. The focus will include both remote and in situ biosignatures of broad relevance while emphasizing early Earth, early Mars, and exoplanets. Among the many lessons learned, early Earth has taught us about false negatives—that is, the possible absence of detectable atmospheric biosignatures above an ocean brimming with life. Both false negative and false positive scenarios, whether remote or in situ, drive us to challenge traditional approaches and seek nontraditional solutions.

The Interdisciplinary Path to Characterizing Terrestrial Exoplanets for Habitability and Life

Victoria Meadows, *University of Washington*

One of the most exciting and interdisciplinary frontiers in exoplanet science is the search for habitable planets and life beyond the Solar System. Recently discovered planets, especially Earth-sized planets orbiting nearby M dwarfs, will provide intriguing near-term targets for astrobiological study by JWST and large ground-based telescopes. Beyond the next decade, even larger telescopes are planned to directly image and explore the environments of worlds around stars like our Sun. However, our ability to accurately interpret signs of habitability and life will depend on our understanding of planetary evolution and processes, and environmental context. This talk will provide an overview of key advances needed to support the search for habitability and life on terrestrial exoplanets, including the crucial role of comparative Solar System and exoplanet studies. For habitability, an improved understanding of star-planet-planetary system interactions and processes is needed, including the generation and maintenance of secondary outgassed atmospheres, and planetary evolutionary paths around different host stars. Strongly interdisciplinary efforts could also advance the identification of new biosignatures, including those that are agnostic to metabolism, and instead identify improbable complexity in a planetary environment, and the development of comprehensive, probabilistic frameworks for biosignature assessment.

2021 Proposal Guidelines & Collaborative Awards

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. Two-page proposals should describe the project and role of each team member. No budget is necessary. A third page may be used for references.
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 didn't 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 **June 18, 2021**. Instructions for submission will be provided at the meeting.
9. Awards are anticipated to start on **August 15, 2021**.

Rika Anderson randerson@carleton.edu
Carleton College, Biology
I use bioinformatics approaches to study microbial evolution in the recent past (focusing especially on the marine subsurface) and the distant past (focusing on the rise and spread of microbial metabolism across the early Earth).

Laurie Barge laura.m.barge@jpl.nasa.gov
NASA Jet Propulsion Laboratory, Planetary Sciences
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.

Natasha E. Batalha natasha.e.batalha@nasa.gov
NASA Ames Research Center, Planetary Systems Branch
I am interested in leveraging theoretical models to understand universal chemical and physical processes of exoplanet atmospheres.

Morgan Cable morgan.l.cable@jpl.nasa.gov
NASA Jet Propulsion Laboratory, California Institute of Technology, Planetary Science Section
I search for life and interesting chemistry throughout the Solar System; the stars are calling and we must go!

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

Simon Darroch simon.a.darroch@vanderbilt.edu
Vanderbilt University, Earth and Environmental Sciences
The structure and function of the oldest multicellular ecosystem—how they were constructed, how they worked, and how they changed prior to the Cambrian Explosion of animals.

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

Courtney Dressing dressing@berkeley.edu
University of California, Berkeley, Astronomy
I am curious about the frequency of planetary systems in the galaxy; the diversity of planet compositions and system architectures; links between stellar and planetary properties; and the prospects for detecting life on planets outside of our solar system.

Peter Driscoll pdriscoll@carnegiescience.edu
Carnegie Institution for Science, Earth and Planets Lab
I am interested in what makes a planet habitable, and why Earth is unique in so many ways.My research focuses on planetary thermal evolution and magnetic field generation, using both simple 1D models and 3D first principles fluid dynamics simulations.

Solange Duhamel duhamel@arizona.edu
University of Arizona, Molecular and Cellular Biology
I am interested in the study of microbial life in planetary analog environments. I utilize Earth as a tool for the search for extra-terrestrial life. My expertise is in oceanography, geomicrobiology and astrobiology.

Aaron E. Engelhart enge0213@umn.edu
University of Minnesota, Genetics, Cell Biology, and Development
@aaronengelhart studies the origins of life with particular interest in nucleic acids and the earliest cells. He is also interested in environments beyond Earth that could support life.

Brad Foley bjf5382@psu.edu
Pennsylvania State University, Geosciences
How rocky planet interiors evolve over time, and how this evolution shapes their prospects for habitability.

Jay Forsythe forsythejg@cofc.edu
College of Charleston, Chemistry and Biochemistry
Researchers in my laboratory form model proto-biopolymers consisting of diverse monomer compositions and structural properties via wet-dry cycling and characterize them by mass spectrometry and infrared spectroscopy.

Greg Fournier g4nier@mit.edu
MIT, Earth, Atmospheric and Planetary Science
I apply phylogenomic analyses to questions of the evolutionary history of the Earth-Life system, including horizontal gene transfer, molecular clocks, and ancestral sequence reconstruction.

Scialog Fellows

Nathaniel M. Gabor nathaniel.gabor@ucr.edu
University of California, Physics and Astronomy
On Earth, why are plants green and why does it matter?

Jennifer B. Glass jennifer.glass@eas.gatech.edu
Georgia Institute of Technology,
Earth and Atmospheric Sciences
The Glass lab studies the mechanisms of methane and nitrous oxide cycling, and habitability of gas hydrates, extreme environments that are widespread in the solar system and could serve as refugia for deep subsurface microbes on Mars and icy moons.

Christopher Hamilton hamilton@lpl.arizona.edu
University of Arizona, Lunar and Planetary Laboratory
Earth and Planetary Scientist specializing in terrestrial analogs for planetary volcanism and astrobiology.

Trinity L. Hamilton trinityh@umn.edu
University of Minnesota, Plant and Microbial Biology
Microbial diversity and physiology in extreme and early earth environments–examining earth's history, exploring bioengineering solutions, and predicting the impacts of climate change.

Keith Hawkins keithhawkins@utexas.edu
University of Texas at Austin, Astronomy
Galactic and Stellar Archaeology, Stellar chemical abundances and its connections to the search for planets and life.

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

Betül Kaçar betul@arizona.edu
University of Arizona,
Molecular and Cellular Biology and Astronomy
Emergence and evolution of early Earth biochemistry, origins of life, evolutionary metallomics, synthetic and systems biology.

Eliza Kempton ekempton@astro.umd.edu
University of Maryland, Astronomy
Exoplanet atmospheres. Models mostly but some observations. Radiative transfer and atmospheric chemistry primarily. Planets both big and small. I endeavor to make observationally relevant theoretical predictions.

Edwin Kite kite@uchicago.edu
University of Chicago, Geophysical Sciences
Solar system and exoplanet habitability. Mars, small exoplanets, Enceladus, Europa. Geoscience, basic physical and chemical models. Terraforming.

Mathieu G. A. Lapotre mlapotre@stanford.edu
Stanford University, Geological Sciences
My research focuses on planetary surface processes and what they can tell us about hydrology, climate, and habitability.

Kimberly Lau kvlau@psu.edu
Penn State, Geosciences
I aim to understand the controls on the habitability of Earth through its history. I investigate the "signatures of life" by evaluating chemical clues in the sedimentary record to understand how the evolution of the Earth's environment is coupled to the biosphere.

Joe Levy jlevy@colgate.edu
Colgate University, Geology
I am interested in how salt, water, and soil interact to create habitable micro-environments on planetary surfaces from Antarctica to Mars and beyond. As a geologist, my primary research method is digging holes.

Nikole Lewis nikole.lewis@cornell.edu
Cornell University, Astronomy
Dr. Lewis' research interests lie at the intersections of exoplanetary observations and theory to explore novel approaches for using current and near-term observational facilities to push forward the search for life in our universe.

Gongjie Li gongjie.li@physics.gatech.edu
Georgia Institute of Technology, School of Physics
Planet formation and dynamical evolution; planet spin-axis variations and effects on snowball transitions.

Liming Li lli7@central.uh.edu
University of Houston, Physics
Comparative studies of planetary atmospheres to better understand climate change on our home planet and the atmospheric systems on other planets and moons.

Stilianos Louca slouca@uoregon.edu
University of Oregon, Biology
My lab works on microbial ecology and evolution, with a particular focus on metabolism.

Scialog Fellows Continued

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

Shannon MacKenzie shannon.mackenzie@jhuapl.edu
JHU APL, Planetary Science Exploration
My research interests include how the composition, distribution, and evolution of surface materials affects the habitability of icy satellites; exploiting these targets in the search for signs of life with robotic missions; and leveraging terrestrial analogs for in situ insight.

Jeffrey Marlow jjmarlow@bu.edu
Boston University, Biology
My research group explores the metabolic activity of complex microbial communities and uses "in place" imaging to derive structuring principles of life's interaction with its environment.

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

Marc Neveu marc.f.neveu@nasa.gov
University of Maryland/NASA Goddard Space Flight Center, Department of Astronomy/Planetary Environments Laboratory
I seek to understand if ocean worlds harbor life via geophysical and geochemical modeling, lab and field studies, and ocean world missions.

Stephanie Olson stephanieolson@purdue.edu
Purdue University, Earth, Atmospheric,
and Planetary Science
Olson uses models to explore the co-evolution of life and environment, on Earth and elsewhere, as it relates to habitability and biosignatures.

Magdalena R. Osburn maggie@northwestern.edu
Northwestern University, Earth and Planetary Sciences
I work at the interface between microbiology and geochemistry trying to advance our understanding of habitability on/in Earth and beyond.

Noah Planavsky noah.planavsky@yale.edu
Yale University, Earth and Planetary Sciences
I am interested in how planetary biospheres transform atmospheres.

Morgan Raven raven@ucsb.edu
University of California, Santa Barbara, Earth Science
I research the intersections between the organic carbon and sulfur cycles, with a particular focus on organic sulfur. I use isotopic, geochemical, and spectroscopic tools to connect carbon-cycling processes with sedimentary archives.

Chris Reinhard chris.reinhard@eas.gatech.edu
Georgia Institute of Technology,
Earth and Atmospheric Sciences
I am interested in better understanding habitable planets as integrated systems and predicting their long-term evolution.

Andro C. Rios andro@bmsis.org
NASA Ames Research Center, Exobiology Branch
I use the tools of organic and analytical chemistry to investigate the reaction pathways of a class of meteoritic compounds that are presumed to have played a role in the origin of life on Earth.

Paul Robertson paul.robertson@uci.edu
University of California, Irvine, Physics and Astronomy
I specialize in instruments and analysis techniques to detect Earth-sized planets orbiting nearby stars.

Tyler D. Robinson tyler.robinson@nau.edu
Northern Arizona University,
Astronomy and Planetary Science
Tyler is interested in habitability indicators and biosignatures for distant worlds, and how future telescopes may study potentially Earth-like exoplanets. Tyler is also interested in how radiative transfer and climate modeling can be used to understand worlds around other stars.

Scialog Fellows Continued

Leslie Anne Rogers larogers@uchicago.edu
University of Chicago, Astronomy and Astrophysics
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.

Laura Schaefer lkschaef@stanford.edu
Stanford University, Geological Sciences
I study how planets evolve from formation through geologic evolution, especially focusing on atmosphere-interior interactions and earliest atmospheres.

Hilke Schlichting hilke@ucla.edu
University of California, Los Angeles,
Earth, Planetary, and Space Sciences
Explaining the origin and diversity of exoplanets and placing the formation of our own Solar System into context.

Eddie Schwieterman eschwiet@ucr.edu
University of California, Riverside,
Earth and Planetary Sciences
I work on computational models of terrestrial exoplanets to better inform our ability to characterize Earth-sized planets in the habitable zones of their host stars, especially in search of remotely-detectable biosignatures.

Andy Skemer askemer@ucsc.edu
University of California, Santa Cruz,
Astronomy and Astrophysics
I am an observational astronomer and instrumentalist who characterizes the atmospheres of exoplanets using adaptive optics imaging and spectroscopy.

Erik Sperling esper@stanford.edu
Stanford University, Geological Sciences
I study Earth history and the evolution of life, and the interactions between the biosphere and the geosphere.

Amanda Stockton astockto@gatech.edu
Georgia Institute of Technology,
Chemistry and Biochemistry
The Stockton group works at the interface between science and engineering to develop new techniques to look for signs of life both on Earth and beyond. We are particularly interested in developing miniature organic analysis tools and exploring the extreme environments on Earth.

Andrew Vanderburg avanderburg@wisc.edu
University of Wisconsin-Madison, Astronomy
I work on exoplanet detection and characterization. I am interested in understanding properties like interior structure, elemental composition, and atmospheric properties of small exoplanets. I am also interested in understanding planetary system architectures.

Ji Wang wang.12220@osu.edu
The Ohio State University, Astronomy
Detecting biosignatures with JWST and modeling planet internal structure and atmospheres.

Ziming Yang zimingyang@oakland.edu
Oakland University, Chemistry
Prebiotic synthesis and organic-inorganic interactions in hydrothermal systems on and beyond Earth.

Coco Zhang ke.zhang@wisc.edu
University of Wisconsin-Madison, Astronomy
How do planets form and what processes determine the initial chemical composition of a newborn planet? My research seeks insight into these two fundamental questions by studying chemical and physical evolutions in the birth environments of planets.

Discussion Facilitators

Daniel Apai apai@arizona.edu
University of Arizona, Astronomy/Planetary Science
Discovery and characterization of exoplanets; planetary atmospheres, formation, and habitability; science requirements and observing strategy for biosignature surveys. Exoplanet space mission concepts and technology development. NASA/NExSS co-lead and PI of the Alien Earths team.

Shawn Domagal-Goldman shawn.goldman@nasa.gov
NASA Goddard Space Flight Center,
Planetary Systems Lab
I'm interested in the theoretical foundations for exoplanet biosignatures, and what that means for future exoplanet observatories.

Tori Hoehler tori.m.hoehler@nasa.gov
NASA Ames Research Center, Exobiology Branch
Detectability; life at low energy flux.

Lisa Kaltenegger lkaltenegger@astro.cornell.edu
Cornell University, Astronomy
I am searching for life on planets and moons circling other stars. Using Earth through time and its diverse forms of life as our key to find clues to life elsewhere. Creating the toolkit to find life on exoplanets if it is out there. @KalteneggerLisa @CSInst

Tim Lyons timothy.lyons@ucr.edu
University of California, Riverside,
Earth and Planetary Sciences
Biogeochemistry; astrobiology; origins of life and relationships to environmental evolution; geobiology; paleoecology; Earth history; isotope geochemistry; paleoceanography-paleoclimatology; co-evolution of the oceans, atmosphere, and life.

Victoria Meadows meadows@uw.edu
University of Washington,
Astronomy and Astrobiology Program
Terrestrial exoplanet evolution, habitability and biosignatures. Solar-System/exoplanet synergies.

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

Dimitar Sasselov dsasselov@cfa.harvard.edu
Harvard University, Astronomy
Origins of life: from chemistry to building blocks to protocells; photochemistry: molecular processes that define the transition from planetary chemistry to life. Earth, Mars, exoplanets: prospects for life.

Anat Shahar ashahar@carnegiescience.edu
Carnegie Institution for Science, Earth and Planets Lab
I am interested in planetary formation, differentiation, and evolution with a focus on how the interior of the planet impacts the evolution.

Guests

Cyndi Atherton catherton@hsfoundation.org
Heising-Simons Foundation, Science
HSF funds primarily in astronomy, cosmology, physics, and increasing the representation of women and BIPOC in physics and astronomy in the U.S.

Jamie Bender jamie.bender@brinsonfoundation.org
The Brinson Foundation, Scientific Research Priority
The Brinson Foundation is a privately funded philanthropic organization with grantmaking priorities in education and scientific research.

France Córdova fcordova@sciphil.org
Science Philanthropy Alliance

Paula Driedger paula.driedger@cifar.ca
CIFAR, Research
As an administrator for the CIFAR Azrieli Global Scholars program, which aims to accelerate the careers of exceptional early-career research leaders across multiple disciplines, I look forward to learning about the Scialog model for sparking interdisciplinary collaboration.

Brent Iverson iversonb@austin.utexas.edu
University of Texas at Austin, Undergraduate Studies, and RCSA Board Member

Jochen Marschall jmarschall@hsfoundation.org
Heising-Simons Foundation, Science Program
Planetary Astronomy.

Christopher Martin cmartin@kavlifoundation.org
Kavli Foundation, Physical Sciences

Diane Matar dmatar@sciphil.org
Science Philanthropy Alliance, Climate, oceans, and physical sciences
Funding needs from private donors in astrobiology, exoplanets, and space science research.

Elizabeth McCormack emccorma@bowdoin.edu
Bowdoin College, Physics and Astronomy, and RCSA Board Member Emeritus
Keen to learn about the frontiers of this field to inspire future generations of scientists through my teaching of Astronomy.

Caroline D. Sinders csinders@gmail.com
Researcher funded by the Sloan Foundation
Independent researcher Observing and Understanding Digital Event Design and the Frictions and Frustrations Academic Organizers are Facing.

David Steuerman dsteuerman@kavlifoundation.org
Kavli Foundation

Mary Voytek mary.a.voytek@nasa.gov
NASA, Astrobiology

Elizabeth Weiss eweiss@sciphil.org
Science Philanthropy Alliance

David Wenner davidwenner01@gmail.com
RCSA Board Member Emeritus

Heising-Simons Foundation

Cyndi Atherton
catherton@hsfoundation.org
Science Director

Jochen Marshall
jmarschall@hsfoundation.org
Science Program Officer

The Kavli Foundation

Christopher Martin
cmartin@kavlifoundation.org
Director, Physical Sciences

Research Corporation for Science Advancement

Laura Esham
lesham@rescorp.org
Program Assistant

Andrew Feig
afeig@rescorp.org
Program Director

Danny Gasch
dgasch@rescorp.org
Chief Financial Officer

Angela Hagen
ahagen@rescorp.org
Communications Director

Kimberly Huynh
khuynh@rescorp.org
Data Analytics Specialist

Dan Linzer
dlinzer@rescorp.org
President

Meg Martin
mmartin@rescorp.org
Pre & Post Award Manager

Silvia Ronco
sronco@rescorp.org
Senior Program Director

Barbara Shapiro
bshapiro@rescorp.org
Program Assistant

Richard Wiener
rwiener@rescorp.org
Senior Program Director

4703 East Camp Lowell Dr.
Suite 201
Tucson, Arizona 85712
Phone 520.571.1111
www.rescorp.org

RESEARCH CORPORATION
for SCIENCE ADVANCEMENT