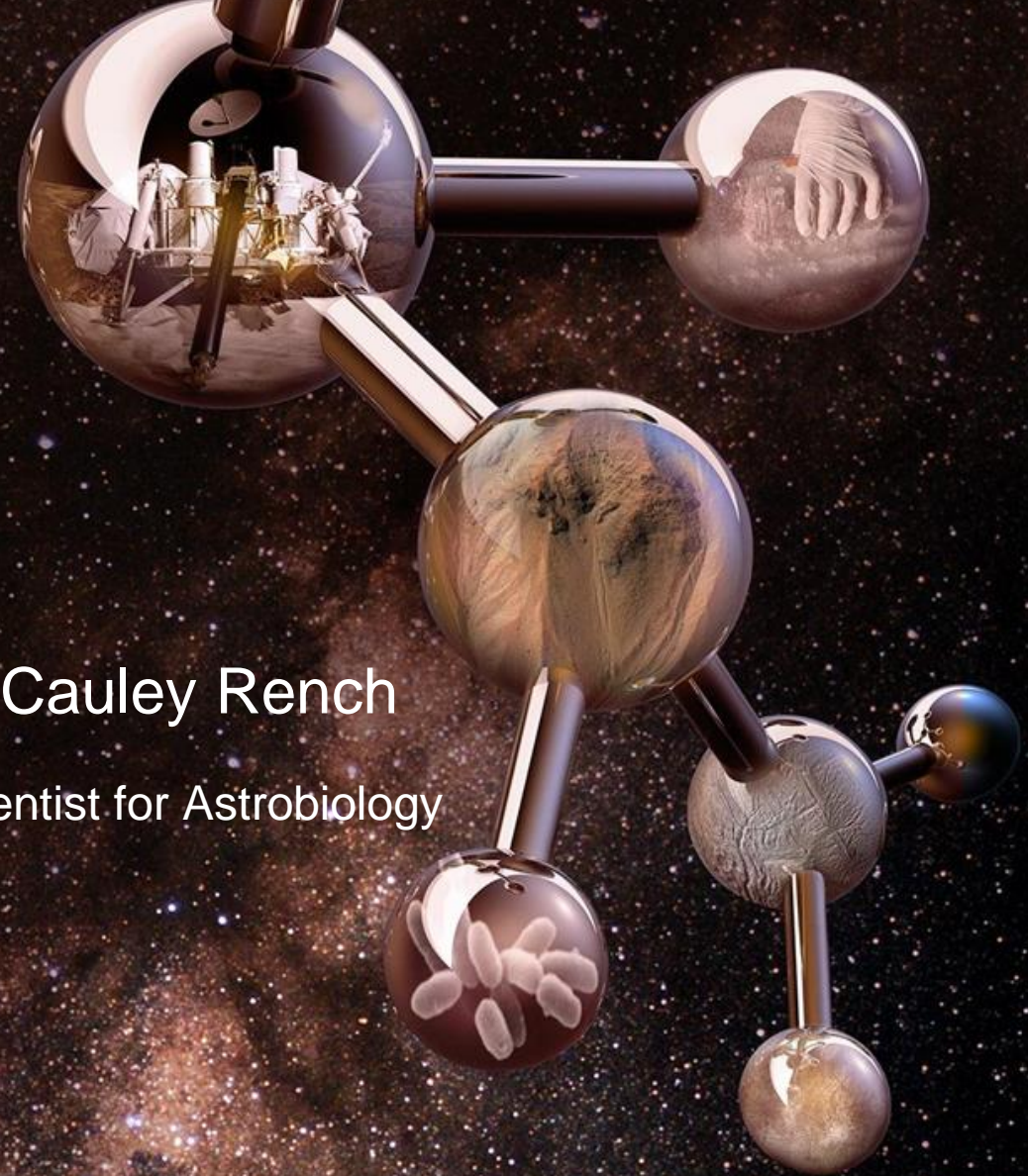


NASA Astrobiology Program Update

David Grinspoon
Senior Scientist for Astrobiology Strategy

Becky McCauley Rench
Deputy
Program Scientist for Astrobiology

Planetary Science Advisory Committee (PAC)
July 2024



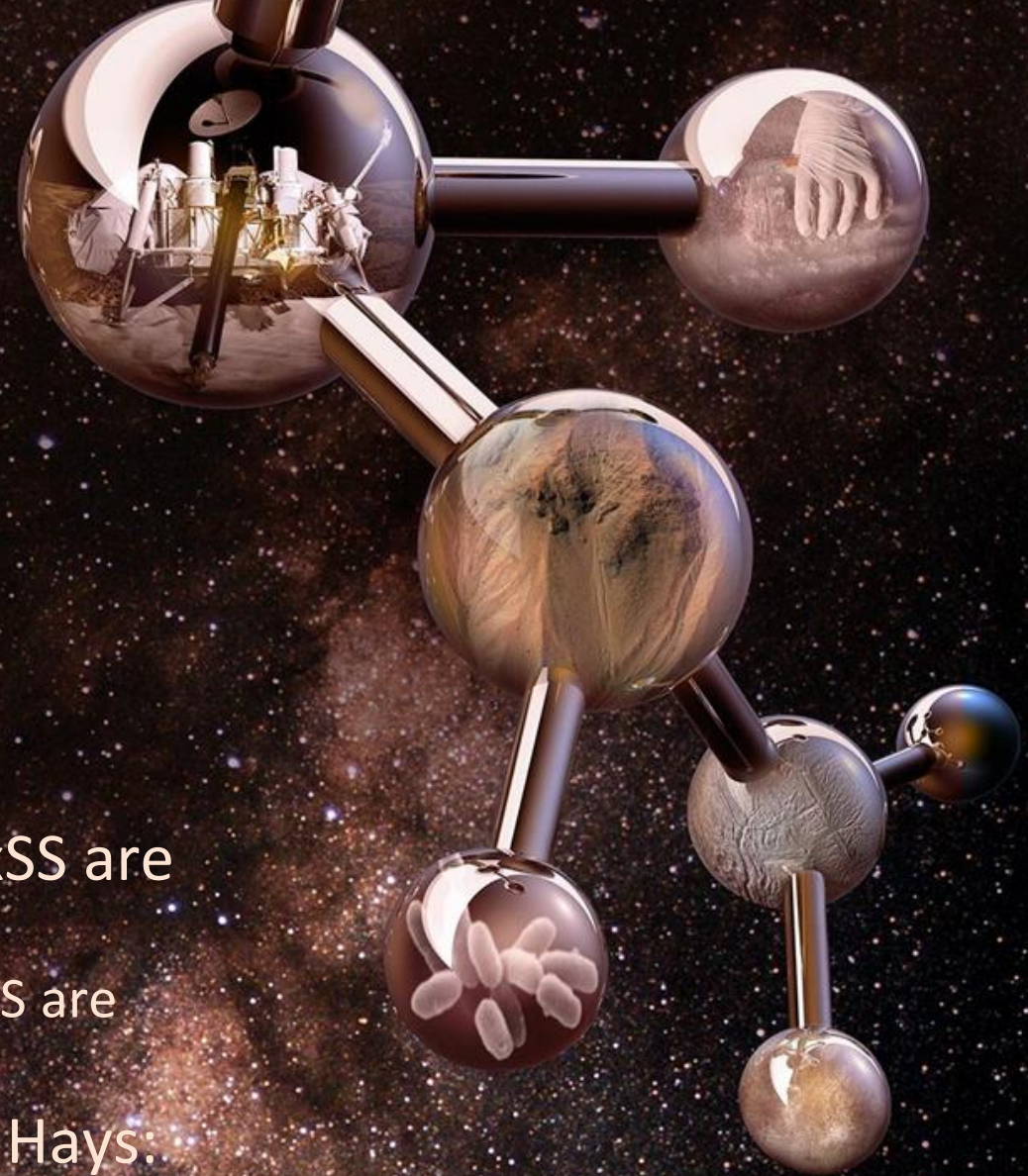


Astrobiology Research Programs

- C.5 Exobiology (PO: Lindsay Hays)
 - Aim is to understand the origin, evolution, distribution, and future of life in the Universe. Research is centered on the origin and early evolution of life, the potential of life to adapt to different environments, and the implications for life elsewhere.
- F.4 Habitable Worlds (HW) (PO: Becky McCauley Rench)
 - Aim is to use knowledge of the history of the Earth and the life upon it as a guide for determining the processes and conditions that create and maintain habitable environments and to search for ancient and contemporary habitable environments and explore the possibility of extant life beyond the Earth.
- C.14 Planetary Science and Technology Through Analog Research (PSTAR) (PO: Becky McCauley Rench)
 - This program solicits proposals for investigations focused on exploring the relevant environments on Earth in order to develop a sound technical and scientific basis to conduct astrobiological research on other Solar System bodies.
- C.20 Interdisciplinary Consortia for Astrobiology Research (ICAR) (PO: Lindsay Hays)
 - Proposals that describe a multi-million dollar, five-year project with an interdisciplinary approach to a single, compelling question in astrobiology. For projects larger than the scope of the individual research programs, but within the scope of the Research Coordination Networks.

ICAR - Interdisciplinary Consortia for Astrobiology Research

- ICAR is solicited in ROSES-24
- Updated text will be released imminently
- Timeline:
 - Step-1 due date: Sept 2024
 - Step-2 due date: Jan 2025
- Proposals with a primary relevance to NExSS are not being solicited this year
 - Proposals with a secondary relevance to NExSS are welcome
- For Questions please reach out to Lindsay Hays:
Lindsay.hays@nasa.gov





2023-24 Astrobiology Mission Ideation Factory

Search for Life at Mars (Related RCN = NfoLD)

- Phase 1
 - NASA Goddard Space Flight Center, August 21-25, 2023
 - Contracted with KnowInnovation
 - 32 participants, U.S. and international, first year graduate student to early career faculty, at many institutions, cross-disciplinary
 - 6 mission ideas presented at end of week by teams of 3-7 individuals
 - 7 mentors from variety of backgrounds
- Phase 2
 - NASA Ames Research Center, November 11-15
 - Support for University of Washington, PI: Brook Nunn
 - Phase 1 participants invited
 - Follow-up activity on mock data from Phase 1 mission ideas with teams focused on proving life vs false positive



Next Mission Ideation Factory Potential Topics: Habitable Worlds Observer (HWO), Ocean Worlds, and/or Prebiotic Chemistry

Astrobiology Strategy 2025

A decade since the previous one.

Much has happened:

- New Decadal Survey.
- Concrete evidence of habitable early environments on Mars.
- Dragonfly confirmation.
- Exoplanets (discovery that Trappist-1 has multiple planets in potentially HZ).
- Tremendous progress in understanding biology and environmental evolution of early Earth.
- New technologies such as AI and networked small satellites.

Worth looking more than 10 years ahead?

20 years from now: Hopefully, samples back from many targets, HWO will be operating, Perhaps we'll be building a fleet of next generation telescopes.

Perhaps we'll have found multiple biosignatures (or not).

What laboratory & analytical techniques might we have access to?

What will our science look like?



NASA-DARES 2025: The 2025 NASA Astrobiology StrAtegy for Decadal Advancements in Research, Exploration, and Synthesis

Dr. Rachel Harris
NPMP
Started at NASA HQ May 1, 2024



REQUEST FOR INFORMATION

DRAFT

Development of NASA-DARES 2025: The 2025 NASA Astrobiology StrAtegy for Decadal Advancements in Research, Exploration, and Synthesis

1. Summary

This NASA Science Mission Directorate (SMD) Request for Information (RFI) seeks community feedback and recommendations on the structure, scope, and goals of the 2025 NASA Astrobiology StrAtegy for Decadal Advancements in Research, Exploration, and Synthesis (NASA-DARES 2025). This Strategy will shape the future of the Astrobiology Program at NASA by establishing a comprehensive framework that formalizes astrobiology's emerging role as a cross-cutting pillar of NASA's scientific research and mission portfolio — a theme that is becoming increasingly represented in several decadal surveys, planetary science and other mission objectives, and planetary protection policies. By synthesizing decadal priorities under the umbrella of one document, NASA-DARES 2025 remains dedicated to astrobiology's core pillars — understanding the origin, evolution, distribution, and future of life in the Universe — but also aims to raise the visibility of the Astrobiology Program to strengthen and support the changing needs and composition of the astrobiology community, anticipating the grand challenges and opportunities of the next decade and beyond.

NASA-DARES 2025: The 2025 NASA Astrobiology Strategy for Decadal Advancements in Research, Exploration, and Synthesis

We seek broad input from the community to help NASA better understand the state of the field of astrobiology and identify emerging priorities for the coming decade and beyond. NASA-DARES 2025 aims to revise and expand upon the 2015 Astrobiology Strategy by addressing the following topics:

Topic 1: Review Recent Advancements. Evaluate the discoveries, advancements, and achievements in astrobiology over the past decade that align with the six themes of the 2015 Strategy.

Topic 2: Identify Emerging Themes and Technologies. Highlight emerging research themes and innovative technologies developed and conceived since the publication of the 2015 Astrobiology Strategy, particularly those that have the potential to drive transformative discoveries and novel applications within and beyond the astrobiology field.

Topic 3: Foster Cross-Divisional and Cross-Directorate Collaboration. Promote collaborative research and exploration efforts across the broad scientific pursuits spanning NASA SMD, including Planetary Science, Earth Science, Astrophysics, and Biological and Physical Sciences, and Heliophysics, as well as NASA mission directorates.

Topic 4: Incorporate and Synthesize Recent Recommendations. Integrate and expand upon the key recommendations of more recent community-assembled documents including Consensus Study Reports published by the National Academies of Sciences, Engineering, and Medicine. These include but are not limited to:

Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology 2023 – 2032 (OWL) (2023); and other SMD division-level Decadal Surveys

[Astrobiology Strategy for the Search for Life in the Universe \(2019\)](#)

[Exoplanet Science Strategy \(2018\)](#)

[National Academies Reports on Planetary Protection Considerations and Requirements](#)

...and other relevant reports not mentioned here.

Topic 5: Strengthen Community. Reflect on our progress as a community and as the NASA Astrobiology Program in the era of the Research Coordination Networks (RCNs). Identify what is working well, what needs additional support, and what could be improved to foster a more effective, engaging, and inclusive environment for community members, stakeholders, and the public. Reinforce community commitments to ethical, safe, and inclusive exploration in line with NASA’s Strategic Plan for Diversity, Equity, Inclusion, & Accessibility (DEIA). Ensure these efforts are assessable following the performance metrics outlined by the Agency’s DEIA Maturity Model (https://www.nasa.gov/wp-content/uploads/2018/08/nasa_deia_strategic_plan-fy22-fy26-final_tagged.pdf).

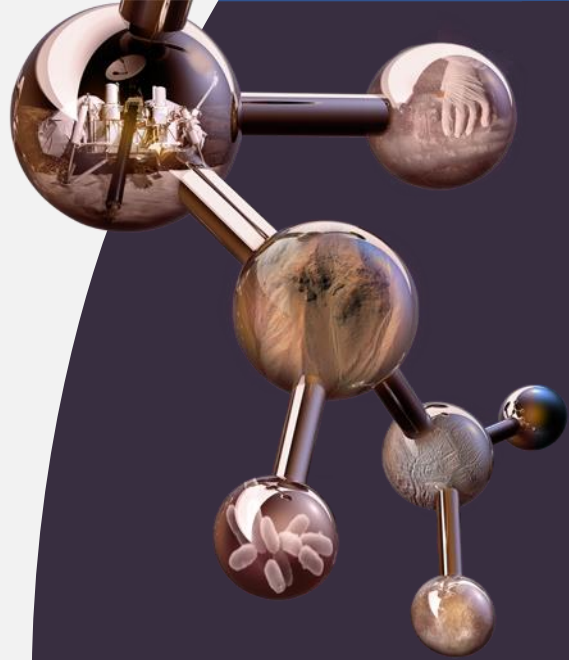
Topic 6: Evaluate Astrobiology’s Role in Missions. Determine how to improve genuine astrobiology partnerships in every stage of mission development from proposal submission to mission selection, R&D activities, planetary protection, operations, and post-mission research.

Topic 7: Astrobiology and Human Space Exploration. Consider the challenges and opportunities for astrobiology research posed by plans for human space exploration. Identify time-sensitive astrobiology questions that must be investigated prior to human missions, as these may require specific baseline measurements to successfully address science questions once human presence alters the environment. Determine how astrobiology can provide insight the era of human missions and factors into the developing Moon to Mars Architecture. Determine how human space exploration can be leveraged to advance astrobiology research in low Earth, on the Lunar Gateway space station, and on other worlds.

Topic 8: Prepare for Post-Discovery Activities. Recognize that finding evidence of life beyond Earth, whether extant or extinct, represents a pivotal evolution in the field of astrobiology. Develop frameworks for international cooperation and public engagement to responsibly handle such discoveries. Build on previous efforts from recent workshops (e.g., “Communicating Discoveries in the Search for Life Beyond Earth”) and prepare for activities (including post-discovery science) that consider and respond to the profound implications of life’s existence elsewhere, ensuring the field evolves to address new scientific, ethical, and societal changes.

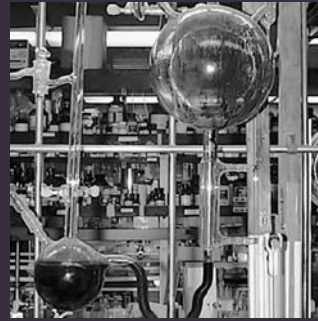
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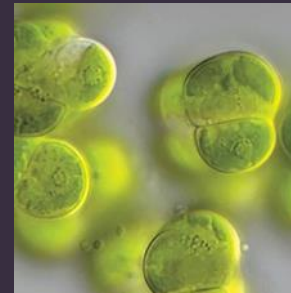


Astrobiology: The Study of Life's

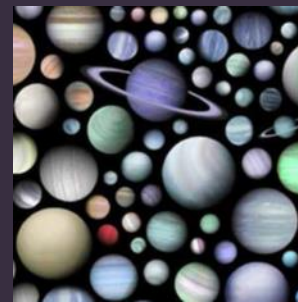
Origin,



Evolution,



Distribution,

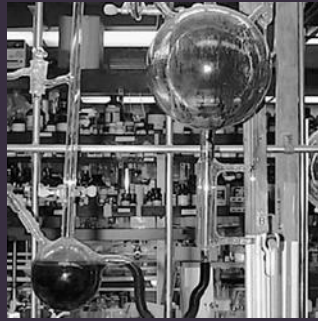


and Future.

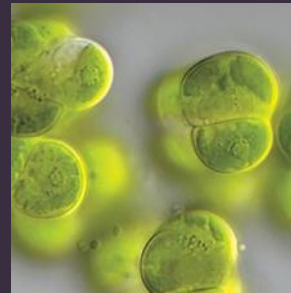


Astrobiology: The Study of Life's

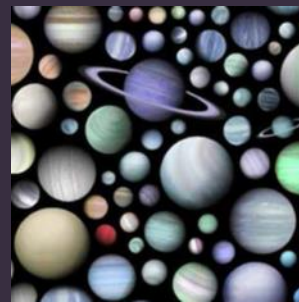
Origin,



Evolution,



Distribution,



and Future.



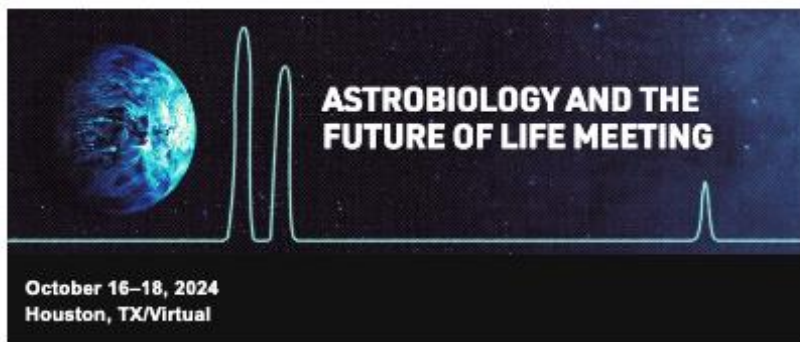
Future of Life

- Technosignatures
- Future of Earth
- Sustainability (writ large)
- Deep time variability (& coevolution) of the Earth system
- Long term fates & states of biospheres & technospheres
- The future as exoplanet
- Becoming interplanetary
- Survival of Earth life on other planets
- Multigenerational life in isolated habitats
- Solar/stellar evolution and habitable zones
- The sun's future path through the galaxy
- Long term stability of planetary systems
- Future habitability of outer solar system during sun's post-main sequence evolution.
- How does life extend (or limit) habitable lifetimes?

Astrobiology and the
Future of Life

Workshop
October 16-18, 2024

LPI



#astrofuturelife

Astrobiology and the Future of Life Meeting

Save the Date

The Astrobiology and the Future of Life meeting is scheduled for October 16–18, 2024, at the [Lunar and Planetary Institute \(LPI\)](#) in Houston, Texas. This meeting is designed to explore the potential of new interdisciplinary, interdivisional research efforts organized around the theme of the Future of Life.

Presentations related to astrobiology and NASA's science divisions (Astrophysics, Biological and Physical Sciences, Earth Science, Heliophysics, and Planetary Science) may include such topics as:

- Technosignatures (Astrophysics, Planetary Science)
- Future evolution of Earth (Biological and Physical Sciences, Earth Science, Planetary Science)
- Long-term climate sustainability and the fates of biospheres and technospheres (Astrophysics, Earth Science, Planetary Science)
- Modeling possible future Earths and exoplanet observations (Astrophysics, Earth Science, Planetary Science)
- Survival of Earth life on other planets (Biological and Physical Sciences)
- Multigenerational life in isolated habitats (Biological and Physical Sciences)
- Solar/Stellar evolution and habitable zones (Astrophysics, Earth Science, Planetary Science)
- The Sun's future path through the galaxy and possible climate implications (Astrophysics, Earth Science, Planetary Science)
- Long-term biosphere/planetary feedback affecting the habitable lifetimes of planets (Planetary Science)
- Stability of Planetary Systems (Astrophysics, Planetary Science)
- Solar/stellar variability and limits on biospheres and technospheres (Astrophysics, Earth Science, Planetary Science)
- Evolution of habitable zones during post-main sequence solar/stellar evolution (Astrophysics, Heliophysics, Planetary Science)

Indication of Interest

To be added to the mailing list to receive additional information about this meeting, submit an [indication of interest](#).

Astrobiology and the Future of Life

Scientific Organizing Committee:

Sharmila Bhattacharya	Ames
Nick Siegler	JPL
Eve Berger	JSC
David Grinspoon	NASA HQ
Madhulika Guhathakurta	GSFC/NASA HQ
Kennda Lynch	NASA HQ
Michael Way	GISS
Jason Wright	Penn State

A workshop to develop an implementation roadmap for technological and procedural integration of metagenomic sequencing into planetary protection.

Early November 2024

Hybrid; At NASA AMES

Drivers: Current culture-based approaches are biased and insufficient for future exploration targets and missions. Follow-on from previous NASA and ESA planetary protection workshops.

Approach: A multinational (ESA, JAXA, COSPAR, NASA) team of space life scientists building an actionable plan to close the gaps between the current state of the art and implementation.

Focus areas: Include technological gaps, low biomass challenges, programmatic considerations, and a broad set of stakeholders across many mission areas (planetary protection, space biology, astrobiology, crew monitoring and health, etc.).



CDSLU: Communicating Discoveries in the Search for Life in the Universe

Overview

If astrobiologists discover evidence of life beyond the Earth, how should these findings be shared with the public? Which communication strategies and techniques would best support public understanding of findings that are likely to be complex and highly specialized? Astrobiology faces a fundamental tension between the implications of finding evidence of biology or biological processes elsewhere in the universe, and explaining how observations or experiments used to accumulate that evidence will be subject to uncertainty and controversy. How might scientists and science communicators navigate this tension and communicate effectively about this uniquely compelling but challenging research?

This virtual workshop organized by NASA's Astrobiology Program (NAP) will bring together astrobiologists, science journalists, science communicators, and science content creators for a series of presentations, conversations, and activities aimed at building a greater shared understanding of the challenges and opportunities for each group that such an event might present. By creating a space to exchange perspectives, experiences, professional realities, and foster relationships between scientists and science communicators we hope to explore mutually-beneficial and socially responsible paths towards communicating the discovery of extraterrestrial life.

Summary

This virtual workshop will bring together the astrobiology and science communication communities to exchange perspectives about the potential discovery of life beyond Earth. Through a series of presentations, conversations, and activities the workshop will explore mutually-beneficial and socially responsible paths towards communicating the discovery of extraterrestrial life and creating a lasting community of shared interest.

Virtual Workshop Session Details

Kickoff webinar: Friday February 23, 11 am to 12 pm EST

Day 1: Friday March 1, 11 am to 1 pm EST

Day 2: Monday March 4, 11 am to 2 pm EST

Day 3: Wednesday March 6, 11 am to 3 pm EST



CDSLU: Communicating Discoveries in the Search for Life in the Universe

Organizing Committee

- Jordan Bimm - Assistant Instructional Professor of Science Communication and Public Discourse, University of Chicago
- David Grinspoon - Senior Scientist for Astrobiology Strategy, NASA
- Caleb Scharf - Senior Scientist for Astrobiology, NASA Ames Research Center
- Mary Voytek - Acting Chief Exobiology Branch, STX: Space Science and Astrobiology Division
- Linda Billings - PHD Researcher, National Institute of Aerospace
- Shawn Domagal-Goldman - Deputy Director of the Sciences and Exploration Directorate, NASA Goddard Space Flight Center
- Sara K. Yeo - Associate Professor in the Department of Communication, The University of Utah
- Aneka Kazlyna - Graduate student, Yale University, NASA graduate intern

Established Program to Stimulate Competitive Research (EPSCoR) FY25 Rapid Response Research (R3) Solicitation

- EPSCoR establishes partnerships with government, higher education and industry and is directed at those jurisdictions that have not participated equably in competitive aerospace and aerospace-related research activities.
- One-year period of performance (POP), \$100,000 total, cost sharing not required
- Proposals Typically Due in Feb, Award Announcement: May

Research Focus Area:

Ocean Worlds Research: observational and modeling synergies between ice, ocean and surficial processes on Earth and other ocean environments in our solar system

POCs: Kelsey Bisson, David Grinspoon

- Kelsey Bisson is a Program Scientist for the Ocean Biology and Biogeochemistry Program (OBB) in the NASA Headquarters Science Mission Directorate.

