




EXPLORE

Astrobiology and RCNs

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22-17: NASA's programs and missions should reflect a dedicated focus on research and exploration of subsurface habitability in light of recent advances demonstrating the breadth and diversity of life in Earth's subsurface, the history and nature of subsurface fluids on Mars, and potential habitats for life on ocean worlds.

Response: NASA concurs with this recommendation and acknowledges the importance of expanding its efforts in applicable astrobiology research and exploration on subsurface habitability.

Since receiving this recommendation in the *2019 NASEM Astrobiology Strategy for the Search for Life in the Universe*, the NASA Astrobiology Program has shifted its funding focus to prioritized support for investigations involving targets (e.g., subglacial/sub-ice environments, caves, aquifers, deep sea), technologies (e.g., drilling and AUV), and research enabling subsurface exploration.

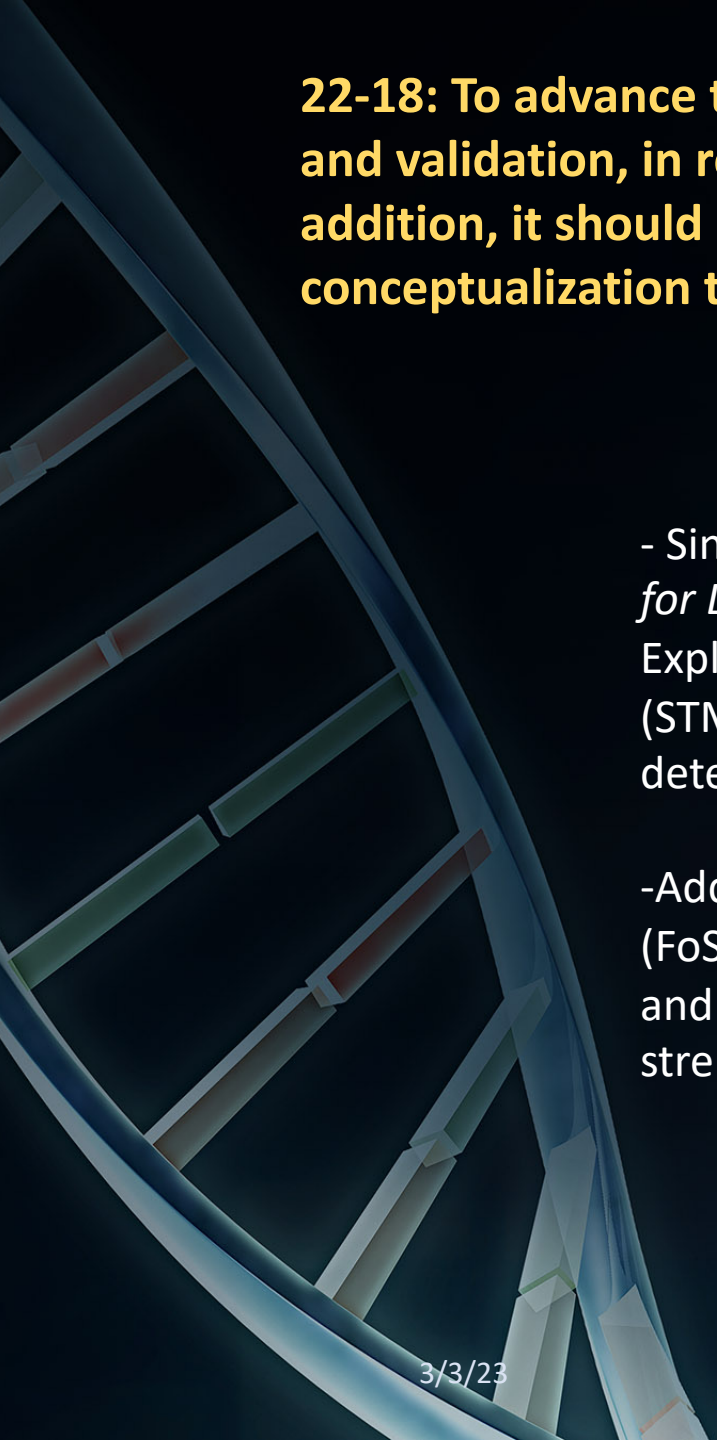
In the coming decade, the NASA Astrobiology Program will continue to prioritize subsurface research and technology. In addition, program leadership will take advantage of advisory board service (e.g., Sanford Underground Research Facility (SURF), International Ocean Drilling Program, Ocean Exploration Advisory Board) to expand opportunities for NASA researchers to engage in subsurface exploration.



F.4 HABITABLE WORLDS

1. Scope of Program

Mars - the astrobiological potential of past or present environments at Mars. The Habitable Worlds program is specifically interested in research that has the potential to significantly advance our understanding of habitability in the subsurface of Mars, as highlighted in *Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology 2023-2032* (<https://www.nationalacademies.org/our-work/planetary-science-and-astrobiologydecadal-survey-2023-2032>).



22-18: To advance the search for life in the universe, NASA should accelerate the development and validation, in relevant environments, of mission-ready, life detection technologies. In addition, it should integrate astrobiological expertise in all mission stages—from inception and conceptualization to planning, development, and operations.

- Since receiving this recommendation in the *2019 NASEM Astrobiology Strategy for the Search for Life in the Universe*, the NASA Astrobiology Program has worked with the Planetary Exploration Science and Technology Office (PESTO) and Space Technology Mission Directorate (STMD) to develop solicitations for instruments and sample handling technology related to life detection.

-Additionally, the program and PESTO co-sponsored a two-week Future of the Search for Life (FoSL) workshop, run by the Network for Life Detection (NfoLD) RCN, bringing together scientists and engineers to develop specific life detection technology requirements necessary to strengthen our solicitations.

NEW Early Career Astrobiology Opportunity

"To advance the search for life in the universe, NASA should accelerate the development and validation, in relevant environments, of mission-ready, life detection technologies. In addition, **it should integrate astrobiological expertise in all mission stages—from inception and conceptualization to planning, development, and operations.**"

- 2022 Planetary & Astrobiology Decadal Survey (OWL) Origins, Worlds, and Life

- Problem Statement: Most astrobiologists are not prepared to be integrated into missions because they are unfamiliar with...
 - how and when their contribution can be most beneficially added to a mission.
 - how to prepare themselves to be on a mission team.
- GOAL: Introduce early career “astrobiologists” to missions—from inception and conceptualization to planning, development, and operations.
- Utilize Know Innovation, Inc. IdeasLab model to bring together ~30 early career (graduate student, post-doc) astrobiologists to brainstorm astrobiology mission idea concepts and their development.
- First Astrobiology Mission IdeasLab to be held in August 2023 will focus on Search for Life at Mars.
 - Outcome will include mentor review of ideas and down-selection of best mission concept ideas to feed into next steps, which will further refine ideas with real-world constraints.
 - Plans to have bi-annual cadence with different astrobiology focus areas
 - Partner with Astrobiology Research Coordination Networks to provide mentors
- Interested in utilizing outcomes as feeders into existing PSD-supported activities (e.g. Planetary Science Summer School, Here to Observe, technology programs, FINESST).

NASA Science Mission Design Schools

Annual Planetary Science Summer School (PSSS) ~35 yo.
Offered by the Jet Propulsion Laboratory (JPL) in Pasadena, California

- PSSS is a three-month-long early career development experience to help prepare the next generation of planetary science and engineering mission leaders.
- Participants learn the process of developing a science hypothesis-driven robotic space mission in a concurrent engineering environment while getting an in-depth, first-hand look at mission design, life cycle, costs, schedule, and the trade-offs inherent in each.
- Target audience-Science and engineering doctoral candidates, recent PhDs, postdocs, junior faculty
- Limited funds are available to provide partial support for travel and lodging for participants who request it in advance and meet the requirements.
- Selection process favors individuals already exposed to missions.

2022 Mission to Detect Life

Jan 24-28, 2022

Astrobiology graduate student workshop
Professor Brook Nunn

Univ. of Washington Astrobiology PhD Program

5 days

On zoom camera 4 hrs per night
Prep outside of class

Kwiya

GOALS of WORKSHOP



1. LEARN

1. Instrument capabilities/limitations
2. Experimental design-
3. Sample management on site
4. Data types and structure
5. Data analysis/interpretation
6. Importance of replication
7. How environmental context shapes interpretation
8. Critically think about Life Detection Ladder
9. How to communicate findings to press/public

2. NETWORK

1. With your peers
2. With experts in the Astrobiology field

Daily Events

9am -5pm → tours, data analysis, meet the experts
6- 9 pm → Simulated Mission Online- zoom breakout rooms

The Mission Timeline

MONDAY

Design Science Payloads for Orbiter and Lander
Present, defend, and discuss with mission control

- 50kg maximum
- @ midnight the Mission Launched

WEDNESDAY

Receive Orbiter Plume Flyby data & all Lander data

- Analyze raw data
- Interpret data
- Establish chemical/physical/ geological environment & history

Initiate 2nd tier lander experiments

FRIDAY

Teams announced
Teams stop collaborating
Experimental, theoretical and Analog research utilized to build case

2 WEEKS LATER

Live 3 hr public debate held in style of Mock Trial

Orbiter arrives and completed one orbit

Receive 1st Orbiter remote data of surface
Design Experiments for Lander
Select landing site based on data

- Submit experiments to mission control to initiate

Orbiter plume flyby & lander sets down
TUESDAY

Data analysis Life v. False Positives

- Share Findings Life v. False Positives
- Setup meetings with additional experts for data analysis/interpretation

Mission control randomly assigns members to team False Positive or Team Life Detection

THURSDAY

Astrobiology Program Goals

- Primary Purpose is to enable world-class interdisciplinary research in Astrobiology.
- Catalyze and coordinate Astrobiology research across science disciplines and organizations.
- Provide scientific and technical input on the astrobiology aspects of current and future NASA missions.
- Recruit and support astrobiologists to be involved in mission planning, development, and implementation.
- Participate in training students at the college and graduate levels
- Provide information to the general public (public outreach)
- Develop content for education (coordinated through the Education lead, SMD SciAct, and OSTEM)
- Working with the broader community to organize workshops to determine the need and establish priorities for national facilities for astrobiology research, to identify the current state of knowledge in the disciplines relevant to astrobiology and to initiate discussion of interesting, new research directions stimulated by workshop reports.



SPACE
FOR
ALL

AB GRAD CON 23

La Jolla, California

May 22nd - 25th

abgradcon.org

[#abgradcon](https://twitter.com/abgradcon)



3/3/23

Submit abstracts by March 15th

A child is shown in profile, focused on painting a night sky. The child has a flower-shaped hair clip and is using a brush to apply paint to a canvas. The canvas features several glowing planets and stars against a dark background. The scene is dimly lit, emphasizing the child's concentration and the vibrant colors of the artwork.

Questions at the end
