Update from NASA Astrobiology Program

Mary Voytek
Astrobiology Senior Scientist

PAC
March 1, 2021
ROSES-20 full proposals were due 5/22/20
156 Proposals submitted
  • 23 proposals were selected for funding
Final Selection rate is **14.7%**

Exobiology in ROSES-21 will be a No Due Dates program
- Using past submission #s
- Expect review panels every 2-3 months
- Will likely split Rolling Evaluation Panels into 4-5 topics
- If you won’t be submitting, please volunteer to serve!!
ROSES-20
Step 1 was due 11/17/20 (received 147); Step 2 was due 1/15/21 (received 71)
Will be reviewed DAPR.

ROSES-19
65 Proposals submitted
• 7 proposals were selected for funding
Selection rate is 10.7%

Currently: 3 active FINESST
ROSES-20
PSTAR will not be solicited, moving to a biennial solicitation cadence

Currently: 7 active grants, 1 active NESSF award.
Interdisciplinary Consortia for Astrobiology Research (ICAR)

First ICAR Selected 8 teams (6-15% Red, 2-Descoped)
Awards will be made in Feb 2021

5 year awards
Avg award size $5M

Cadence will be every 3 years.
Next subset of topics TBD
Measures of Success of RCN

- Investigators carry out and propose interdisciplinary research through new collaborations stimulated by RCN interactions
- Demonstration of technology transfer between research areas and disciplines
- Produces a plan for utilization of current mission data and spawns ideas for new and exciting missions (if applicable)
- Influences Decadal Surveys for all SMD Divisions
- Enhances international engagement
- Supports development of early AB community
Research Coordination Networks Update

NExSS
investigate the diversity of exoplanets and to learn how their history, geology, and climate interact to create the conditions for life.

Prebiotic Chemistry and Early Earth Environments
Investigate chemical processes under the conditions on the Early Earth and the formation of basic proto/biological molecules and pathways, leading to the emergence of systems harboring the potential for life.

NfoLD
investigate life detection research, including biosignature creation and preservation, as well as related technology development.

From Early Cells to Multicellularity
investigate the earliest biological processes and the evolution of life on Earth into more complex organisms up to the advent of multicellularity.

Ocean Worlds (Habitable Worlds)
investigate the diversity of other worlds in the solar system and to learn how their history, geology, and climate interact to create the conditions for life.
NExSS investigate the diversity of exoplanets and to learn how their history, geology, and climate interact to create the conditions for life.

Follow up meeting to Habitable Worlds 2017
Co-Hosted NExSS, AAS and NExSci
Abstracts-207
Paid Registrants-411
Strong Early Career Presence
Goal: Develop synergistic research questions and collaborations between Earth and Planetary ocean sciences to move forward research related to ocean worlds. By creating a coordinated joint community of scientists from both divisions, identify knowledge gaps, identify opportunities for testable ideas based on the Earth System, and develop a strategy to advance our knowledge of Ocean Worlds in our solar system. These communities began as one and this initiative will bring the two communities back together.

Ocean Worlds (Habitable Worlds) investigate the diversity of other worlds in the solar system and to learn how their history, geology, and climate interact to create the conditions for life.
Overarching topics and questions identified by consensus of researchers from both ESD and PSD:

- Leveraging comparative oceanography between Earth and other Ocean Worlds
- Ocean Worlds as integrated systems
- Understanding the properties of environmental change in Ocean Worlds
- Methods to look for past and extant life on Ocean Worlds
- Defining and characterizing habitable environments in Ocean World systems
- Research in analog environments to enable studies of Ocean Worlds
- Necessary broad reaching technology requirements for in-situ and remote sensing exploration of Ocean Worlds.

White papers for each topic forth coming
Overarching topics and questions identified by consensus of researchers from both ESD and PSD:

- Leveraging comparative oceanography between Earth and other Ocean Worlds
- Ocean Worlds as integrated systems
- Understanding the properties of environmental change in Ocean Worlds
- Methods to look for past and extant life on Ocean Worlds
- Defining and characterizing habitable environments in Ocean World systems
- Research in analog environments to enable studies of Ocean Worlds
- Necessary broad reaching technology requirements for in-situ and remote sensing exploration of Ocean Worlds.

White papers for each topic forth coming
Earliest Cells to Multicellularity

Request for Information on themes, structure, and operation March 2020
Received 9 responses
Contributors spanned the notional scope
This document contains answers to Frequently Asked Questions about the Astrobiology Program organized by topical areas:

- NASA Astrobiology Program (goals, 2015 Strategy, history, contact)
- Funding Astrobiology Research (ICAR, Workshops, Early Career, topic-specific programs)
- Coordinating Astrobiology Research (RCNs: what, who, how)
Currently 14 active NPP Fellows and one NPMP Fellow
  • Fellows are distributed across RCN teams, Exo and PSTAR awards and former NAI teams
5 new Fellows pending start dates
  • Four awaiting visas
  • One expected to accept by 2/26
Remaining productive during the pandemic
  • Many are back in the lab, others working effectively remotely
  • Publishing
  • Presenting and organizing sessions at conferences/workshops
Provided presentations on their research in July 2020

We are not accepting applications for the March 1 deadline.
The week long Josep Comas i Solà International Astrobiology Summer School is co-sponsored by the NASA Astrobiology Program and the Centro de Astrobiologia since 2002.

2020 Summer School was canceled.

2021 Summer School is scheduled for September 5 – 10, contingent on travel approval, includes lectures a group project and a visit to a location of astrobiological interest.

**Topic: Searching for Life on Mars:** Techniques and Challenges

Includes 15 – 20 participants (grad students/postdocs) and two lecturers from the US and an equal number from ESA member states.

U.S. Director is Rosaly Lopes, JPL.
Astrobiology Graduate Conference (AbGradCon)

Student organized/led annual conference, held annually, both in the U.S. and internationally
Applications and size has grown tremendously since 2004 and now includes roughly 100 graduate students and postdoctoral fellows, who provide oral or poster presentations
Well balanced for gender, geographical distribution and disciplines represented
2020 conference canceled
2021 conference scheduled for September 14 – 17, 2021, contingent on travel approval, at the Earth Life Science Institute, Tokyo, Japan
Applications are currently open
The Astrobiology Learning Progressions provides direct connections between
• **discipline-based, fundamental concepts in science** that guide what teachers must teach and benchmark what students learn in which grades and
• the **interdisciplinary core concepts** of astrobiology.

The AB LP’s are a collection of interdisciplinary narratives—one for each of 23 different astrobiology concepts—each of which is presented four times, progressed in depth and sophistication through the grade bands (K-2, 3-5, 6-8, 9-12).

The AB LP’s are meant to serve two primary audiences:
• Educators: supporting them to use astrobiology content to teach the discipline-based topics required by the standards.
• Astrobiologists: supporting them to communicate with learners across the grade bands/spectrum.

[https://astrobiology.nasa.gov/education/alp/](https://astrobiology.nasa.gov/education/alp/)
Organization and Structure

List of Core Learning Questions and Sub-Questions

1. How did matter come together to make planets and life in the first place?
   1.1: Are we really made of star stuff?
   1.2: How did our Solar System form?

2. How did Earth become a planet on which life could develop?
   2.1: What was the Earth like right after it formed?
   2.2: How was the Sun different when it formed compared to now?
   2.3: Where could life have gotten started on Earth?

3. What is life?
   3.1: What are the characteristics of life?
   3.2: What does life need for survival?
   3.3: What determines if a planet can have life?
   3.4: Why is water so important for life as we know it?
   3.5: How can we tell if something is alive or not?

4. How did life on Earth originate?
   4.1: Where do life’s building blocks come from?
   4.2: What are the sources of life’s building blocks within the Earth?
   4.3: What are the sources of life’s building blocks outside the Earth?

5. How have life and Earth co-evolved?
   5.1: How did life first emerge on Earth?
   5.2: How did the first cells arise?
   5.3: How did life become something that competes for resources and evolves?

6. How has life evolved to survive in diverse environments on Earth?
   6.1: How did life on Earth come to occupy so many different environments?
   6.2: What types of conditions can life survive in?
   6.3: Are there environments beyond Earth that could be habitable?

7. How do we explore beyond Earth for signs of life?
   7.1: What is a biosignature?
   7.2: How do we explore within our own Solar System for signs of life?
   7.3: How do we discover worlds around other stars?
   7.4: How can we identify worlds around other stars that could have life?

6.3. Are there environments beyond Earth that could be habitable?
Astrobiology for the Incarcerated
Initiative to bring Science Programs to the Incarcerated (INSPIRE)

Programs piloted 2017-2019 with funding from NASA Astrobiology Program

- Astrobiology lecture given to ~1400 adults
- Astrobiology hands-on program given to ~300 youth
- 26 facilities in four states (UT, WA, OH, FL)
- December, 2017 – March, 2019

- IRB-approved surveys administered; data collected from ~1000 matched-pairs (adults only)
  - Significant gains in content knowledge, value of science, science identity, and future actions
  - Manuscript in press now
Questions?