DARES Focus Area #8: Workforce and Early Career Support

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Summary: Answering one of the most important questions in science and research endeavors of our time cannot happen without a thriving astrobiology workforce:

Image courtesy NASA: Crew members (STS-131) on the International Space Station (14 April 2010).

Overview - Looking Inward, At Ourselves

What is this Focus Area about?

1. Need for institutionalized support for all astrobiology workforce, with a special emphasis on early career researchers (ECR)
2. Need for supportive work environments and adequate infrastructure to achieve the vision of understanding and searching for life in the universe.

Why is it important to NASA Astrobiology?

1. Astrobiology exemplifies the intense demands on scientists.
2. NASA has an enormous cultural influence around the world.
3. Mission success depends critically on human capital and human factors, an intrinsic part of astrobiology mission/research
4. Mission success also depends critically on science policies that underlie astrobiology research

In the past, overburdening scientists and engineers by "trying to do too much with too little," has directly lead to loss of missions and crew. (Gehman et al., 2003)

Relevant Takeaways:

1. Workforce (including ECR) in astrobiology can be supported through:
   a. research/travel funding, jobs
   b. interdisciplinary/international networks
   c. physical and scalable infrastructures
   d. mentorship and mental health programs,
   e. intra- and inter-agency collaborations

2. Incorporate non-traditional fields, e.g. philosophy or humanities, into funding proposals, as these are critical for mission success at the different stages of the mission/research (*i.e., before, during and after the mission*)

Foundational Documents: 2024 NASA PESTO Technology Strategy

- Advance Open Science**:** Foster a welcoming community and early-career support

DARES:
Several RFIs and previous Focus Areas raised these points => persistent throughout the RFIs

Key Findings from RFI Synthesis

Workforce and mission success can continue to be supported through **RCN**s, which can:

a. have stronger role in avoiding duplicative work/siloing
b. have stronger role in early-phase mission development
c. organize meetings/workshops to review search for life beyond Earth and collaboratively address most pressing scientific gaps in their communities
d. establish and maintain a centralized science gap list

Foundational documents: 2018 Exoplanet Science Strategy

- Strengthen support for RCN's to include research funding
- Recommendation: Building on the NExSS model, NASA should support a cross-divisional exoplanet research coordination network that includes additional membership opportunities via dedicated proposal calls for interdisciplinary research.

<u>Open questions:</u>

1. Diversify support for RCN?
2. Missions that can last longer than a career ?

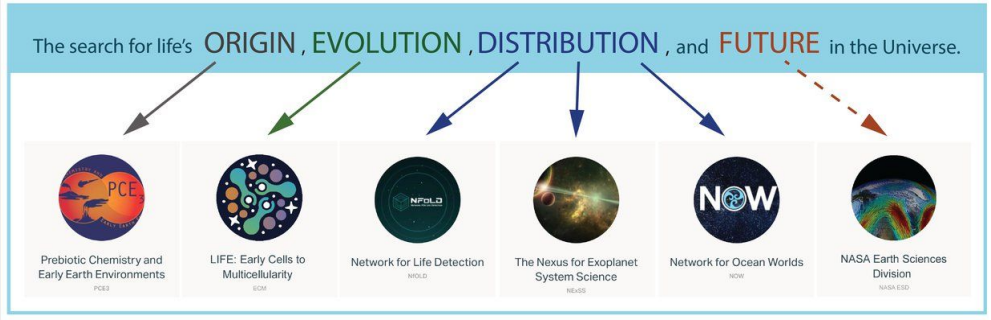
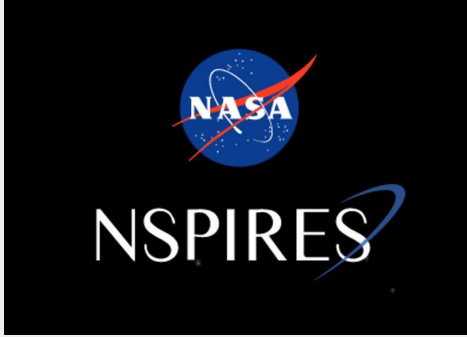


Image Credit: NASA Astrobiology

Key Findings from RFI Synthesis



Workforce and mission success can be better supported by **ROSES** by:

a. adding *Applied Science Impact* and/or *Earth-relevant applications* sections in future calls to identify how fundamental astrobiology research can inform science and research back on Earth and thus enabling cross-agency funding pathways
b. funding research that bridges fundamental astrobiology with applied science disciplines

Foundational Documents: none

<u>Open questions:</u>

1. Can there be other funding calls than ROSES that can include workforce support?
2. Can theoretical/basic science be a part of funding calls?

Key Findings from RFI Synthesis

Workforce and mission success can continue to be supported by:

a. broadening astrobiology subject matter experts (**SME**s): i.e., philosophers, ethicists, historians, economists, social scientists critical to mission success.
b. one such example is the prestigious Blumberg Chair in Astrobiology at LoC

Foundational Documents: Astro2020 Decadal Survey: Pathways to Discovery

Recommendation: NASA and the National Science Foundation should explore mechanisms to improve coordination among U.S. archive centers and to create a centralized nexus for interacting with the international archive communities. The goals of this effort should be informed by the broad scientific needs of the astronomical community.

<u>Open questions:</u>

1. Can there be partnerships with other institutions in non-traditional areas? (e.g., National Endowment for the Arts, American Economic Association, etc.)
2. Do other institutions develop astrobiology programs?

The Blumberg Chair in Astrobiology at the Library of Congress is one of the most reputable interdisciplinary programs in astrobiology.

Baruch S. Blumberg NASA/Library of Congress Chair in Astrobiology, Exploration, and Scientific Innovation

Key Findings from RFI Synthesis

Workforce and mission success can continue to be supported by **intra- and inter- agency collaborations**:

a. develop **strategic partnerships**, joint solicitations or companion proposal tracks with NSF, NOAA, DOE, and DoD to co-fund projects spanning astrobiology and applied science, as well as international partnerships to utilize ocean drilling platforms and technologies to pursue astrobiology research questions.
b. **Inter-Directorate Collaboration**: Establish formal liaison offices or working groups between SMD/PSD, STMD, HEO, and relevant Earth-science divisions to coordinate funding and review.
c. expand **planetary protection** research by consulting with or hiring SMEs in environmental and space ethics, as well as establish a multidisciplinary ethical, legal, and social implications advisory panel for astrobiology.
d. address issues of **stigma**, self-stigma, limits to self-expression and mental health challenges among NASA/astrobiology workforce by funding intervention strategies, providing incentives (even unfunded) rewarding effective mentorship, encouraging healthier work habits, and supporting individual work styles that optimize individual productivity.

Key Findings from RFI Synthesis - Foundational Docs

- Origins, Worlds, and Life A Decadal Strategy for Planetary Science and Astrobiology 2023-2032 (2023)
  - 20 INFRASTRUCTURE FOR PLANETARY SCIENCE AND EXPLORATION
    - **Finding:** Already established, and newly emerging, mechanisms for facility and data collaborations across other federal science agencies can serve as a good model for future NASA collaborations. Such partnerships ought to span from theoretical modeling and simulations to data ecosystems to data analysis, laboratory experiments, and field investigations across multiple entities.
- 2024 Heliophysics Decadal
  - Recommendation 5-11: The National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), and the National Oceanic and Atmospheric Administration (NOAA) should continue to support the development of modern cyberinfrastructure to enable effective sharing and utilization of heterogeneous data produced across the integrated HelioSystems Laboratory. Future investments should consider the following agency roles and approaches:
- 2018 Exoplanet Science Strategy
  - Recommendation: Building on the NExSS model, NASA should support a cross-divisional exoplanet research coordination network that includes additional membership opportunities via dedicated proposal calls for interdisciplinary research.

<u>Open questions:</u>

1. Persistent throughout the RFIs and other Focus Areas: ocean worlds, infrastructure needs, etc. - how can this be implemented?
2. Do we need policy makers to make this happen?

Key Findings from RFI Synthesis

Workforce and mission success can continue to be supported by **investing in Early Career Researchers**:

a. incentivize ECR funding and mentorship within data analysis programs (DAP) or similar
b. continued support of travel funds such as the Lewis and Clark Award and the NASA Early Career Collaborator Award
c. continued support of AbSciCon and AbGradCon with the addition of initiatives to build peer networks in-person
d. provide Astrobiology Graduate fellowships that are explicitly interdisciplinary
e. The technosignature RFIs made a strong emphasis on ECR, but applicable to all ECR

Foundational Documents: none

<u>Open questions:</u>

1. How do we shield ECR from the pitfalls of previous astrobiologists, i.e., stigma?

Image Credit: NASA Astrobiology

Why Workforce and ECR now?

- Many of the RFIs do not have specific provisions or recommendations in Foundational documents (i.e., workforce support, ECR, stigma, interdisciplinary SMEs)
- Astrobiology community is growing and the science is developing and evolving both horizontally and vertically
- More institutions are conducting research relevant to astrobiology
- Previous panels, discussions: AbSciCon2024, CDLSU, PSETI…
- Lots of overlaps with Focus Area #9

=> Perhaps invest in a survey and research of the state of the field?

Image courtesy NASA Astrobiology Institute

Workforce and ECR Landscape

- Key research areas: ALL
- NASA science divisions/mission directorates: ALL
- Missions: All
- Communities: ALL

<u>Uncertainty: political and geopolitical climate worldwide</u>

Looking forward to more discussions…

Image courtesy US Bureau of Labor Statistics

Summary

- Answering one of the most important questions in science and research endeavors of our time cannot happen without a thriving astrobiology workforce
- Support for workforce and ECR is critical to mission success
- Workforce and ECR need support both for research and the work they do, and for career and personal well-being

Image courtesy AbSciCon 2017