

Opportunity Title: ICAR - Alternative Earths – How to Build and Sustain a Detectable Biosphere

Opportunity Reference Code: 0010-NPP-NOV23-ABProg-Astrobio

Organization National Aeronautics and Space Administration (NASA)

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How to Apply All applications must be submitted in [Zintellect](#)

Application Deadline 11/1/2023 6:00:59 PM Eastern Time Zone

Description Description:

Our research is defined by one fundamental question: How do ocean chemistry and solid planetary processes lead to sustained habitability and the maintenance of detectable atmospheric biosignatures? Our search requires a comprehensive mechanistic understanding of Earth's past and is producing, by extension, a framework for interpreting remote observations of exoplanets. We are viewing the stages of our planet's history over its initial four billion years as 'alternative Earths.' These chapters provide unique windows onto the evolution of our own planet — as well as the factors that, more generally, regulate the evolution of planetary habitability and the appearance, persistence, and detectability of atmospheric biosignatures on habitable worlds. These efforts build on our previous results but go much further by: (1) employing exciting new and wide-ranging geochemical and numerical approaches to deconstructing Earth's past, including extensive calibration of proxy approaches in modern analogs of ancient oceans, and (2) extending our understanding of Earth system dynamics to exoplanet observables.

We have constructed an interdisciplinary team with broad expertise across Earth system science, marine biogeochemistry, microbial ecology, climate modeling, and observational astronomy. The highly interdisciplinary nature of our team allows for a novel vertical integration of approaches: cutting-edge geochemical proxies; 3-D models for ocean biogeochemistry that will yield gas fluxes to simulated atmospheres; coupled climate and photochemical models to predict steady-state atmospheric compositions and their synthetic spectra generated by radiative transfer models; and finally exploration of remote detectability using instrument simulators, thereby solidifying our connection to ongoing NASA missions and future mission concepts.

Applicants who apply for this research opportunity and are subsequently selected for an NPP award are expected to attend the Astrobiology Graduate Conference (AbGradCon) and/or the Astrobiology Science Conference (AbSciCon) using the travel funds that are conferred as part of the NPP award.

Field of Science: Astrobiology

Advisors:

Tim Lyons

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951-321-0813



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Eligibility is currently open to:

- U.S. Citizens;
- U.S. Lawful Permanent Residents (LPR);
- Foreign Nationals eligible for an Exchange Visitor J-1 visa status; and,
- Applicants for LPR, asylees, or refugees in the U.S. at the time of application with 1) a valid EAD card and 2) I-485 or I-589 forms in pending status

**Eligibility
Requirements**

- **Degree:** Doctoral Degree.