

**Opportunity Title:** RCN - NexSS: CLEVER Planets - Cycles of Life-Essential Volatile Elements on Rocky Planets

**Opportunity Reference Code:** 0016-NPP-NOV23-ABProg-AstroBio

**Organization** National Aeronautics and Space Administration (NASA)

**Reference Code** 0016-NPP-NOV23-ABProg-AstroBio

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

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

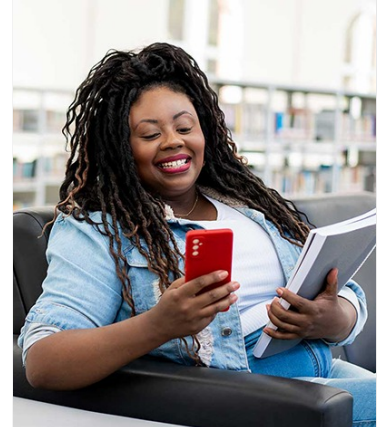
**Description Description:**

Building a chemically habitable environment on rocky planets requires the life-essential elements (C, N, O, H, S, and P) to journey through a series of astronomical, planetary, geological, and geochemical processes during planet formation and early planetary evolution. The overarching goal of our research is to trace the life-essential elements from protoplanetary disks to early prebiotic molecules on the surfaces of rocky planets, with a particular emphasis on the endogenic processes such as feedbacks between surface and interior processes. We use observations from our own Solar System in terms of comparative planetology but also construct possible pathways that may lead to chemical habitability, which can be utilized for exploration of other solar systems in search for life. Our research team is organized across several themes – Theme 1: The origin of life-essential ingredients in rocky planets; Theme 2: Delivery and loss of life-essential elements during accretion; Theme 3: Distributing life-essential ingredients during core-mantle-atmosphere differentiation; Theme 4: The role of magmatism, control of mantle-climate coupling and impacts on delivery and redistribution of life-essential elements in a young planet; Theme 5: Combining the life-essential elements into prebiotic organic compounds in hydrothermal environments.

Through our research in various themes, we seek to answer fundamental questions such as – Where do rocky planets form and what is the chemical composition of the reservoir material for planet formation? What is the abundance of life-essential elements of rocky planets from formation and how does this depend on the formation location in the disk and disk mass? How do small and large impacts alter the abundance of life-essential elements of rocky planets? What are the possible roles of core-mantle-atmosphere differentiation in making life-essential elements available to surface environments young rocky planets? What is the role of magmatism in delivery of life-essential elements to planetary surfaces? How various states tectonic-climate coupling affect planetary surface conditions? What roles frequent planetary impacts play in modulating the conditions of habitability through redistributing life-essential elements? For more information about our team's research, visit – <http://cleverplanets.rice.edu/>

Interested applicants are encouraged to propose research that seeks to address any of the above questions or that are at the intersection of any of the above themes.

Applicants who apply for this research opportunity and are subsequently



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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:**

Rajdeep Dasgupta  
Rajdeep.Dasgupta@rice.edu  
713-348-2664

Andrea Isella  
isella@rice.edu  
713-348-5491

Sarah T. Stewart  
sts@ucdavis.edu  
530-794-8689

Cin-Ty A. Lee  
ctlee@rice.edu  
713-348-5084

Adrian Lenardic  
ajns@rice.edu  
713-348-4883

Hilke Schlichting  
hilke@ucla.edu  
310-825-5130

**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.