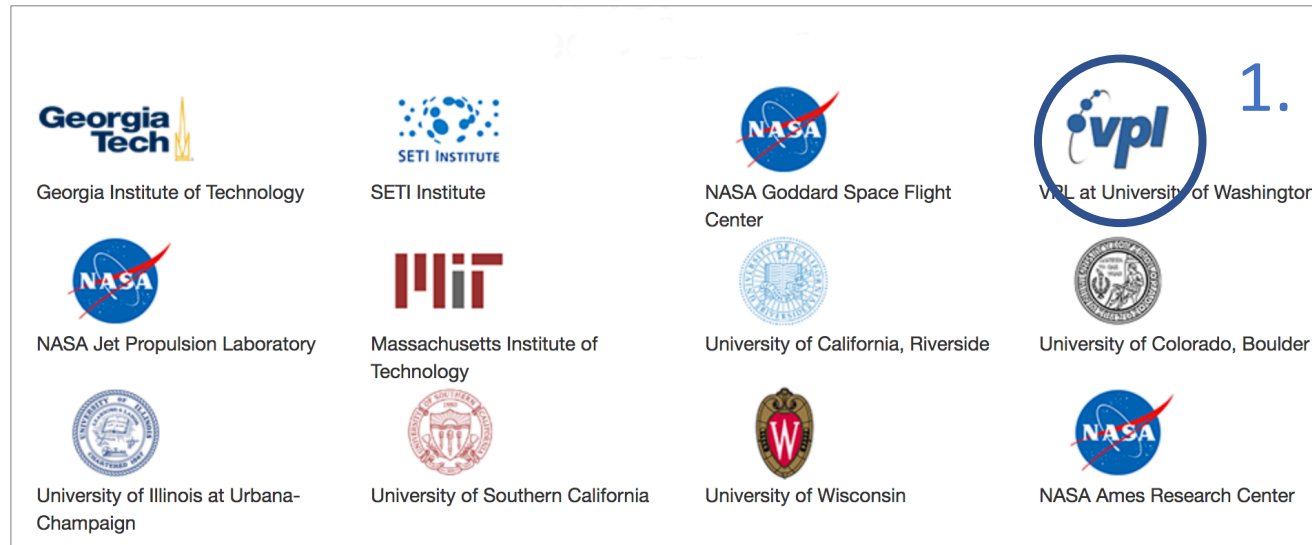


2017 NAI Annual Science Report Submission Process

NAI EC Meeting
November 17, 2017

Welcome to the 2017 submission site!

<https://nai-ar.ndc.nasa.gov>



1. Select your Team

NASA Astrobiology Institute

Please sign in

Name*

Password*

[Sign in](#)

[Forgot Password?](#)

2. Login

3. Create

NASA Astrobiology Institute | VPL at University of Washington

Create new 2017 report?

[Create](#)

[Cancel](#)

Menu – What's Different?

2017 NAI Annual Report 1/1/2017 – 12/31/2017

Logo and Background Image

Overview and Executive Summary

Projects

Field Sites

Additional

Members

Complete

DIFFERENT

Publications

Field Sites

Team Roster

REMOVED

Interdisciplinarity

REPLACED WITH

Extended Scientific
Directions



2017 NAI Annual Report 1/1/2017 — 12/31/2017

Logo and Background Image Overview and Executive Summary **Projects** Field Sites Additional People Complete

Team Overview Copied from the 2016 report.

Provide an overview of your Team's research, its connections to the overall field of astrobiology, and a bulleted list of your research themes/investigations/projects. Overview will most likely stay the same from year to year.

Identifying a habitable or inhabited planet around another star is one of NASA's greatest long-term goals. Major advances in exoplanet detection place humanity on the brink of finally answering astrobiology's over-arching question: "Are we alone?", but there are still many scientific steps required before we can identify a living world beyond our Solar System. The Virtual Planetary Laboratory focuses on understanding how to recognize whether an extrasolar planet can or does support life. To do this, we use computational models to understand the many factors that affect planetary habitability, and use models, field and laboratory experiments to better understand how life might impact a planetary environment in detectable ways. These results are used to determine the potentially observable planetary characteristics and the telescope measurements required to discriminate between planets with and without life. Our five research objectives are to:

- Characterize habitability and biosignatures for an Earth-like planet
- Characterize the environment, habitability and biosignatures of the Earth through time
- Develop interdisciplinary, multi-parameter characterization of exoplanet habitability
- Determine the impact of life on terrestrial planet environments and the generation of biosignatures
- Define required measurements and optimal retrieval methods for exoplanet characterization missions

Upload replacement team overview

Executive Summary

Highlight your Team's accomplishments for this year. **This should be written in the style of a review article.** You may include information on key discoveries, collaborative efforts, important publications, outreach efforts, honors/awards, etc. While reference may be made to specific projects or publications, this section should be written as a coherent piece independent of the individual project reports.

Upload executive summary

Publications

Provide publications supported fully or in part by the NAI, and that acknowledge the NAI. These would include:

- Peer reviewed journal articles (provide doi numbers) published during the year of reporting or that have been accepted or in press for publication.
- Extended abstracts with references and acknowledgements (ex. LPSC abstract).
- Book chapters (reviewed and acknowledged)

We can **ONLY** accept publications that acknowledge support by the NAI. If you are including a publication that doesn't, you **MUST** include a statement justifying how NAI played a significant role.

Upload publication list

Executive Summary Images

Provide 2 – 3 images with short captions and image credits that can be used to enhance your executive summary. Size: 1200px x 1800px or 4" x 6" @ 300dpi.

Add an executive summary image

Previous Next

Publications

- Items to include:
 - Peer reviewed journal articles (provide doi numbers) published during the year of reporting or that have been accepted or in press for publication.
 - Extended abstracts with references and acknowledgements (ex. LPSC abstract).
 - Book chapters (reviewed and acknowledgements)
- **New Criterion**
 - Only provide publications **supported fully or in part by the NAI, and that acknowledge NAI support.**
 - If you are including a publication that doesn't, **you MUST** provide a statement justifying how NAI played a significant role.

Field Sites

2017 NAI Annual Report 1/1/2017 – 12/31/2017

[Logo and Background Image](#)

[Overview and Executive Summary](#)

[Projects](#)

[Field Sites](#)

[Additional](#)

[Members](#)

[Complete](#)

Field Sites

Please submit a short half page summary of all the field work your team carried out with the sig

Note: Labs and astronomical observatories should NOT be included as field sites.

[Add field sites](#)

[Previous](#)

[Next](#)

- **No longer collecting details for each site**
- Please submit a short half page summary of all the field work your team carried out with the significance to astrobiology clearly stated.

Member Roster

Logo and Background Image Overview and Executive Summary Projects Field Sites Additional **Members** Complete

Menu will look different from rest of the site

NASA Astrobiology Institute | Member Roster | VPL at University of Washington

[Back To Other Report Section](#)

Pending **70** [Add New Member](#) To Be Removed **0** Reviewed **0** [Role Definitions](#)

There are **70 members** left to review. Return to the other report sections at any time by clicking here.

- **New** - Online submission
- Pre-populated fields
- Definitions of member roles have been clarified

The screenshot displays the NASA Astrobiology Institute Member Roster interface. At the top, there is a navigation bar with the following items: Pending (70), Add New Member, To Be Removed (0), Reviewed (0), Role Definitions, and a 'Back To Other Report Section' link. Below the navigation bar, a message states: 'There are 70 members left to review. Return to the other report sections at any time by clicking here.' The main content area shows a list of members, each with a profile picture and a form for editing their details. The first member shown is Eric Agol, with details: First name: Eric, Last name: Agol, Institution: University of Washington, Email: agol@astro.washington.edu. The second member is Elena Amador, with details: First name: Elena, Last name: Amador, Institution: University of Washington, Email: [redacted]. The third member is John Armstrong, with details: First name: John, Last name: Armstrong, Institution: Weber State University, Email: jcamstron@weber.edu. The fourth member is Glada Arney, with details: First name: Glada, Last name: Arney, Institution: University of Washington, Email: glada.n.arney@nasa.gov. The fifth member is Jeremy Bailey, with details: First name: Jeremy, Last name: Bailey, Institution: University of New South Wales, Email: jab@saoepp.aao.gov.au. Each member's details are in a form with 'Save' buttons. At the bottom right, there is a pagination control showing page 1 of 14.

Team Member - Definitions

- **Principal Investigator (PI)** – The Principal Investigator is the individual who has been designated as such for one of the NAI team awards. The PI is responsible for the quality and direction of the proposed research, the appropriate use of funds, and other administrative requirements such as the submission of annual progress reports to the Agency.
- **Co-Investigator (Co-I)** – A Co-I is a member of a team who may hold either a full-time or limited-term appointment and who is a critical “partner”, through the contribution of unique expertise and/or capabilities, for the conduct of one or more of the key investigations identified under the NAI award.
- **Collaborator** – A Collaborator is an individual who is less critical to the Team than a Co-I but who is committed to provide a focused but unfunded contribution for a specific task. If funding support is provided, such a person must be identified in one of the other categories above. Postdocs and students (graduate or undergraduate) should not be identified as Collaborator.
- **Postdoctoral Researcher** – A postdoctoral researcher is a person pursuing additional research, training, or teaching experience after the completion of their doctoral studies (typically a Ph.D.). They should be included as team members when a majority of their support is provided by NAI funding. Postdoctoral status is determined not by number of years beyond the Ph.D. but is based rather on the institutional employee status of the individual.
- **Graduate or Undergraduate Students** –PI’s should include students working towards bachelors or graduate degrees when a majority of their support is provided by NAI funding to help carry out investigations that are within the scope of the team’s originally proposed research.
- **Other Professional** – This category is appropriate for personnel who support the Team in a critical manner, e.g., a IT support or Administrative Professional but who is not identified as a Co-I or Collaborator.

NEW – Extended Scientific Directions

- Do you have publications or other activities that were NOT in your original proposals that have grown out of the work and collaborations that the NAI has enabled?
- What we are hoping to track here is any insights or cross-fertilizations that have generated new directions in your thinking and activities unforeseen in your original vision.
- Will not be published verbatim in the annual report but used in various ways, on the website or reporting purposes.

Schedule

- Submission opens – **TODAY!**
- Submission closes – **Feb. 2, 2018**
- One-on-one Trainings – **any time**
- Layout and PI reviews – **Feb thru May**
- Internal review – **May**
- HQ review – **June**
- Publish (PDF on website) – **July**
- Print hard copies – **July/August**

Questions?

- Submission site issues
 - **Shige Abe**
 - 650-604-1927
 - Shige.Abe@nasa.gov
- Trainings and other issues
 - **Julie Fletcher**
 - 650-604-3798
 - Julie.k.fletcher@nasa.gov

How to help with HQ?

NUGGETS!



Science Nuggets

- Each week Planetary Science Division provides one science discovery/story for distribution through upper management
- Help us feed the pipeline!
 - Highlight a few of your pubs from your monthly reports
- Specific format – Images and text in a **PowerPoint**
- Include:
 - Text should give background information and explain the impact of the results to astrobiology – at about an Grade 8 level
 - Reference the paper, from a peer-reviewed journal
 - Image or simple graphic (artist concept) is required

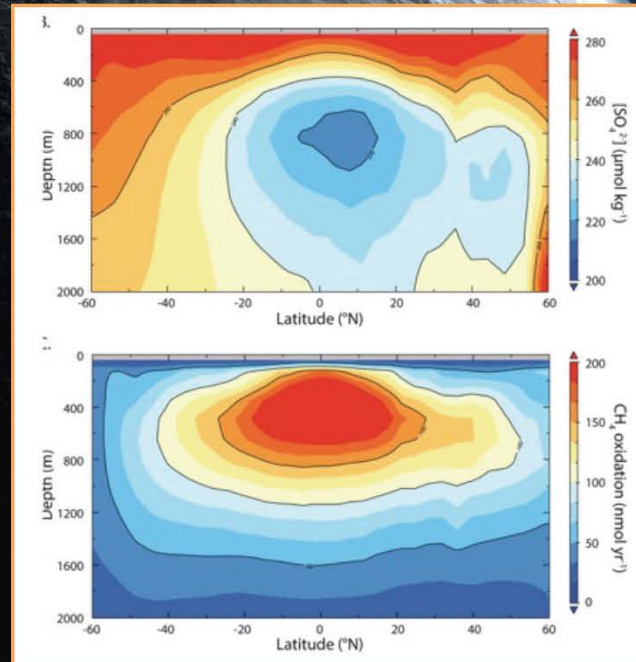
METHANE MUTED

How Did Early Earth Stay Warm?

The Alternative Earths Team of the NASA Astrobiology Institute finds that, contrary to popular climate models for the distant past, methane could not be the gas that kept the oceans liquid and livable.

For at least a billion years of its early history, planet Earth should have been frozen over but wasn't. The sun was up to 20% dimmer than it is today—too weak to warm the planet on its own. Historical computer models of the Earth's atmosphere have indicated that methane, a potent greenhouse gas, was the primary climate warming agent for the first 3.5 billion years of Earth history because oxygen was absent initially and little more than a whiff later on. (Nowadays oxygen is one-fifth of the air we breathe, and it destroys methane in a matter of years.)

PNAS, Sept. 26, 2016



DISCOVERY | A new accounting of biogeochemical cycles in the oceans reveals that methane, which is produced in the oceans by specialized microbes that ferment organic matter, has a much more powerful foe than oxygen: sulfate. Between 1.8 billion and 800 million years ago, seawater sulfate limited both the production and accumulation of methane to only 1 to 10 parts per million (ppm) in the atmosphere. That's a fraction of the 300 ppm touted by some previous models—and well below remote detection limits of current technology.

INNOVATION | The numerical model used in this study, which calculated sulfate reduction (*top*), methane oxidation (*bottom*), and an array of other biogeochemical cycles for nearly 15,000 three-dimensional regions of the ocean, is by far the highest resolution biogeochemical model ever applied to the ancient Earth. Previous models used no more than five regions.

IMPACT | Astrobiologists now face a serious challenge to explain our planet's early habitability. Identifying early Earth's precise greenhouse cocktail, probably including water vapor, nitrous oxide, and carbon dioxide, is essential for spectroscopic efforts to assess the habitability of other planets in our galaxy.

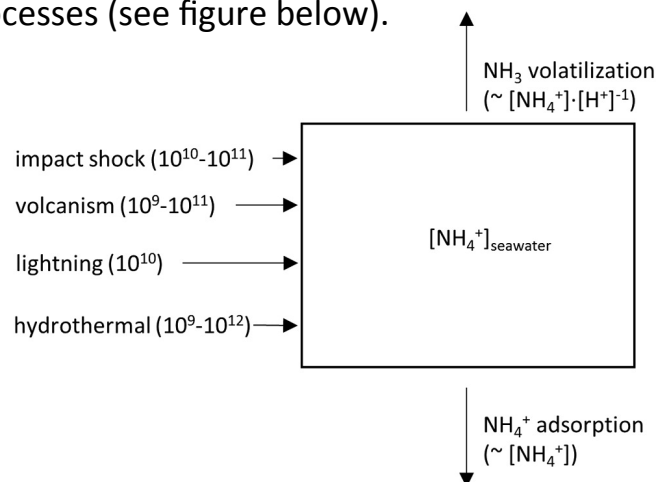
BACKGROUND IMAGE | This artist's depiction of an ice-covered planet in a distant solar system resembles what early Earth might have looked like if a mysterious mix of greenhouse gases had not warmed the climate. CREDIT: EUROPEAN SOUTHERN OBSERVATORY (ESO) VIA WIKIMEDIA COMMONS

Nitrogen in Ancient Mud: A Biosignature?

BACKGROUND: Nitrogen is an essential nutrient for all life on Earth and possibly elsewhere. Some organisms are capable of converting nitrogen gas into molecules that other species can use. Nitrogen fixation, as the process is called, involves breaking the powerful chemical bonds that hold nitrogen atoms in pairs in the atmosphere and using the resulting single nitrogen atoms to create molecules such as ammonia, which is a building block of many complex organic molecules, such as proteins, DNA and RNA. Nitrogen enrichments in ancient sedimentary rocks or in extraterrestrial samples, therefore, may be a useful biosignature.



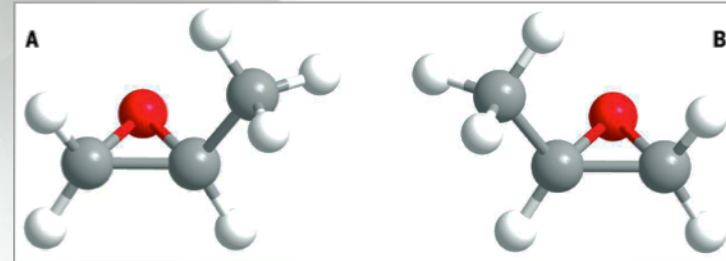
THE RESEARCH: This study focused on 3.8 billion-year-old rocks from the Isua Supracrustal Belt in Greenland, where nitrogen enrichments of up to 430 ppm were found. While this may be a biosignature, abiotic processes such as lightning or volcanism can also fix atmospheric N_2 and contribute to sedimentary nitrogen burial in the absence of life. A numerical model was developed to determine how much nitrogen enrichment could occur through only abiotic processes (see figure below).



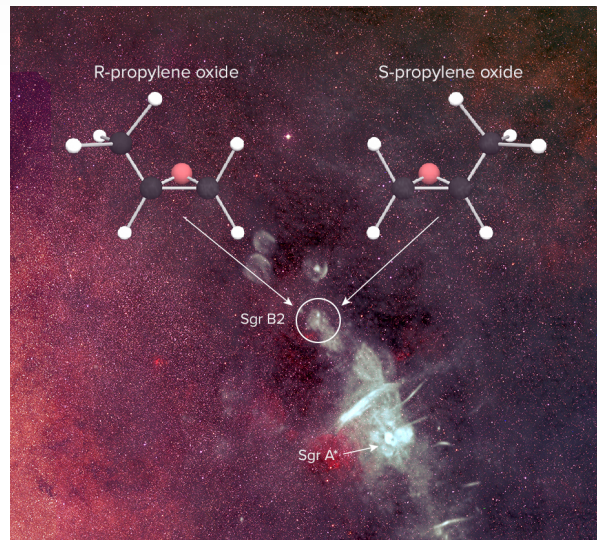
TAKE-HOME: Results showed that abiotic processes alone could not explain the nitrogen levels seen in the Isua rocks. As such, the results provide more evidence of an early origin of life on Earth—before 3.8 billion years ago. This research also suggests that analyzing nitrogen levels could help detect signs of life on Mars or perhaps elsewhere in our Solar System.

Chiral Molecule Detected in Interstellar Space

BACKGROUND: Like a pair of human hands, certain organic molecules have mirror-image versions of themselves, a chemical property known as chirality. These so-called "handed" molecules are essential for biology and have intriguingly been found in meteorites on Earth and comets in our Solar System. None, however, has been detected in the vast reaches of interstellar space, until now.



THE RESEARCH: Data was acquired from the Prebiotic Interstellar Molecular Survey (PRIMOS) project at the Green Bank Telescope. The molecule, propylene oxide ($\text{CH}_3\text{CHOCH}_2$), was found near the center of our Galaxy in an enormous star-forming cloud of dust and gas known as Sagittarius B2 (Sgr B2). Additional supporting observations were taken with the Parkes radio telescope in Australia.



TAKE-HOME: Propylene oxide is among the most complex and structurally intricate molecules detected so far in space. This is the first molecule detected in interstellar space that has the property of chirality, making it a pioneering leap forward in our understanding of how prebiotic molecules are made in the Universe and the effects they may have on the origins of life. Detecting this molecule opens the door for further experiments determining how and where molecular handedness emerges and why Life on Earth chooses one form to be more abundant than the other.

Resources on NAI EC Agenda page

November 17, 2017 Agenda

November 16, 2017

10:00-10:30 David Crisp (JPL), Orbiting Carbon Observatory-2 (OCO-2) Mission

10:30-10:50 2017 Annual Report and Science nuggets – Julie Fletcher

Science Nugget References:

- [List of accepted Planetary Science nuggets \(accepted NAI nugget\)](#)
- [Directive from Jim Green](#)
- [sample NAI Team nuggets](#)

UPCOMING MEETINGS

November 17, 2017 - VideoCon

December 15, 2017 - VideoCon - CANCELLED

January 19, 2018 - VideoCon

February 16, 2018 - VideoCon

March 16, 2018 - VideoCon

April 20, 2018 - VideoCon

May TBA, 2018 - In-Person (CUB)