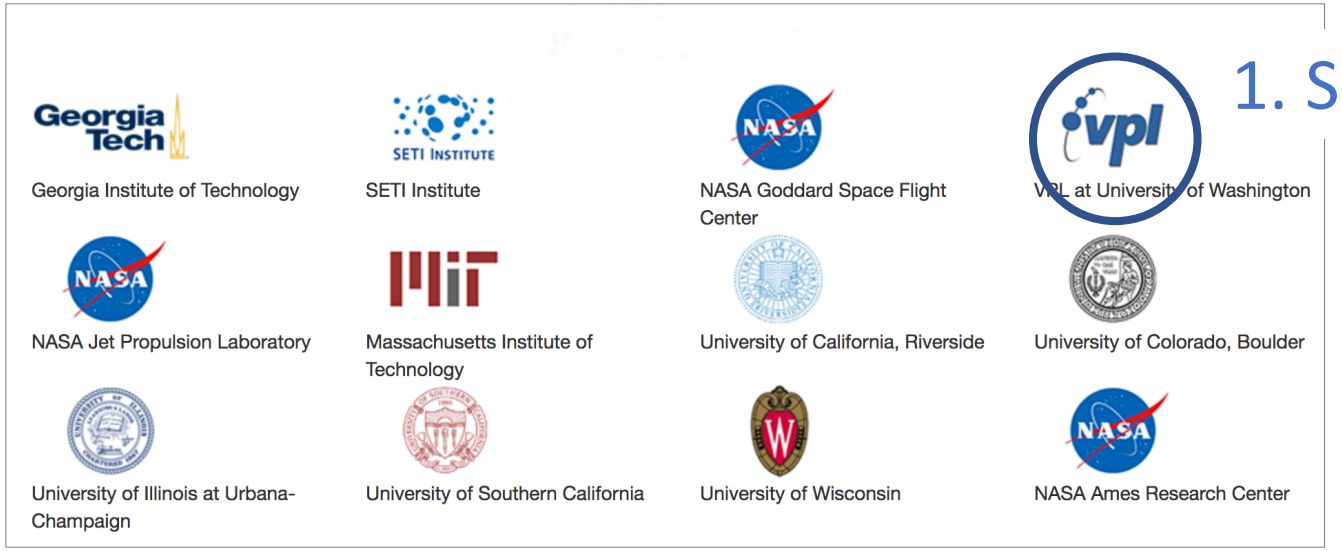
2017 NAI Annual Science Report Submission Process

NAI EC Meeting

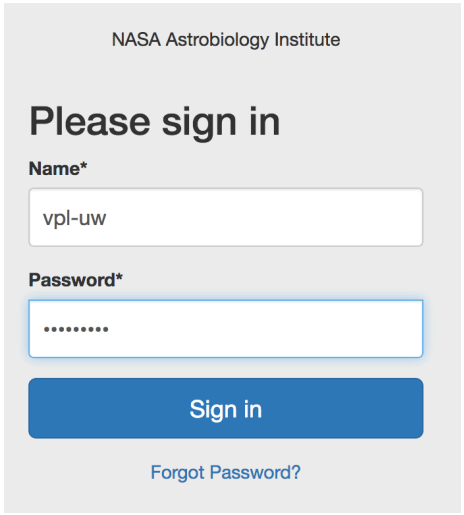
November 17, 2017

Welcome to the 2017 submission site!

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

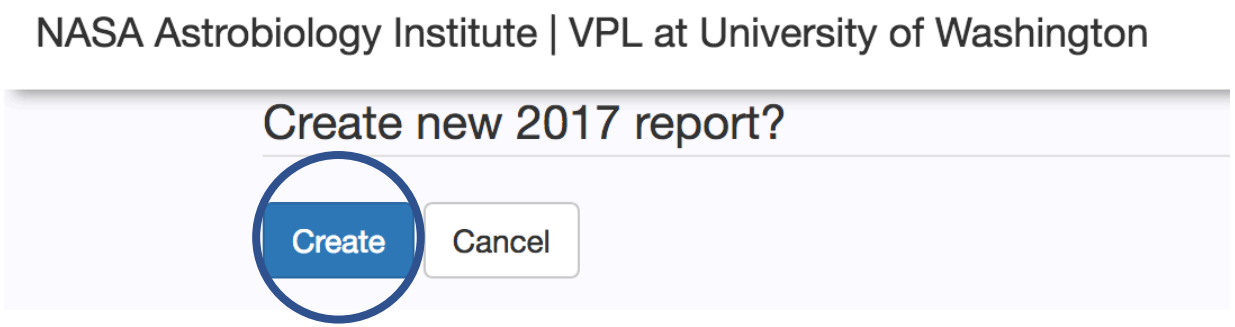


1. Select your Team

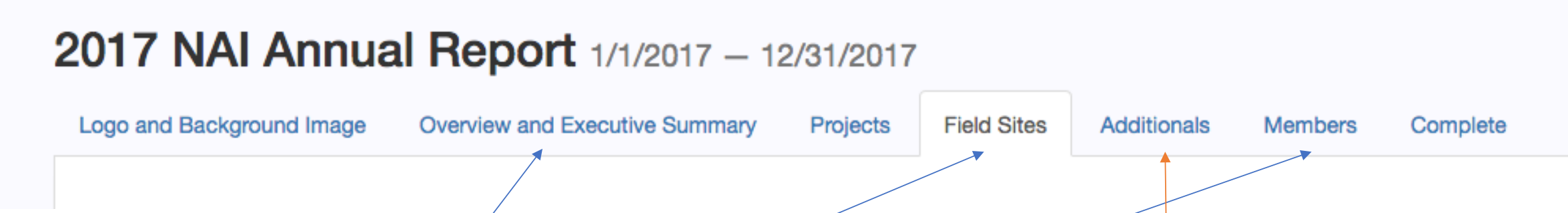


2. Login

3. Create



Menu – What's Different?



DIFFERENT

Publications

Field Sites

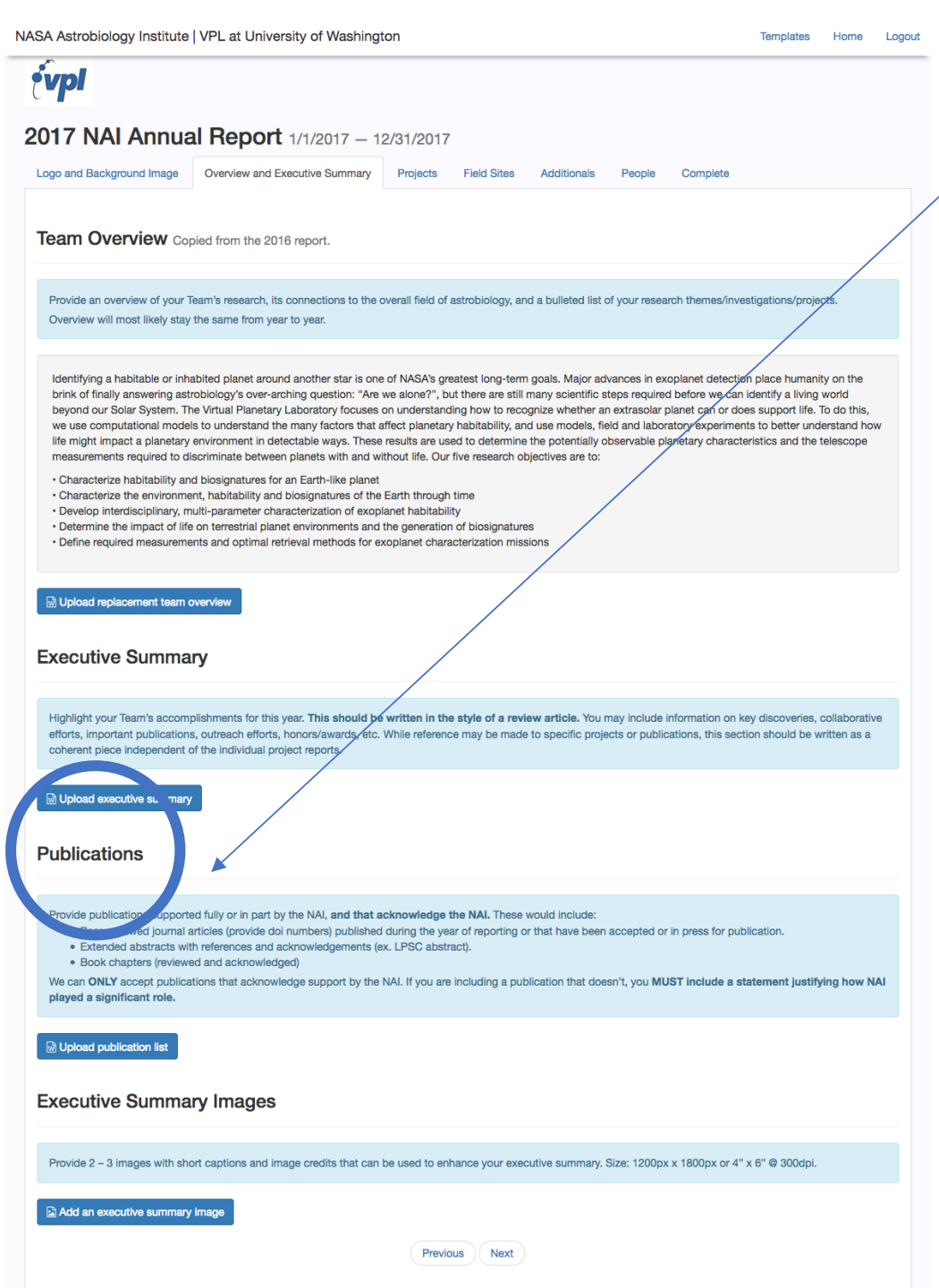
Team Roster

REMOVED

Interdisciplinarity

REPLACED WITH

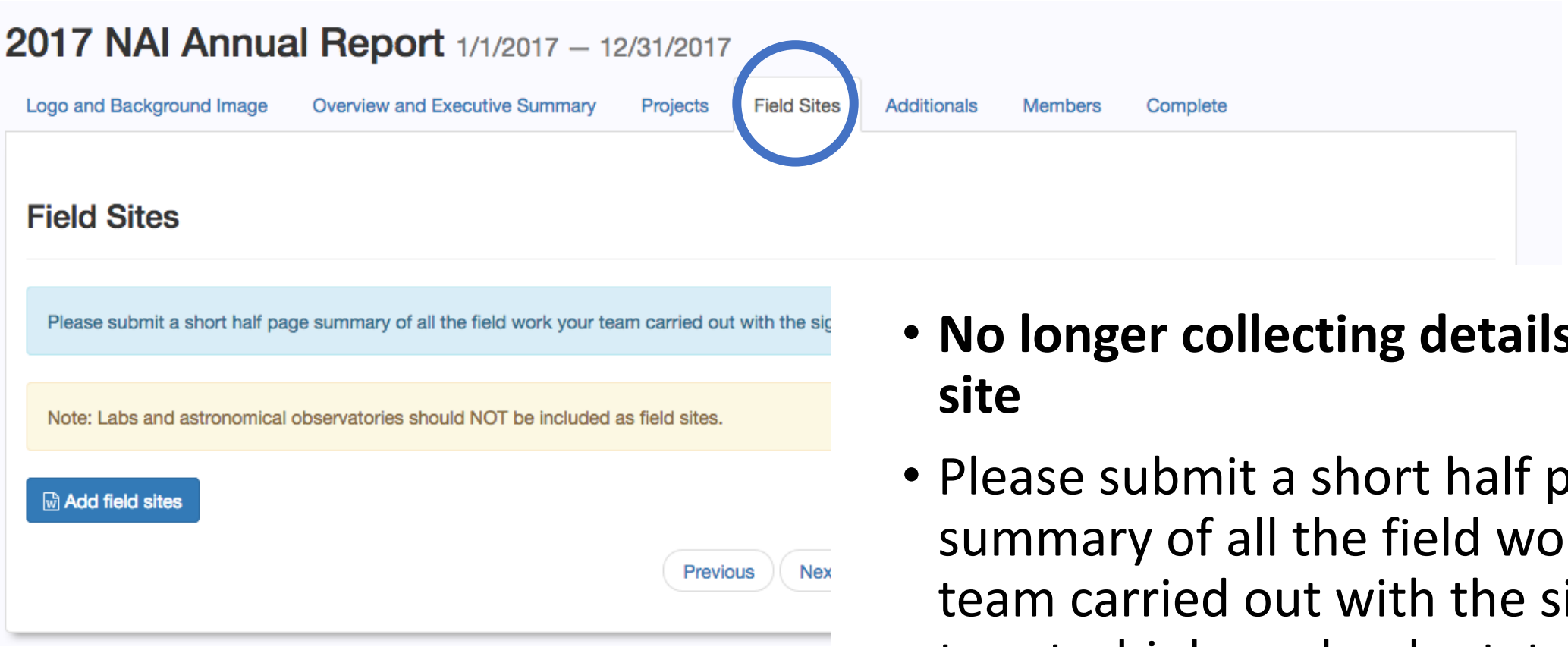
Extended Scientific Directions



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

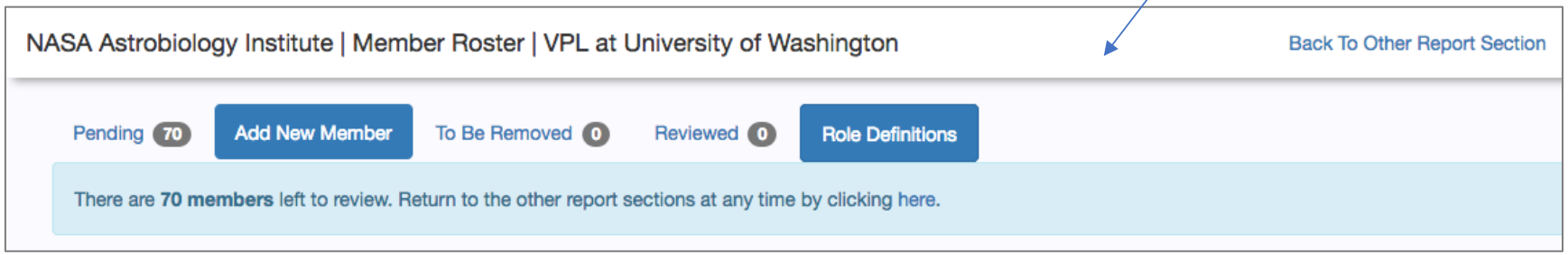


- **No longer collecting details for each site**
- Please submit a short half page summary of all the field work your team carried out with the significance to astrobiology clearly stated.

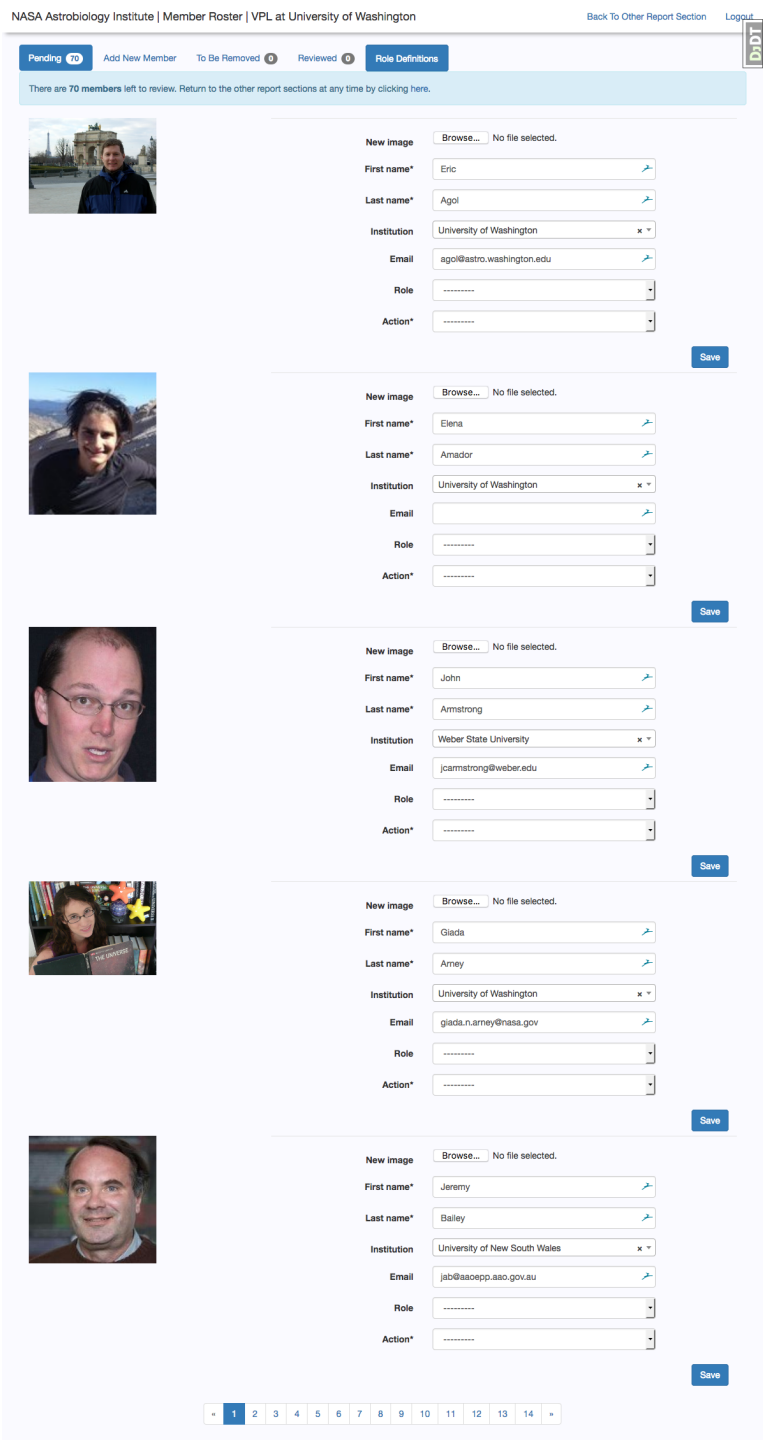
Member Roster

Logo and Background Image | Overview and Executive Summary | Projects | Field Sites | Additionals | Members | Complete

Menu will look different from rest of the site

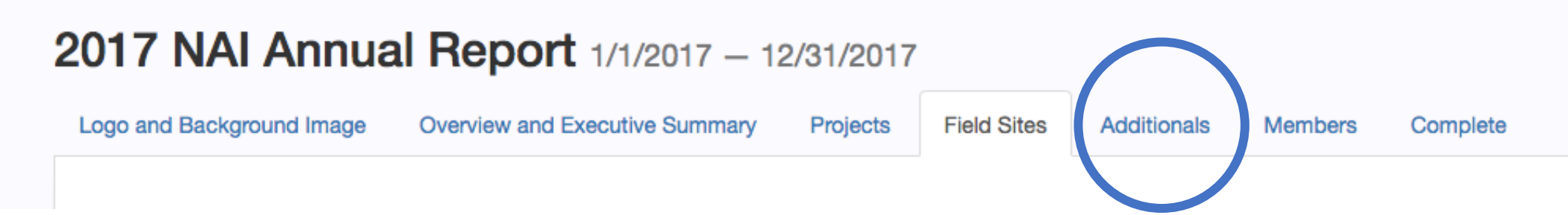


- **New -** Online submission
- Pre-populated fields
- Definitions of member roles have been clarified



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

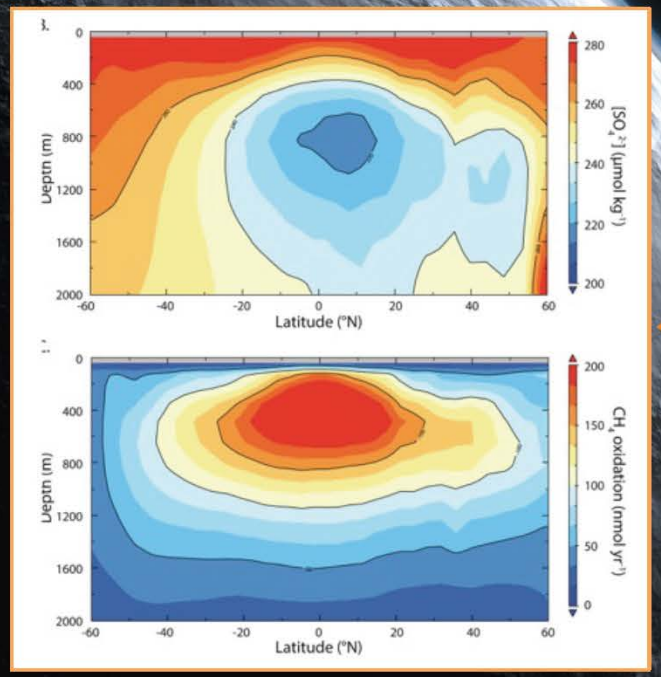
- Each week Planetary Science Division provides one science discovery/story for distribution through upper management
- Help us feed the pipeline!
  - Highlight a few of your pubs from your monthly reports
- Specific format – Images and text in a **PowerPoint**
- Include:
  - Text should give background 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.

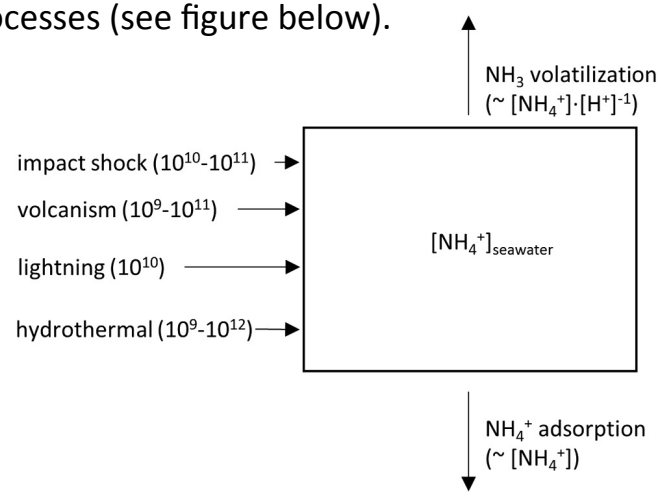
IMPACT | Astrobiologists now face a serious challenge to explain our planet's early habitability. Identifying early Earth's precise greenhouse cocktail, probably including water vapor, nitrous oxide, and carbon dioxide, is essential for spectroscopic efforts to assess the habitability of other planets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

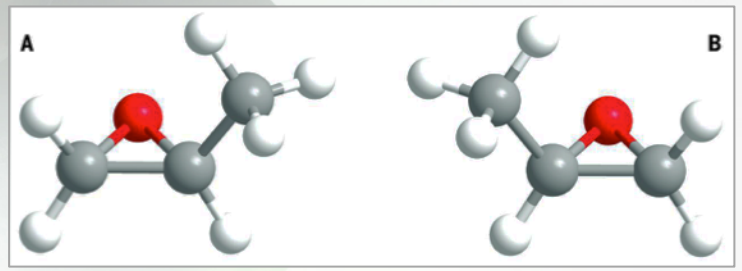


TAKE-HOME: Results showed that abiotic processes alone could not explain the nitrogen levels seen in the Isua rocks. As such, the results provide more evidence of an early origin of life on Earth—before 3.8 billion years ago. This research also suggests that analyzing nitrogen levels could help detect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

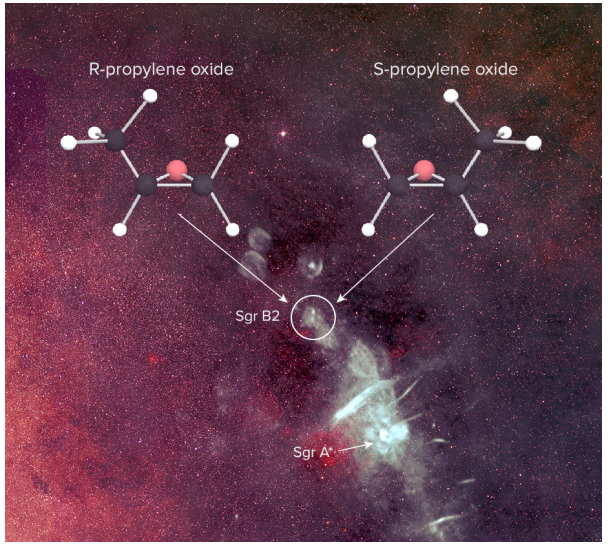
Stüeken, E.E., 2016. Nitrogen in Ancient Mud: A Biosignature? *Astrobiology*, *16*(9), pp.730-735.

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 (CH_3CHOCH_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.

Brett A. McGuire, P. Brandon Carroll, Ryan A. Loomis, Ian A. Finneran, Philip R. Jewell, Anthony J. Remijan, Geoffrey A. Blake. *Science* 2016, 352, 1449.

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