



# Lunar Surface Innovation

C O N S O R T I U M

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## Extreme Environments Focus Group February Telecon

**February 9, 2021**

Dr. Benjamin Greenhagen  
Planetary Spectroscopy Section Supervisor  
Johns Hopkins Applied Physics Laboratory

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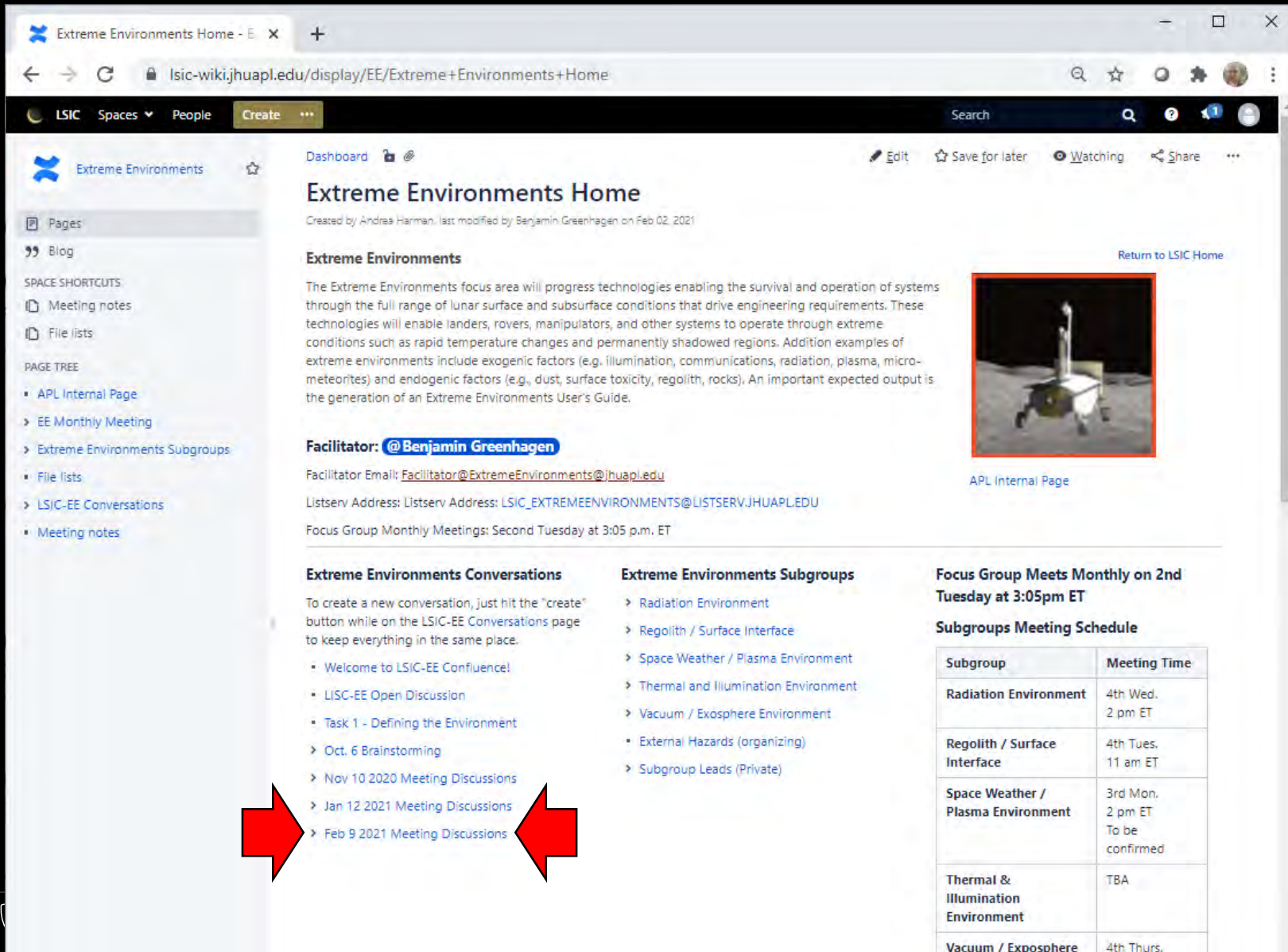


# Today's Agenda

- LSIC-EE Updates (5 min – Greenhagen, Stockstill-Cahill, Somervill)
- Featured Presentation (25 min – Clowdsley)
  - “Protecting Astronauts from Space Radiation on the Lunar Surface”
- LSIC-EE Winter/Spring Meeting Cycle (20 min – Greenhagen)
- Open floor (time permitting)

- Next month: March Meeting is scheduled for Tuesday 3/9/21 at 3:05pm EST

# Join the Discussion on Confluence



Extreme Environments Home - E x +

lsic-wiki.jhuapl.edu/display/EE/Extreme+Environments+Home

LSIC Spaces People Create

Search

Extreme Environments

Dashboard


## Extreme Environments Home

Created by Andreas Harman, last modified by Benjamin Greenhagen on Feb 02, 2021

### Extreme Environments

The Extreme Environments focus area will progress technologies enabling the survival and operation of systems through the full range of lunar surface and subsurface conditions that drive engineering requirements. These technologies will enable landers, rovers, manipulators, and other systems to operate through extreme conditions such as rapid temperature changes and permanently shadowed regions. Additional examples of extreme environments include exogenic factors (e.g. illumination, communications, radiation, plasma, micro-meteorites) and endogenic factors (e.g., dust, surface toxicity, regolith, rocks). An important expected output is the generation of an Extreme Environments User's Guide.

[Return to LSIC Home](#)



APL Internal Page

**Facilitator:** @ Benjamin Greenhagen

Facilitator Email: [Facilitator@ExtremeEnvironments@jhuapl.edu](mailto:Facilitator@ExtremeEnvironments@jhuapl.edu)

Listserv Address: Listserv Address: [LSIC\\_EXTREMEENVIRONMENTS@LISTSERV.JHUAPL.EDU](mailto:LSIC_EXTREMEENVIRONMENTS@LISTSERV.JHUAPL.EDU)

Focus Group Monthly Meetings: Second Tuesday at 3:05 p.m. ET

#### Extreme Environments Conversations

To create a new conversation, just hit the "create" button while on the LSIC-EE Conversations page to keep everything in the same place.

- Welcome to LSIC-EE Confluence!
- LSIC-EE Open Discussion
- Task 1 - Defining the Environment
- Oct. 6 Brainstorming
- Nov 10 2020 Meeting Discussions
- Jan 12 2021 Meeting Discussions
- Feb 9 2021 Meeting Discussions

#### Extreme Environments Subgroups

- Radiation Environment
- Regolith / Surface Interface
- Space Weather / Plasma Environment
- Thermal and Illumination Environment
- Vacuum / Exosphere Environment
- External Hazards (organizing)
- Subgroup Leads (Private)

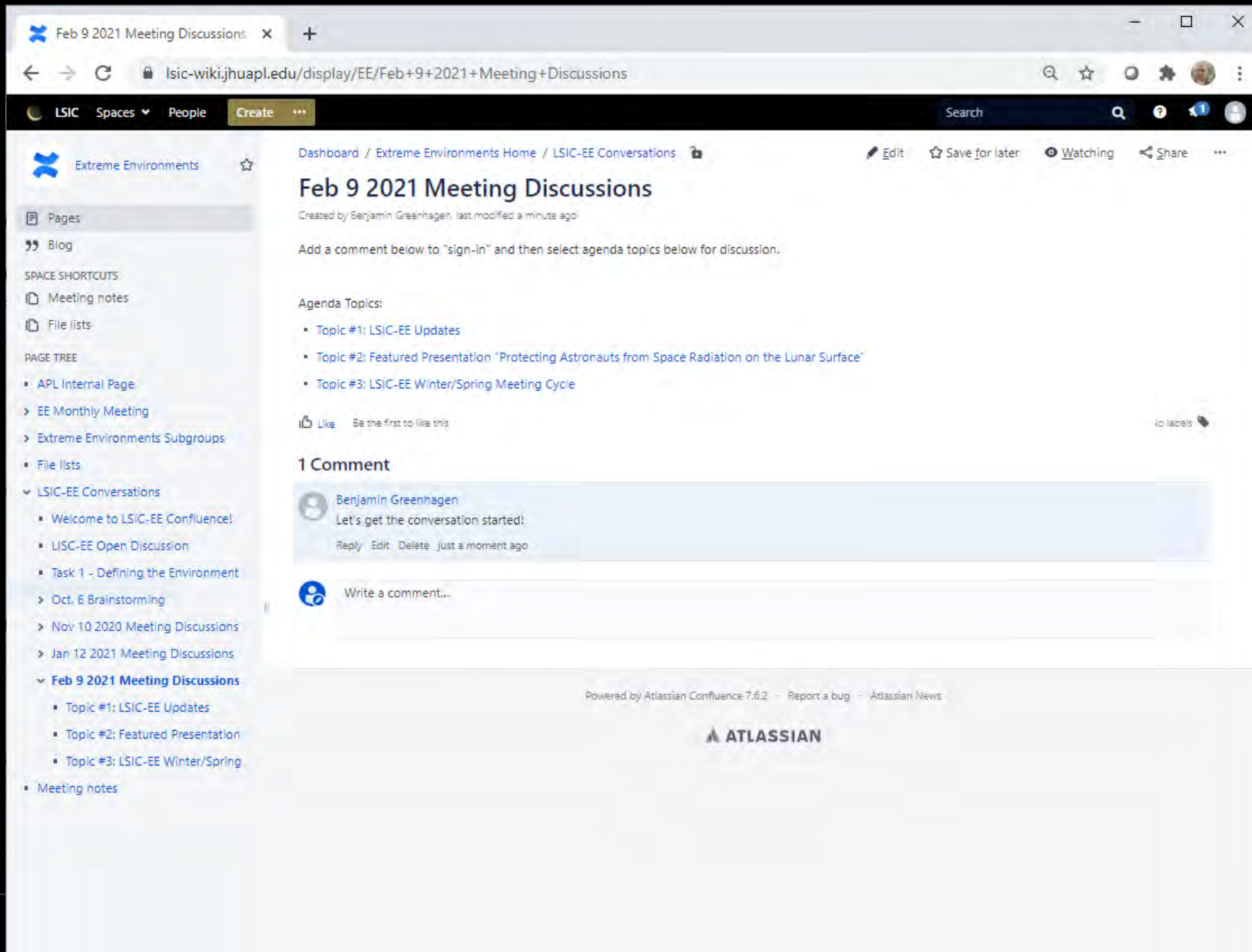
#### Focus Group Meets Monthly on 2nd Tuesday at 3:05pm ET

#### Subgroups Meeting Schedule

Subgroup	Meeting Time
Radiation Environment	4th Wed. 2 pm ET
Regolith / Surface Interface	4th Tues. 11 am ET
Space Weather / Plasma Environment	3rd Mon. 2 pm ET To be confirmed
Thermal & Illumination Environment	TBA
Vacuum / Exosphere	4th Thurs.

<https://lsic-wiki.jhuapl.edu/display/EE>

# Join the Discussion on Confluence



The screenshot shows a web browser window displaying a Confluence page. The browser's address bar shows the URL: `Isic-wiki.jhuapl.edu/display/EE/Feb+9+2021+Meeting+Discussions`. The page header includes navigation links for 'LSIC', 'Spaces', 'People', and 'Create'. The main content area is titled 'Feb 9 2021 Meeting Discussions' and includes a 'Like' button and a '1 Comment' section. The comment by Benjamin Greenhagen says 'Let's get the conversation started!'. Below the comment is a text input field with the placeholder 'Write a comment...'. The left sidebar contains a navigation menu with categories like 'Pages', 'Blog', 'SPACE SHORTCUTS', and 'PAGE TREE'. The footer of the page indicates it is powered by Atlassian Confluence 7.6.2.

1. Add a comment to “sign-in”
2. Select an agenda topic and comment your thoughts
3. You can comment before, during, or after the presentations
4. Check back later to see what others have commented!

# Focus Group Updates

*Continuing effort to reorganize and improve support for our subgroups*

- Illumination subgroup has been folded into the thermal subgroup, which is now called “Thermal & Illumination Environment” subgroup
  - Thank you Craig for you leadership of the former Illumination Environment subgroup!
- All subgroup monthly tag-ups will be planned for 3<sup>rd</sup> or 4<sup>th</sup> week of the month

Subgroup	Meeting Times (ET)	Lead	Email
Radiation Environment	4th Wed @ 2 pm	Lawrence Heilbronn	lheilbro@utk.edu
Regolith / Surface Interface	4th Tue @ 11 am	Melissa Roth	melissa@offplanetresearch.com
Space Weather / Plasma Environment	3rd Mon @ 2 pm (to be confirmed)	Justin Likar	justin.likar@jhuapl.edu
Thermal & Illumination Environment	TBA	Ahsan Choudhuri	ahsan@utep.edu
Vacuum / Exosphere Environment	4th Thu @ 2 pm	Stephen Indyk	sjindyk@honeybeerobotics.com
External Hazards	TBA	<vacant>	<vacant>

*Karen’s Corner – Monthly Confluence Highlight*

# Focus Group Updates

## *Meeting Reminders*

- Structuring Real-Time Science Support of Artemis Crewed Operations (2/24/21 - 2/25/21 11am – 5:40pm EST)
  - <https://www.hou.usra.edu/meetings/lunarsurface2020/>
- Workshop on Lunar Mapping for Precision Landing (3/2/21 - 3/4/21 ~3.5 hours each day)
  - Day 1 will cover TRN and Digital Elevation Map Basics, including an overview of currently available data, best practices, and overviews of TRN systems in use on OSIRIS-REx and Mars 2020.
  - Day 2 will be focused on DEM building methods and tools
  - Day 3 will focus on modeling lunar surface features and terrain rendering tools, including a poster session focused on descriptions of current terrain rendering tools. If you would like to present at the poster session, please submit an abstract by February 16. Details are available on the website.
  - Submit poster abstracts by 2/16 & register by 2/26!
  - <http://lsic.jhuapl.edu/Events/Agenda/index.php?id=120>

# Featured Presentation

- Protecting Astronauts from Space Radiation on the Lunar Surface
  - Martha Cloudsley, NASA Langley Research Center

# Winter/Spring Meeting Cycle

*Each Focus Group is tasked with compiling community inputs on relevant topics*

- Some FGs have conducted ~6-hour topic-specific workshops (e.g. ISRU Supply and Demand, Dust Mitigation) but there are other possible approaches
- Desirable to leverage unique structure of LSIC-EE and broad-based expertise
- Planning a multi-month approach including a “supersized” monthly tag-up
- First topic: Identifying and Classifying Specific Lunar Environments
  - “Breaking Down the Lunar Environment Monolith”
  - How do specific lunar environment differ from descriptions of the general lunar environment?
    - NASA Cross-Program Design Specification for Natural Environments (DSNE) Revision H
    - <https://ntrs.nasa.gov/citations/20205007447>



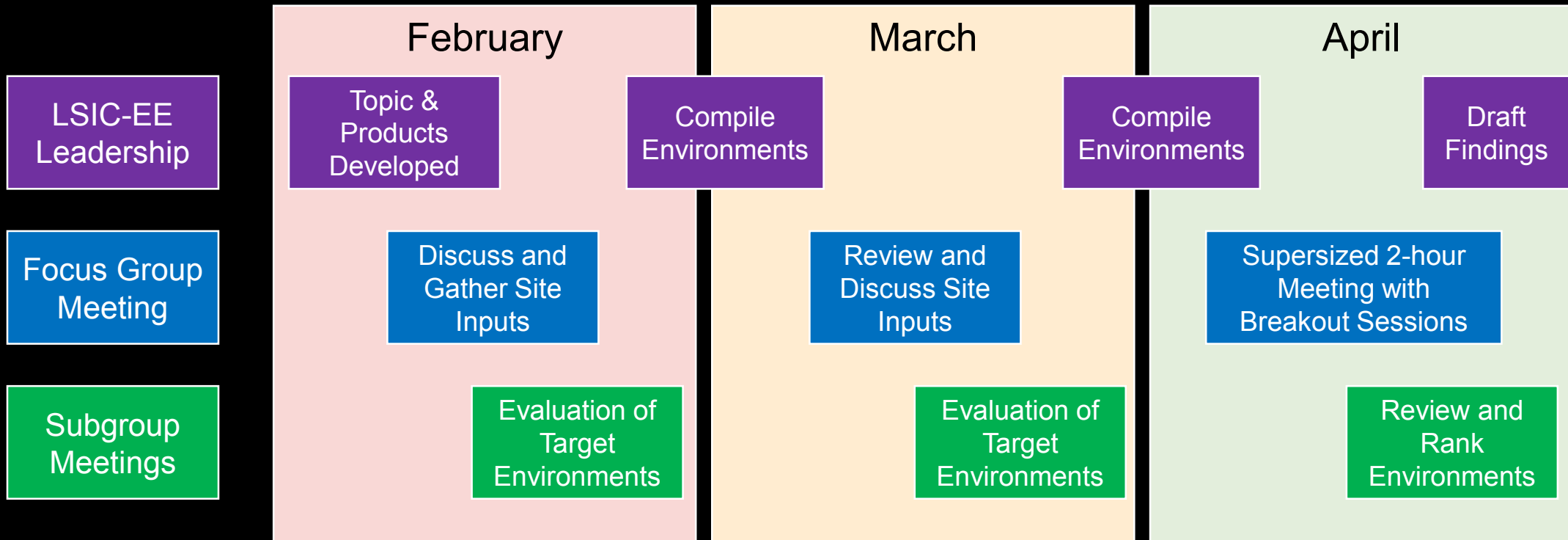
# Winter/Spring Meeting Cycle

## *Activities to Complete Before the LSIC Spring Meeting*

- Gather community inputs regarding interesting lunar environments / types of sites.
  - *January Subgroups + February (2/9) & March (3/9) Focus Group Meetings*
- Subgroups summarize environments for each site (What do we know? What do we think? What do we not know?)
  - *February & March Subgroup Meetings*
- Categorize sites and present preliminary evaluations to focus group; seek feedback; identify missing information
  - *April Supersized Focus Group Meeting (4/13)*
- Have subgroups revisit sites for additional characterization (as needed) and rank sites by level of environmental stresses (hardest environments ranked higher / easier environments ranked lower)
  - *April Subgroup Meetings*
- LSIC Spring Meeting likely in Early May

# Winter/Spring Meeting Cycle

*Activities to Complete Before the LSIC Spring Meeting*



# Winter/Spring Meeting Cycle

## *What Kinds of Environments and Sites?*

- Any lunar surface environment that represents a challenge or requires a technical mitigation to allow surface survival and operations
  - Looking to be comprehensive at this stage!
  - Environments with risks essentially the same as the space environment are lower priority

## *How can I suggest / nominate environments or sites to be considered?*

- Participate in subgroup discussions and on confluence
- Use the LSIC-EE: Surface Environments Survey:
  - [http://bit.ly/LSIC\\_Env\\_Survey](http://bit.ly/LSIC_Env_Survey) or
  - <https://docs.google.com/forms/d/191NLHB9MQK9ff1X7VTPEwQszoMRyVqsKZBnUEVW0ho8/>
  - Survey responses received by COB 2/16/21 are most useful to be considered by the subgroups this month!

## *Thoughts? Discussion?*

# Winter/Spring Meeting Cycle

## *What to Expect at the Supersized April 13<sup>th</sup> Focus Group Meeting*

- 2 Hour Meeting (2:30 – 4:30 EST)
  - 30 Minutes Introduction and Description of Environments
  - 5 Minutes for Transition to Breakout Groups
  - 50 Minutes to Discuss Specific Environments (3:05 – 3:55 EST)
  - 5 Minutes for Transition to Breakout Groups
  - 30 Minutes for Summary and General Discussion
  
- Number of Breakout Sessions **TBD** Based on Number of Environments to Consider

Product #1: Preliminary environmental assessments for each type, archived on Confluence

Product #2: “Final” list of environments ranked by subgroups according to difficulty

*Thoughts? Discussion?*

# Looking Ahead to 2021-22 Cycles

## *Activities to Complete After the LSIC Spring Meeting (Summer 2021 through Spring 2022)*

- Prioritize Specific Lunar Environments to Focus on During LSIC Year 2
  - *Likely a mixture of NASA priorities and community identified stressing environments*
- Identify Technology Capabilities and Gaps for Specific Lunar Environments
- Identify Observation (Knowledge) and Simulation (Prediction) Capabilities and Gaps for Specific Lunar Environments
- Identify Experimental Testing and Technology Maturation (including Facilities) Capabilities and Gaps for Specific Lunar Environments

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APPLIED PHYSICS LABORATORY