# Resources for Writing a Decadal Paper

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2020 - 2021 ASGSR Decadal Survey Workshop Series

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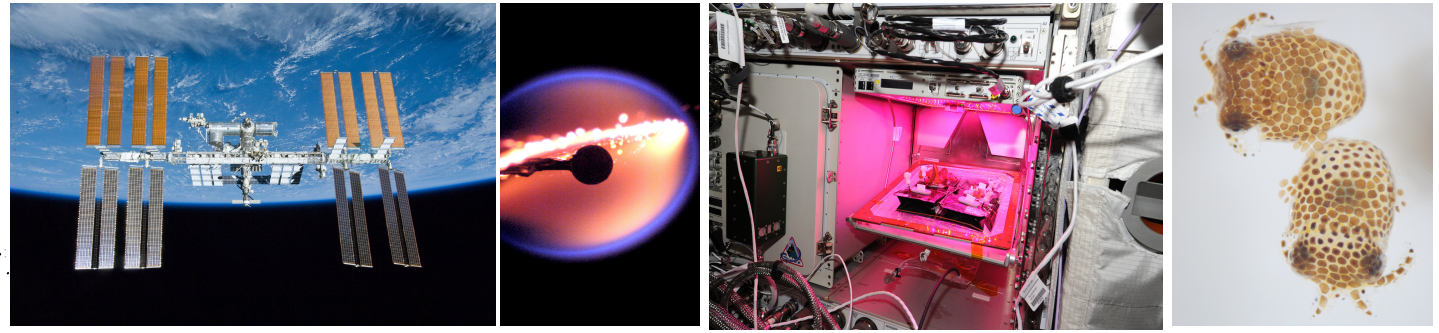


# 1. Virtual Topical Town Halls (n = 7; last Oct-Nov)

**A. Pre-recorded knowledge talks available for participants to familiarize with topics**

**B. Pre-recorded Plus10 Videos available to watch before town hall**

A researcher pretends they are presenting at **ASGSR 2030** and talks about their research results – leaving gaps where the current technology/methods might be lacking

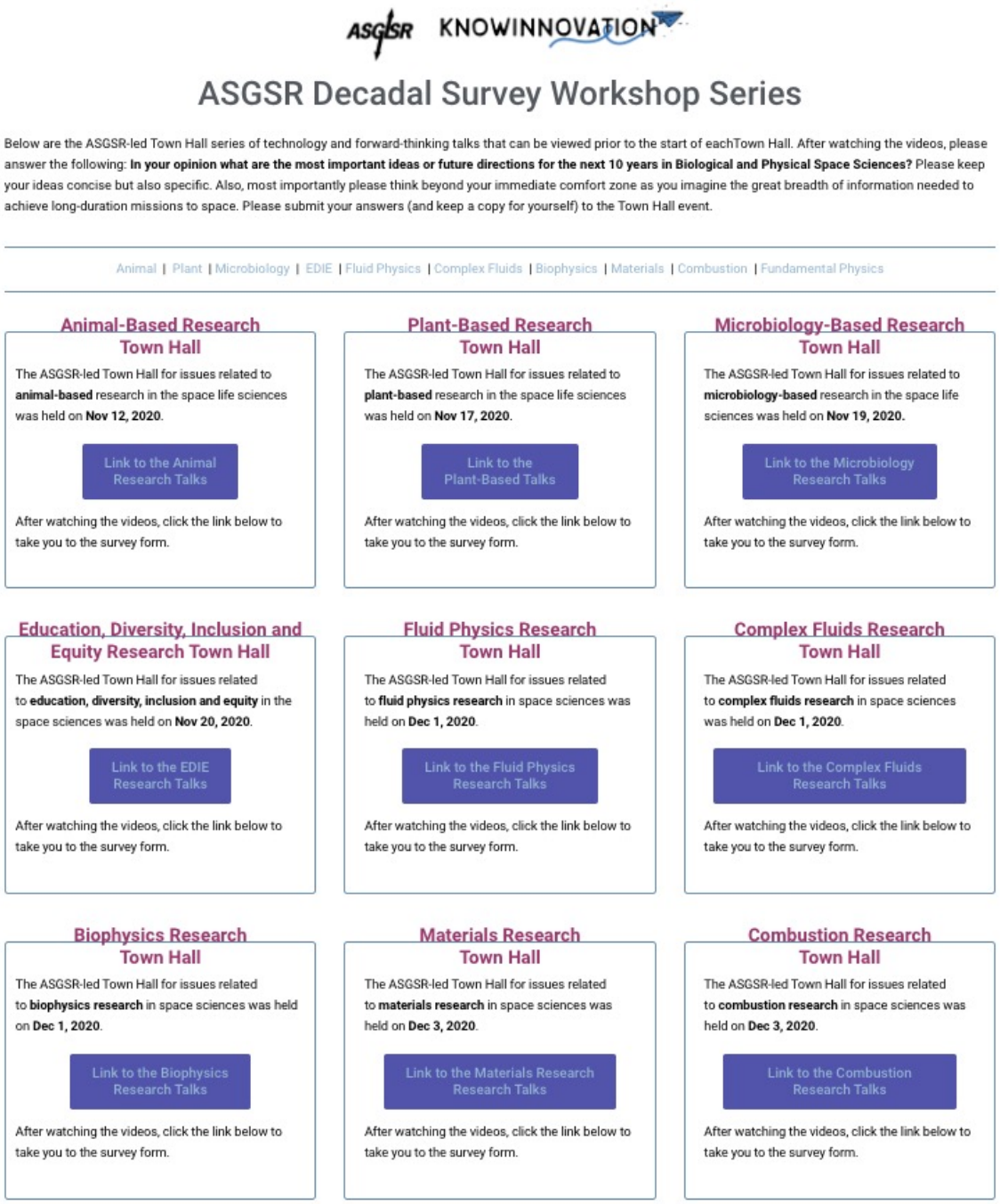
**C. At Town Hall start they discussions on how to fill those gaps in the Plus10 talks**

Ask the audience what other frontiers of research they see based on current technology and try to identify major question in that area that represent important frontiers

**Outcome Goal of Town Halls: 1) Stimulated discussion; 2) identified vocal and engaged participants; 3) began to home in on the major research campaign ideas**

**Various researchers in the community generated presentations about various topics in the Biological and Physical Space Sciences.**

https://asgsr.org/decadal-talks/



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## ASGSR Decadal Survey Workshop Series

Below are the ASGSR-led Town Hall series of technology and forward-thinking talks that can be viewed prior to the start of eachTown Hall. After watching the videos, please answer the following: **In your opinion what are the most important ideas or future directions for the next 10 years in Biological and Physical Space Sciences?** Please keep your ideas concise but also specific. Also, most importantly please think beyond your immediate comfort zone as you imagine the great breadth of information needed to achieve long-duration missions to space. Please submit your answers (and keep a copy for yourself) to the Town Hall event.

Animal | Plant | Microbiology | EDIE | Fluid Physics | Complex Fluids | Biophysics | Materials | Combustion | Fundamental Physics

### Animal-Based Research Town Hall

The ASGSR-led Town Hall for issues related to **animal-based** research in the space life sciences was held on **Nov 12, 2020**.

Link to the Animal Research Talks

After watching the videos, click the link below to take you to the survey form.

### Plant-Based Research Town Hall

The ASGSR-led Town Hall for issues related to **plant-based** research in the space life sciences was held on **Nov 17, 2020**.

Link to the Plant-Based Talks

After watching the videos, click the link below to take you to the survey form.

### Microbiology-Based Research Town Hall

The ASGSR-led Town Hall for issues related to **microbiology-based** research in the space life sciences was held on **Nov 19, 2020.**

Link to the Microbiology Research Talks

After watching the videos, click the link below to take you to the survey form.

### Education, Diversity, Inclusion and Equity Research Town Hall

The ASGSR-led Town Hall for issues related to **education, diversity, inclusion and equity** in the space sciences was held on **Nov 20, 2020**.

Link to the EDIE Research Talks

After watching the videos, click the link below to take you to the survey form.

### Fluid Physics Research Town Hall

The ASGSR-led Town Hall for issues related to **fluid physics research** in space sciences was held on **Dec 1, 2020**.

Link to the Fluid Physics Research Talks

After watching the videos, click the link below to take you to the survey form.

### Complex Fluids Research Town Hall

The ASGSR-led Town Hall for issues related to **complex fluids research** in space sciences was held on **Dec 1, 2020**.

Link to the Complex Fluids Research Talks

After watching the videos, click the link below to take you to the survey form.

### Biophysics Research Town Hall

The ASGSR-led Town Hall for issues related to **biophysics research** in space sciences was held on **Dec 1, 2020**.

Link to the Biophysics Research Talks

After watching the videos, click the link below to take you to the survey form.

### Materials Research Town Hall

The ASGSR-led Town Hall for issues related to **materials research** in space sciences was held on **Dec 3, 2020**.

Link to the Materials Research Research Talks

After watching the videos, click the link below to take you to the survey form.

### Combustion Research Town Hall

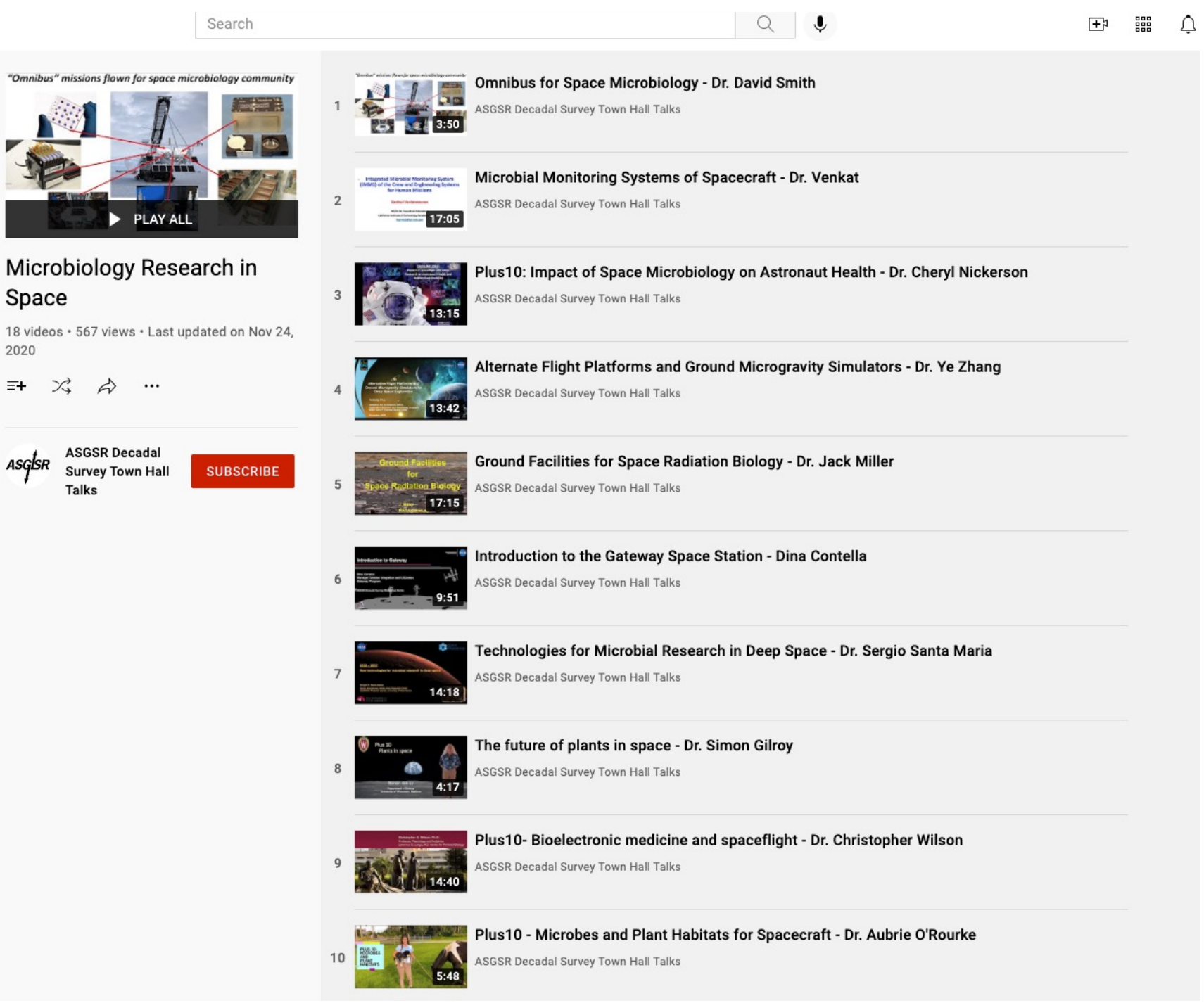
The ASGSR-led Town Hall for issues related to **combustion research** in space sciences was held on **Dec 3, 2020**.

Link to the Combustion Research Talks

After watching the videos, click the link below to take you to the survey form.

**ASGSR YouTube channel has all the Plus10 talks and other informational sessions about the future of biological and physical space sciences.**

https://www.youtube.com/playlist?list=PL2otGG0bPu58wd5xPDCPsDK8ymIrNP_M2



2020 - 2021 ASGSR Decadal Survey Workshop Series

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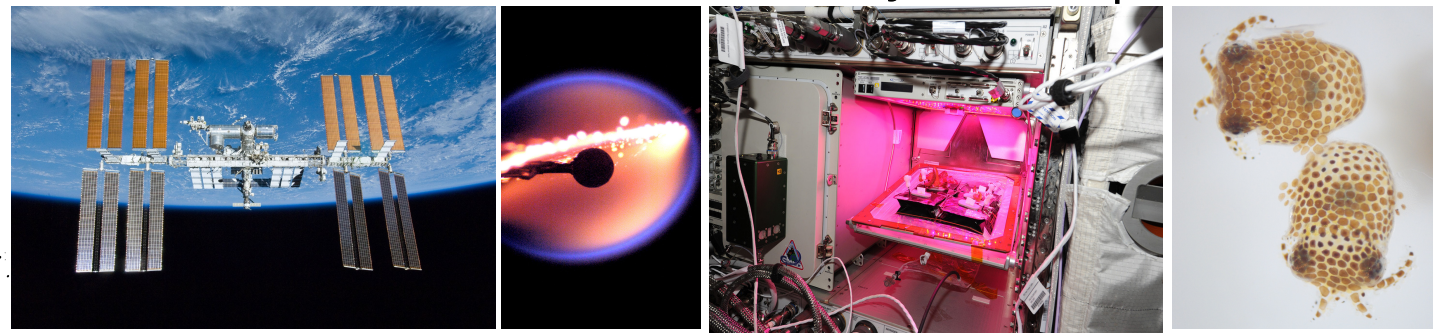


# MicroLabs – Highly Interactive workshops (2– 3 h; Spring 2021)

**A. Invited most active participants in Town Halls and Surveys from a wide range of career stages to participate in the Knowinnovation MicroLab workshops**

~50 participants in each of the topical MicroLabs
topical researchers and technology experts will be included

Participants participated in a series of break out groups and share information with larger MicroLab

**B. Using the major campaign ideas from the Town Halls and Surveys to start developing critical areas that need to be represented in the Decadal Survey**

**Outcome Goals of MicroLabs:**

1) **Identified Champions who will lead the major campaign White Paper writing effort;**
2) **Identify the topical areas for supporting white papers and identify lead writers for those**

https://asgsr.org/decadal-survey/

If you want to brain-storm and see the ideas that came out of the Town Halls and MicroLabs visit the ASGSR website and see what was discussed for each area.

Links remain active….

# MicroLabs –Interactive Writing Workshops - SPRING 2021

- MicroLabs will be highly interactive 150-minute virtual events that will be held as part of a series to help spur on creative thinking and facilitate the free exchange of ideas.
- Mentors from the ASGSR leadership and the Knowinnovation staff will help catalyze creative thinking and stimulate the emergence of ideas in these events.
- The goal of these MicroLabs will be to begin to outline major research campaigns that will be submitted to the NASEM portal as a Concept Paper.
  Attendance at the MicroLab writing session is not mandatory to help with the writing process.
- We anticipate hosting five of these MicroLabs topics that span the different subtopics within Biological and Physical Space Sciences (e.g., microbiology, animal, plant, fluid physics, complex fluids, combustion, material science, biophysics).
- If you would like to be a topic leader and help organize a concept paper on any of the following topics please sign up.

**Portal for Concept Paper Submission at the National Academies**

Submit Topical White Paper

Submit Research Campaign Paper

## MicroLab Writing Workshops

Animal Research:
May 5, 2021 15:00 - 17:30 Eastern

Materials Research:
May 5, 2021 15:00 - 17:30 Eastern

Microbiology Research:
May 7, 2021 15:00 - 17:30 Eastern

Combustion Research:
May 7, 2021 15:00 - 17:30 Eastern

Plant Research
May 13, 2021 15:00 - 17:30 Eastern

Complex Fluids Research
May 13, 2021 15:00 - 17:30 Eastern

Fluid Physics Research
May 17, 2021 15:00 - 17:30 Eastern

Education, Diversity, Equity, Inclusion
May 17, 2021 15:00 - 17:30 Eastern

Access Writing Portal Here

## Jump to a Specific Topic to Sign-up for MicroLab

### Biological Sciences

- Animals
- Microbiology
- Plants

### Physical Sciences

- Combustion
- Complex Fluids
- Fluid Physics
- Materials

### Research Campaigns

- Artificial Intelligence/Automation
- Additive Manufacturing
- Bioregenerative life support
- In Situ Resource Utilization
- Microbiome
- Space Manufacturing
- Systems Biology
- Spacecraft Fire Safety

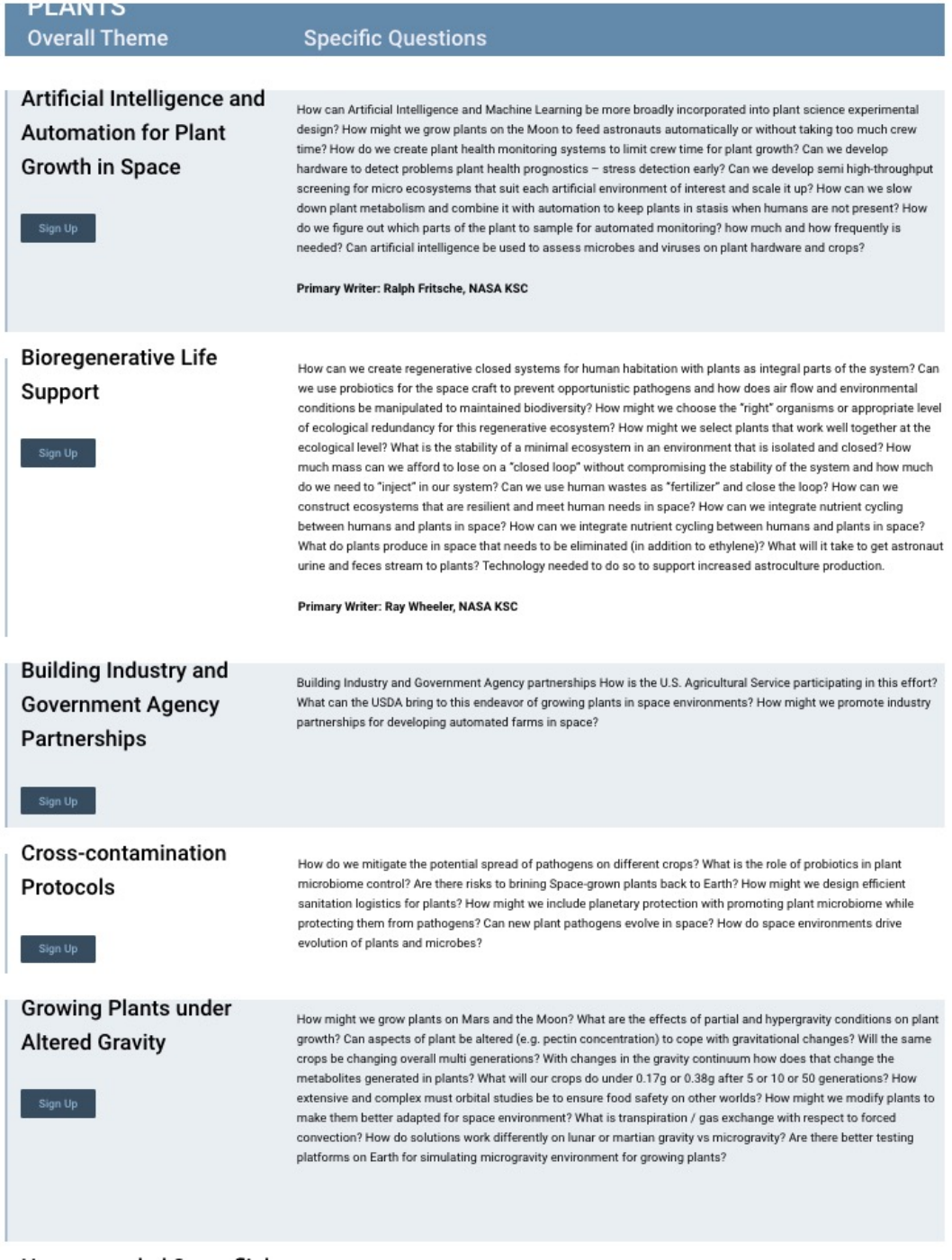
### Education, Diversity, Inclusion & Equity

- Creating Safe Spaces
- Demographics
- Graduate Fellowships
- Power and Responsibility
- Retention of STEM students
- Outreach and Citizen Science

# Outcomes of Town Halls – Big Ideas

- **Example – Some of the big ideas that emerged from plants**
- **Primary Writers – Cat-herder-in-Chief**
- **Some topics never were not signed up for before the Microlabs**
- **Sign-ups now defunct but you can access material and it is highly recommended to reach out to Primary Writer to see the current status**

https://asgsr.org/decadal-survey/#plants



PLANTS

| Overall Theme | Specific Questions |
|---|---|
| Artificial Intelligence and Automation for Plant Growth in Space<br>Sign Up | How can Artificial Intelligence and Machine Learning be more broadly incorporated into plant science experimental design? How might we grow plants on the Moon to feed astronauts automatically or without taking too much crew time? How do we create plant health monitoring systems to limit crew time for plant growth? Can we develop hardware to detect problems plant health prognostics – stress detection early? Can we develop semi high-throughput screening for micro ecosystems that suit each artificial environment of interest and scale it up? How can we slow down plant metabolism and combine it with automation to keep plants in stasis when humans are not present? How do we figure out which parts of the plant to sample for automated monitoring? how much and how frequently is needed? Can artificial intelligence be used to assess microbes and viruses on plant hardware and crops?<br>**Primary Writer: Ralph Fritsche, NASA KSC** |
| Bioregenerative Life Support<br>Sign Up | How can we create regenerative closed systems for human habitation with plants as integral parts of the system? Can we use probiotics for the space craft to prevent opportunistic pathogens and how does air flow and environmental conditions be manipulated to maintained biodiversity? How might we choose the "right" organisms or appropriate level of ecological redundancy for this regenerative ecosystem? How might we select plants that work well together at the ecological level? What is the stability of a minimal ecosystem in an environment that is isolated and closed? How much mass can we afford to lose on a "closed loop" without compromising the stability of the system and how much do we need to "inject" in our system? Can we use human wastes as "fertilizer" and close the loop? How can we construct ecosystems that are resilient and meet human needs in space? How can we integrate nutrient cycling between humans and plants in space? How can we integrate nutrient cycling between humans and plants in space? What do plants produce in space that needs to be eliminated (in addition to ethylene)? What will it take to get astronaut urine and feces stream to plants? Technology needed to do so to support increased astroculture production.<br>**Primary Writer: Ray Wheeler, NASA KSC** |
| Building Industry and Government Agency Partnerships<br>Sign Up | Building Industry and Government Agency partnerships How is the U.S. Agricultural Service participating in this effort? What can the USDA bring to this endeavor of growing plants in space environments? How might we promote industry partnerships for developing automated farms in space? |
| Cross-contamination Protocols<br>Sign Up | How do we mitigate the potential spread of pathogens on different crops? What is the role of probiotics in plant microbiome control? Are there risks to brining Space-grown plants back to Earth? How might we design efficient sanitation logistics for plants? How might we include planetary protection with promoting plant microbiome while protecting them from pathogens? Can new plant pathogens evolve in space? How do space environments drive evolution of plants and microbes? |
| Growing Plants under Altered Gravity<br>Sign Up | How might we grow plants on Mars and the Moon? What are the effects of partial and hypergravity conditions on plant growth? Can aspects of plant be altered (e.g. pectin concentration) to cope with gravitational changes? Will the same crops be changing overall multi generations? With changes in the gravity continuum how does that change the metabolites generated in plants? What will our crops do under 0.17g or 0.38g after 5 or 10 or 50 generations? How extensive and complex must orbital studies be to ensure food safety on other worlds? How might we modify plants to make them better adapted for space environment? What is transpiration / gas exchange with respect to forced convection? How do solutions work differently on lunar or martian gravity vs microgravity? Are there better testing platforms on Earth for simulating microgravity environment for growing plants? |

https://asgsr.org/decadal-survey/

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Links remain active….

**Now how do you see what has been worked on??**

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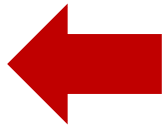
Access Writing Portal Here



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- Animals
- Microbiology
- Plants

**Physical Sciences**

- Combustion
- Complex Fluids
- Fluid Physics
- Materials

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# KI Storm – resources for collaboration and writing

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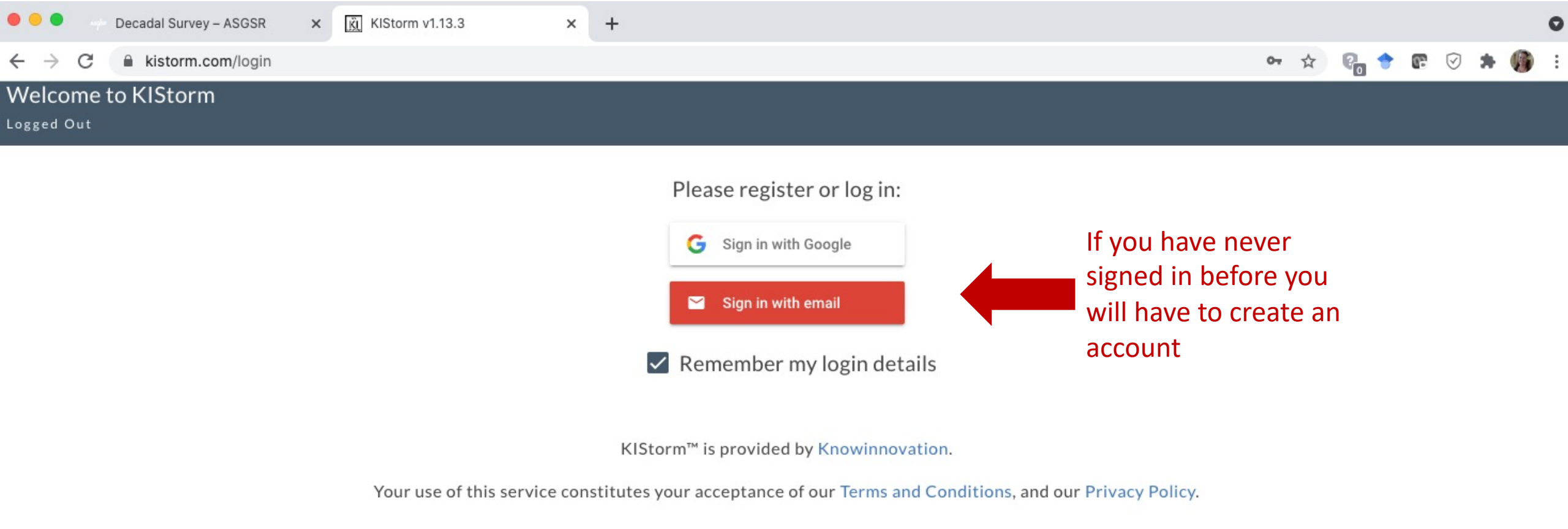


If you have never signed in before you will have to create an account

**Event Code = ASGSR**

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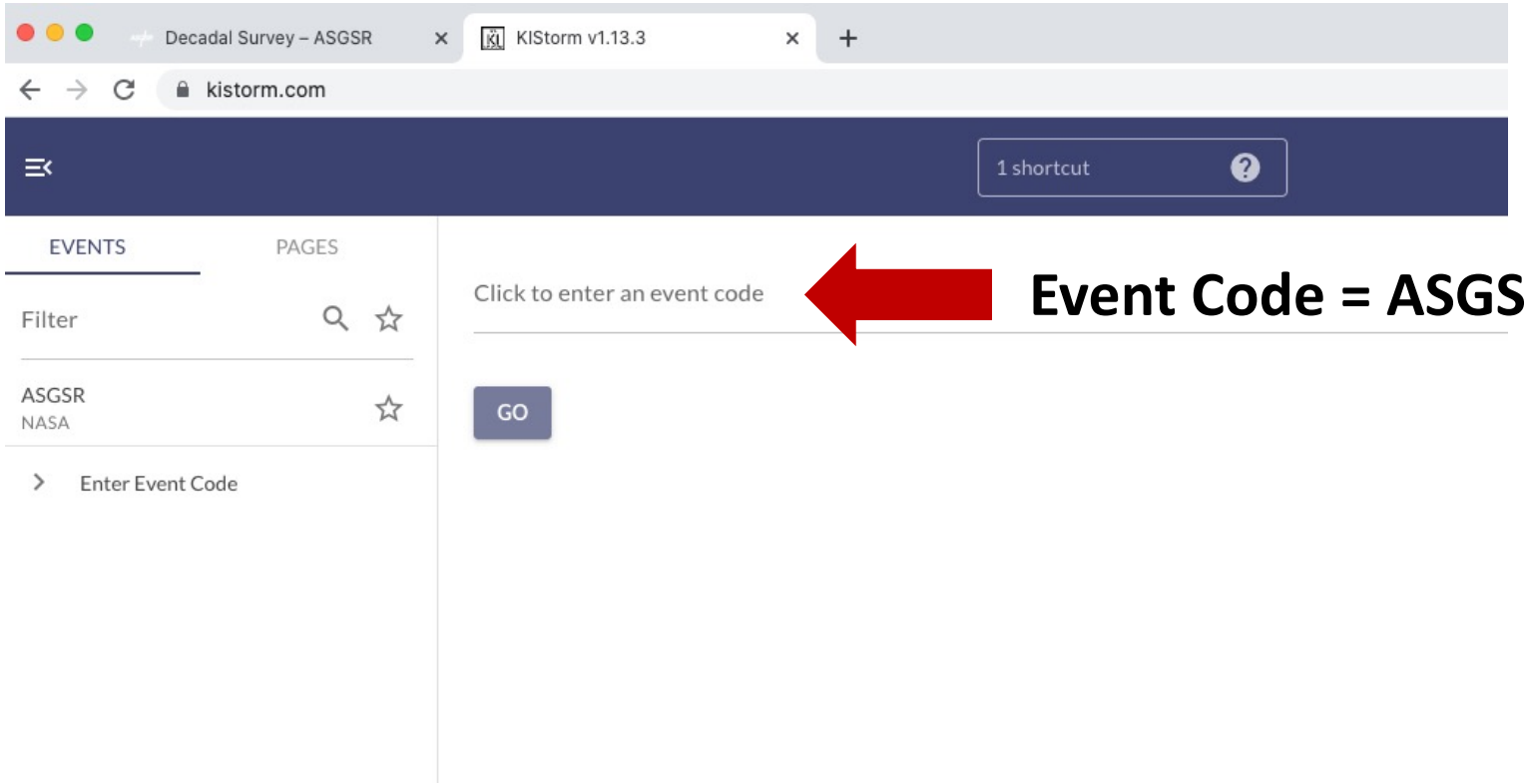
Once you have entered KI Storm the event will show up in your KI Storm history

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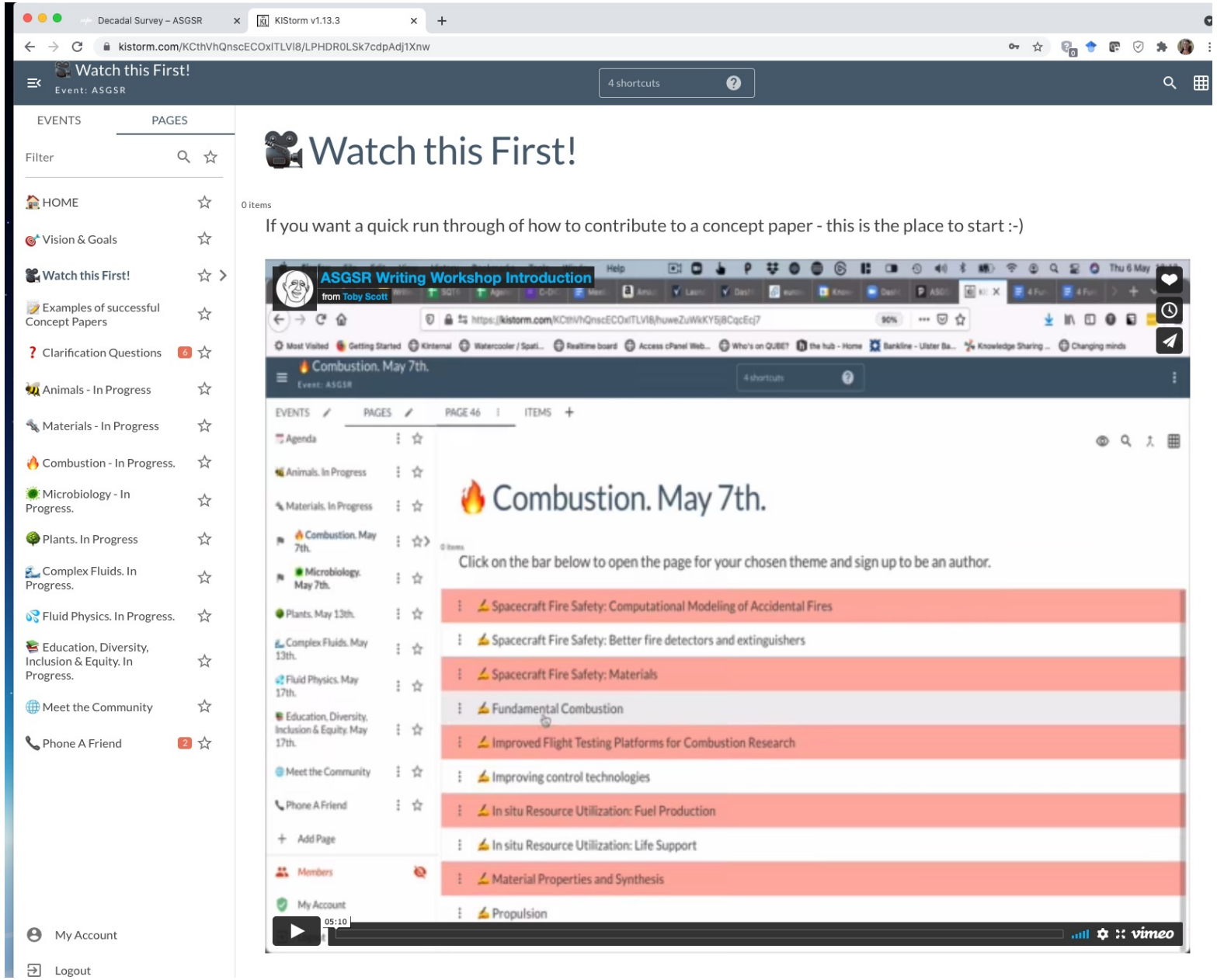

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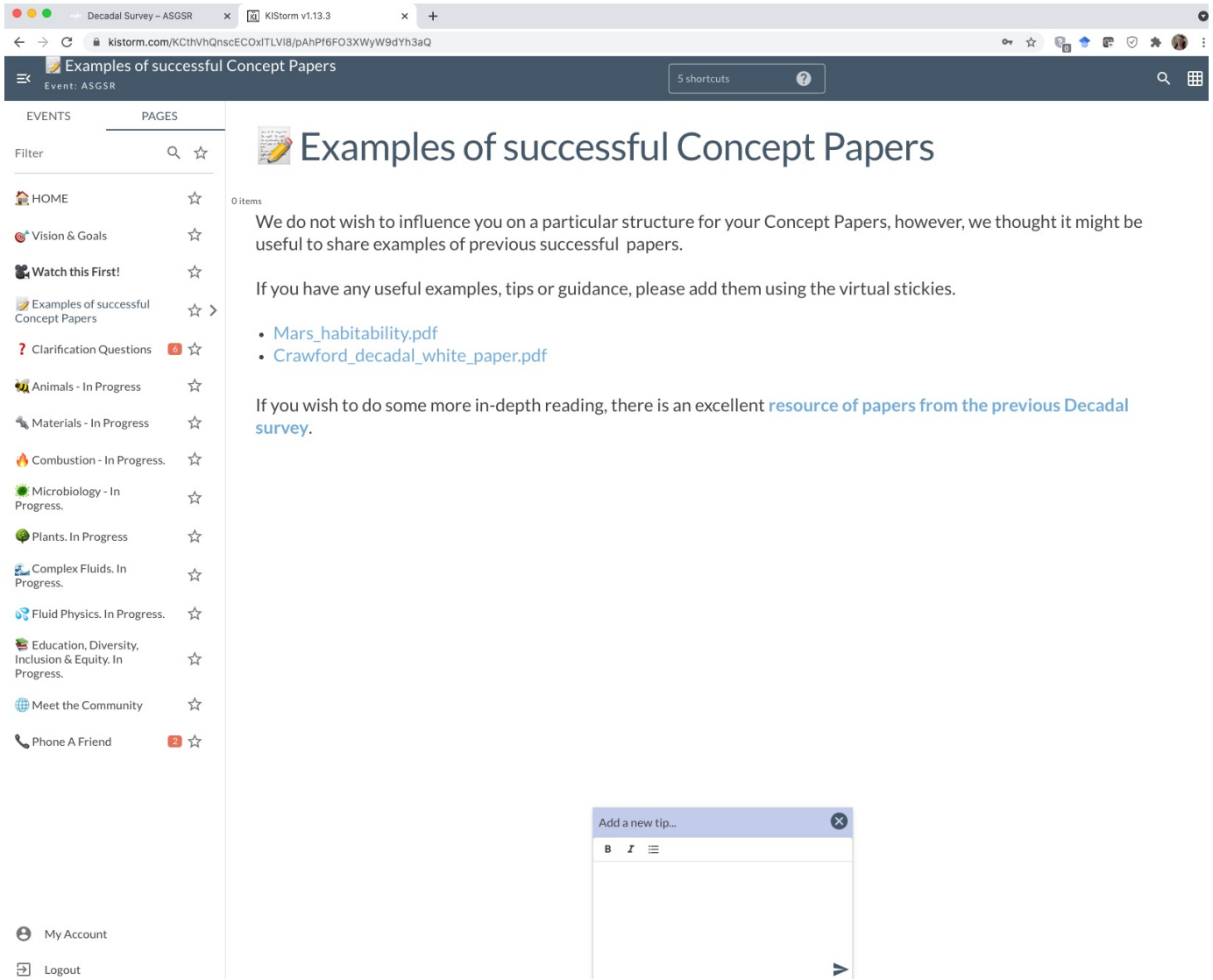

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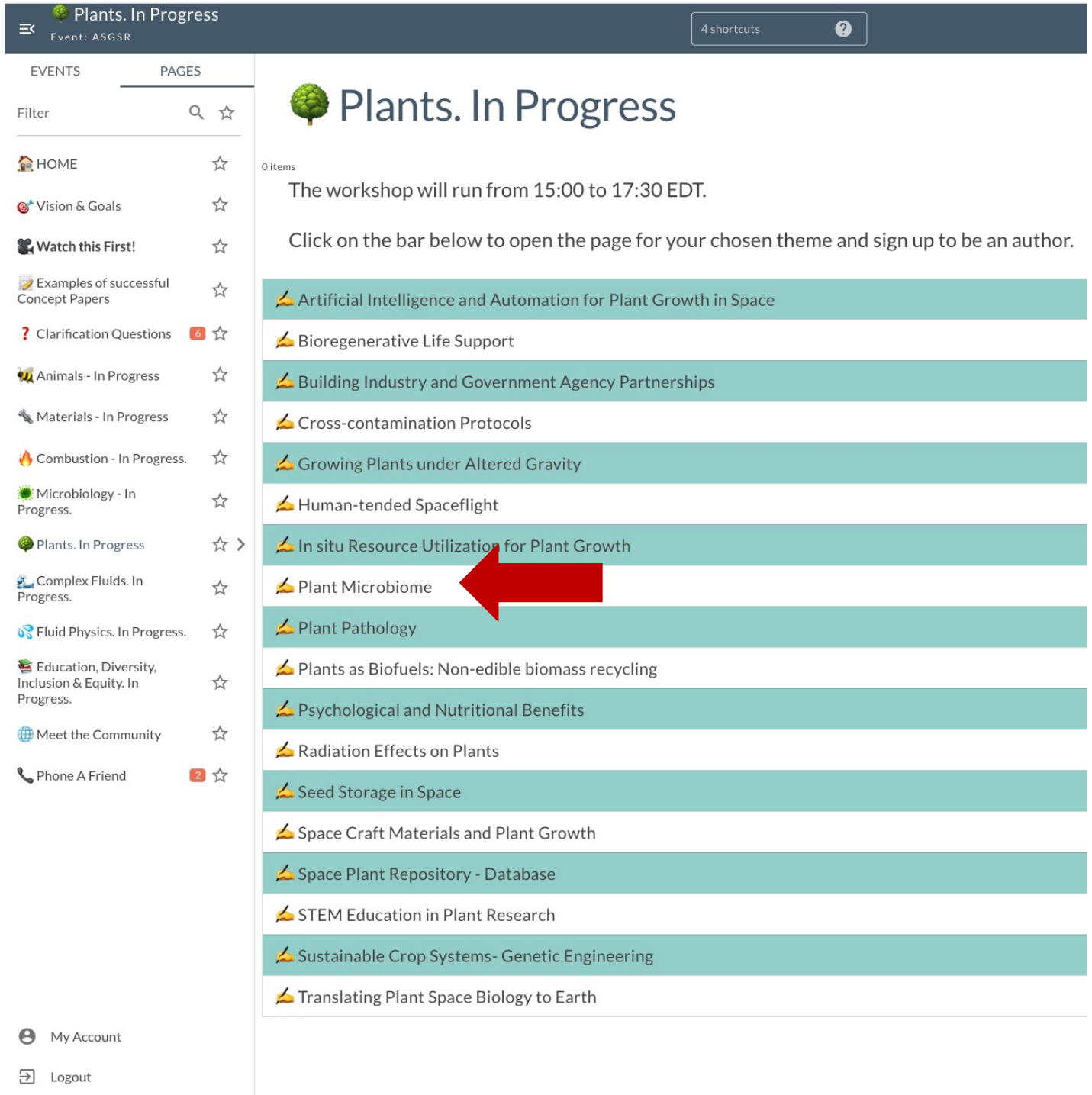
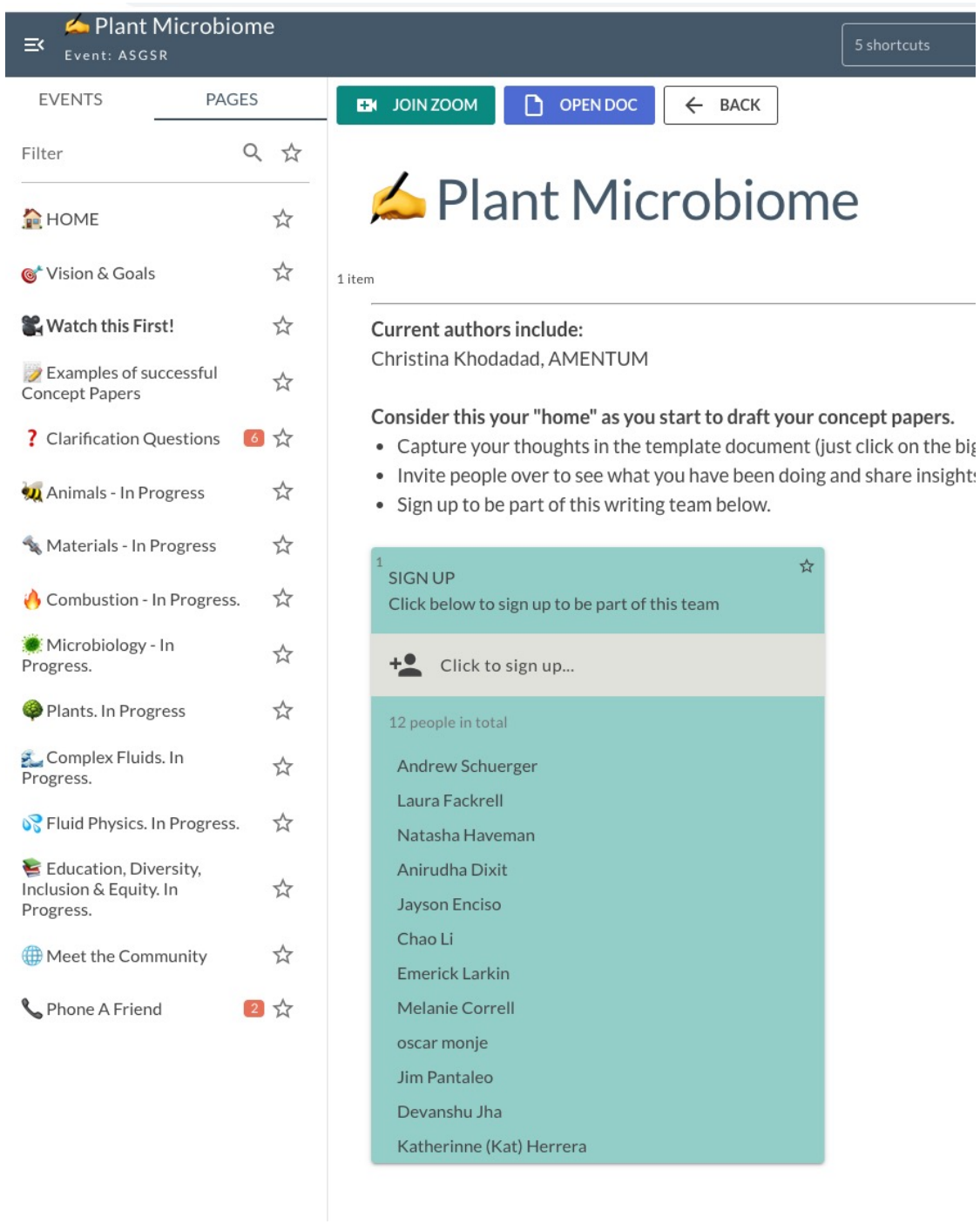


# KI Storm – resources for collaboration and writing

Zoom Link – Dedicated to this topic

Google Doc– Dedicated to this topic



# KI Storm – resources for collaboration and writing

Google Doc– Dedicated to this topic

**Template can help you develop your own concept paper**

We invite you to use the following template both as a guide to content and also as a mechanism to capture the key elements of your Concept Paper.

| **Who is on your team?** | | |
|---|---|---|
| Name | Institution or affiliation | Area of specialism |
| Christina (Tina) Khodadad (Primary) | AMENTUM Services, Inc.<br>KSC, FL<br>christina.l.khodadad-1@nasa.gov | Molecular Ecology, Microbiology, Population and community ecology, plant microbiome studies |

| **Specific Questions**<br>*What are the original questions that emerged from the Town Halls?* |
|---|
| 1. How do microbes interface with plants and the spacecraft surfaces?<br>2. What are the mechanisms of microbial transfer (e.g. crew – materials – plants?<br>3. Are microbial biofilms (complex communities) needed for growing plants?<br>4. How can we use the plant microbiome to help regulate the biodiversity on spacecraft?<br>5. Can the microbiome enhance plant growth? |

| **What is your refined problem statement?**<br>*This is the research question that you would like to see answered.* |
|---|
| How do we define a healthy microbiome?<br>What are markers of a healthy microbiome (RNA, chemical, spectral)?<br>How do we best encourage standardized sampling, sequencing and analysis methods during spaceflight analogue stress missions?<br>Microbiome intervention strategies for crops? |


# KI Storm – resources for collaboration and writing

Google Doc– Dedicated to this topic

**Template can help you develop your own concept paper**

**Feel free to copy this template!**

| **Why is this question important?**<br>*Illustrate the context for this question to show why answering it might lead to significant breakthroughs in the field.* |
| --- |
| |

| **What is the likely impact of this research?**<br>*If this research is done - what are the likely outcomes?* |
| --- |
| E.G.: It will allow us to do YYY |

| **Recommendations and or Priorities**<br>*What are the priorities and/or recommendations that you are suggesting that NASA implement to address these questions?* |
| --- |
| E.G.: We recommend the following platforms, approaches, or model organisms to address this issue…. |

| **Is this a cross-disciplinary topic? If so, what other areas of Biological and Physical Sciences do you see this topic applying to?**<br>*Do you think there would be overlap between other areas of research within BPS to address this topic? Is this a topic worthy of a Research Campaign discussion?* |
| --- |
| E.G.: **In Situ Resource Utilization** would require numerous biological and physical sciences components to use natural materials (Lunar regolith) for manufacturing and potential life support applications. |

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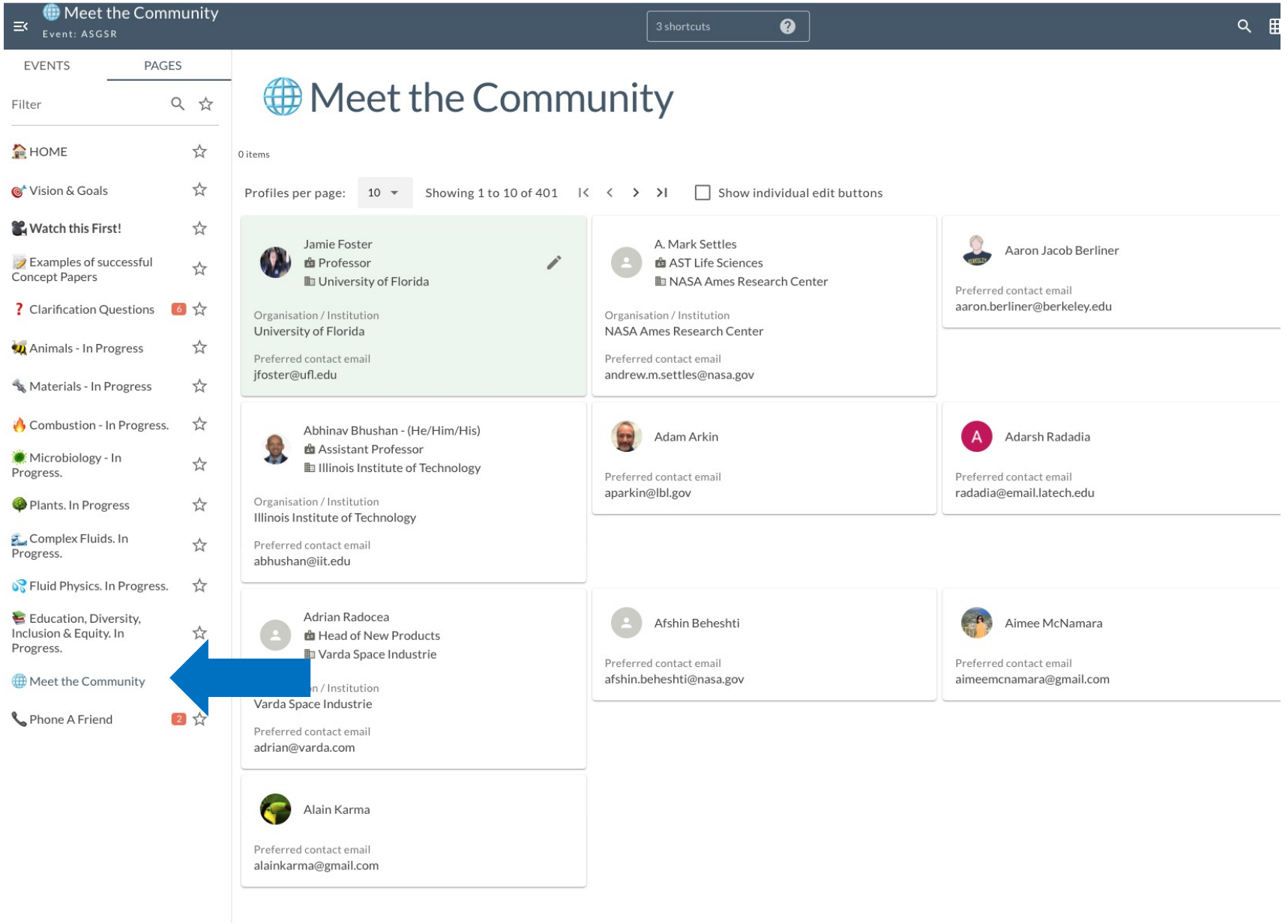
# KI Storm – resources for collaboration and writing

**Need to reach out to someone in the field?**

## Meet the Community




# KI Storm – resources for collaboration and writing

Research Campaign
Submission deadline
12/31/21

## MicroLab for Research Campaigns

**Date: TBD November 2021**

### Research Campaign Topics

- Artificial Intelligence/Automation
- Additive Manufacturing
- Bioregenerative Life Support
- In situ Resource Utilization
- Microbiome
- Space Manufacturing
- Systems Biology
- Spacecraft Fire Safety

**A similar KI Storm Platform will developed for Campaigns**

# Any Questions???

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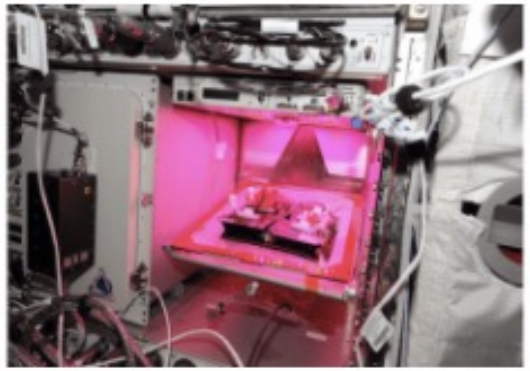
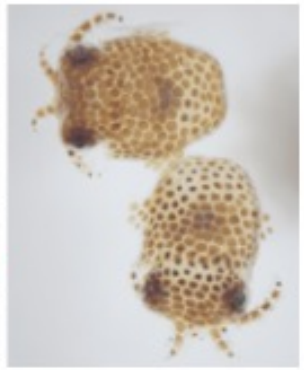
## ASGSR Decadal Survey Workshop Series

### A once in a decade opportunity....



Over the next two years the National Academies of Science, Engineering and Medicine (NASEM) will be developing the next Decadal Survey on Life and Physical Sciences Research in space 2023-2032, which will serve as a critical framework to shape the upcoming vision and strategy plan for NASA's research efforts in the area of biological and physical sciences in space.

The NASEM Decadal Survey committee will be reviewing the current state of knowledge in areas of space-related biological and physical sciences research, identify the most compelling scientific challenges and frontiers within Biological and Physical Sciences in Space Research, and develop a comprehensive research strategy to advance these areas of NASA's portfolio. The full description of the NASEM Statement of Task can be found here.

**https://asgsr.org/decadal-survey/**