American Society for Gravitational and Space Research – 2020

douglas.matson@tufts.edu

Leadership

Gale Allen	ASGSR Executive Director	
Douglas Matson	President 2020	Tufts University
Jamie Foster	Pres-elect	U. Florida
Kevin Sato	Past-Pres	NASA HQ
2020 Board of Directors		
Sirisha Bandla	Virgin Galactic	
Thomas Graham	University of Guelph	
Kasthuri Venkateswaran	Jet Propulsion Lab	
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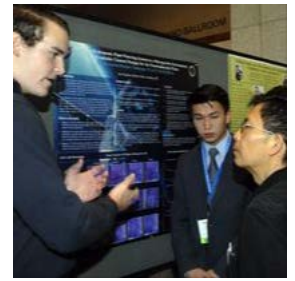
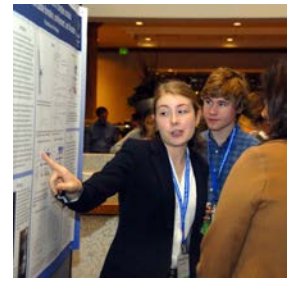
Gioia Massa	NASA KSC	
Jeff Willey	Wake Forest University	
William Meyer	USRA, Cleveland Ohio	
Peter Lee	Brown University	
Ken Shields	CASIS	
Dave Reed	Techshot	

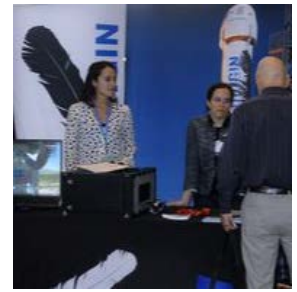
ASGSR as the US Gravitational Sciences Technical Society
- 400 members (academia, agency, industry)
- Vibrant student outreach HS/UG/grad
- Active student chapter

Annual meeting going on RIGHT NOW – *20 years of ISS habitation*
- Plenary presentations
- 287 member submissions / 100 virtual talks
- 38 undergrad / 62 grad *"lightening"* presentations

2020 Highlights – Initiating activities to support the Decadal
- ASGSR as PI/Industry focal point
- Upcoming National Academies *"White Paper"* solicitation
- BPS/SMD encourages communication / community involvement
- Proposal to NASA supporting ASGSR Decadal Workshop Series
- Identify Campaign Champions and Collaborations







ASGSR Decadal Survey Workshop Series

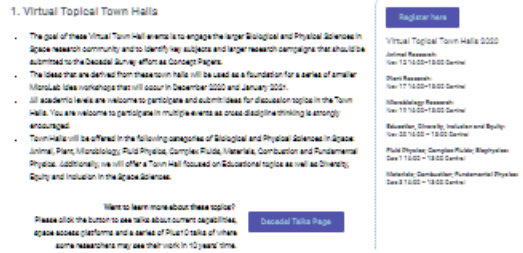
jfoster@ufl.edu

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

Goals of this Series are to educate stakeholders and foster collaborative efforts to develop potentially transformative ideas into white papers and grand campaigns.

Objectives

- Provide a public forum to stimulate constructive discussion and identify community leaders.
- Organize cohorts, facilitate networking within collaborative partnerships, and present strategies that optimize communication to ensure capturing a robust and balanced space program.
- Develop a tutorial to guide the science community on how to prepare white papers that address not only the scientific needs, but also how to envision synergy and create a budget to develop grand campaigns.
- Document the progress and lessons-learned by collating community input.



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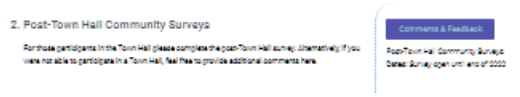

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Approach is to host a series of virtual topical ❶ Town Halls, ❷ community surveys, and ❸ interactive MicroLabs with the assistance of a professional facilitator.

KNOWINNOVATION

Acknowledge financial support by NASA SMD/BPS
Topical Workshop Solicitation #NNH20ZDA001N-TWSC

Virtual Topical Town Halls 2020

Animal Research:	Nov 12 16:00–18:00 CST
Plant Research:	Nov 17 16:00–18:00 CST
Microbiology Research:	Nov 19 16:00–18:00 CST
Education, Diversity, Inclusion and Equity:	Nov 20 16:00–18:00 CST
Fluid Physics; Complex Fluids; Biophysics:	Dec 1 16:00–18:00 CST
Materials; Combustion; Fundamental Physics:	Dec 3 16:00–18:00 CST

Discipline-focused Virtual Town Halls

Stimulate ideation and discussions leading to transformative research campaigns while identifying vocal participants who are candidates to serve as team leads moving forward

GOALS

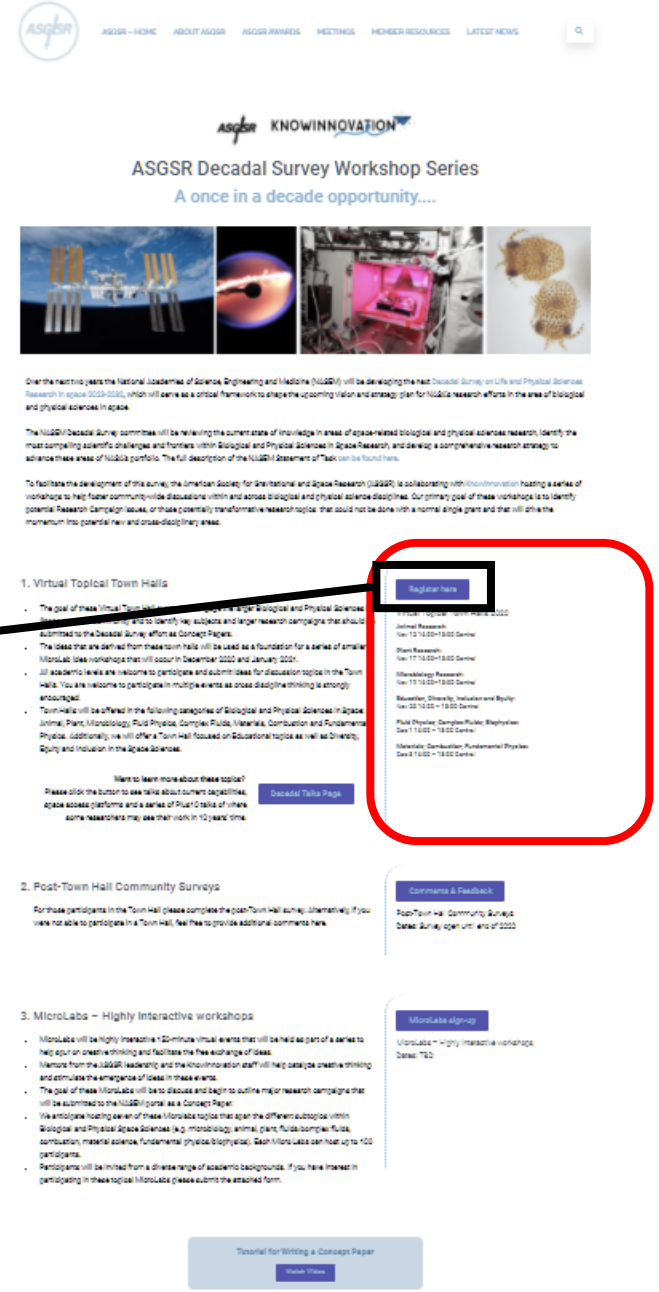
Engage community in discussions promoting development of "White Papers" for the National Academies Decadal
Identify stakeholders as leaders in these efforts

APPROACH

Ideation of Transformative Research Topics:
(1) Keystone capabilities on existing hardware
(2) Identify cross-disciplinary Research Campaigns

Register

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



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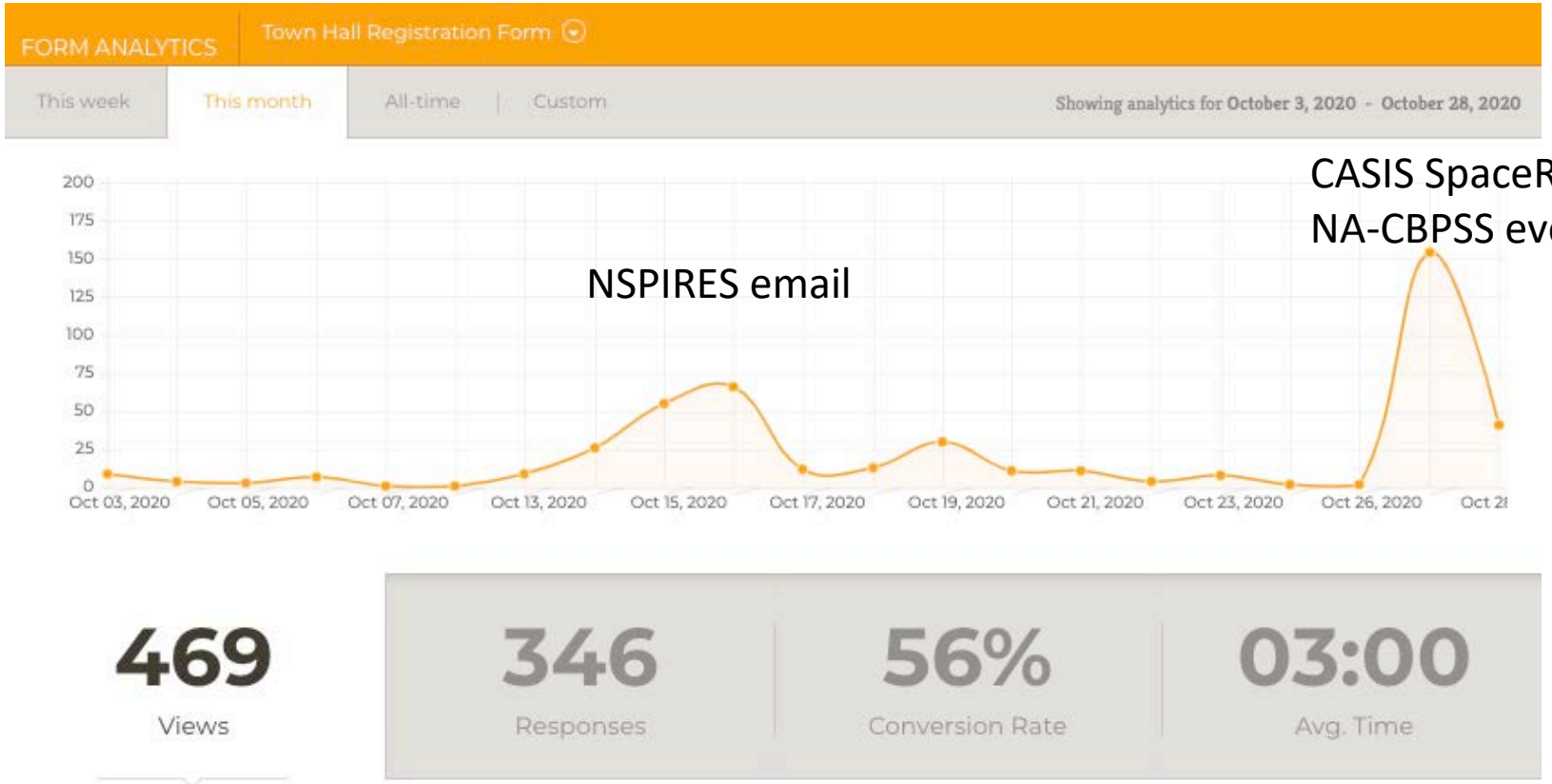
Virtual Town Hall Registration (data as of 10/28/20)



NSPIRES email

CASIS SpaceRef
NA-CBPSS event

Town Hall	Registrants
Microbiology	196
Plants	170
Animals	170
Education, Diversity, Inclusion, Equity	154
Materials	108
Biophysics	107
Fundamental Physics	95
Fluid Physics	87
Complex Fluids	70
Combustion	64
Grand Total	1221

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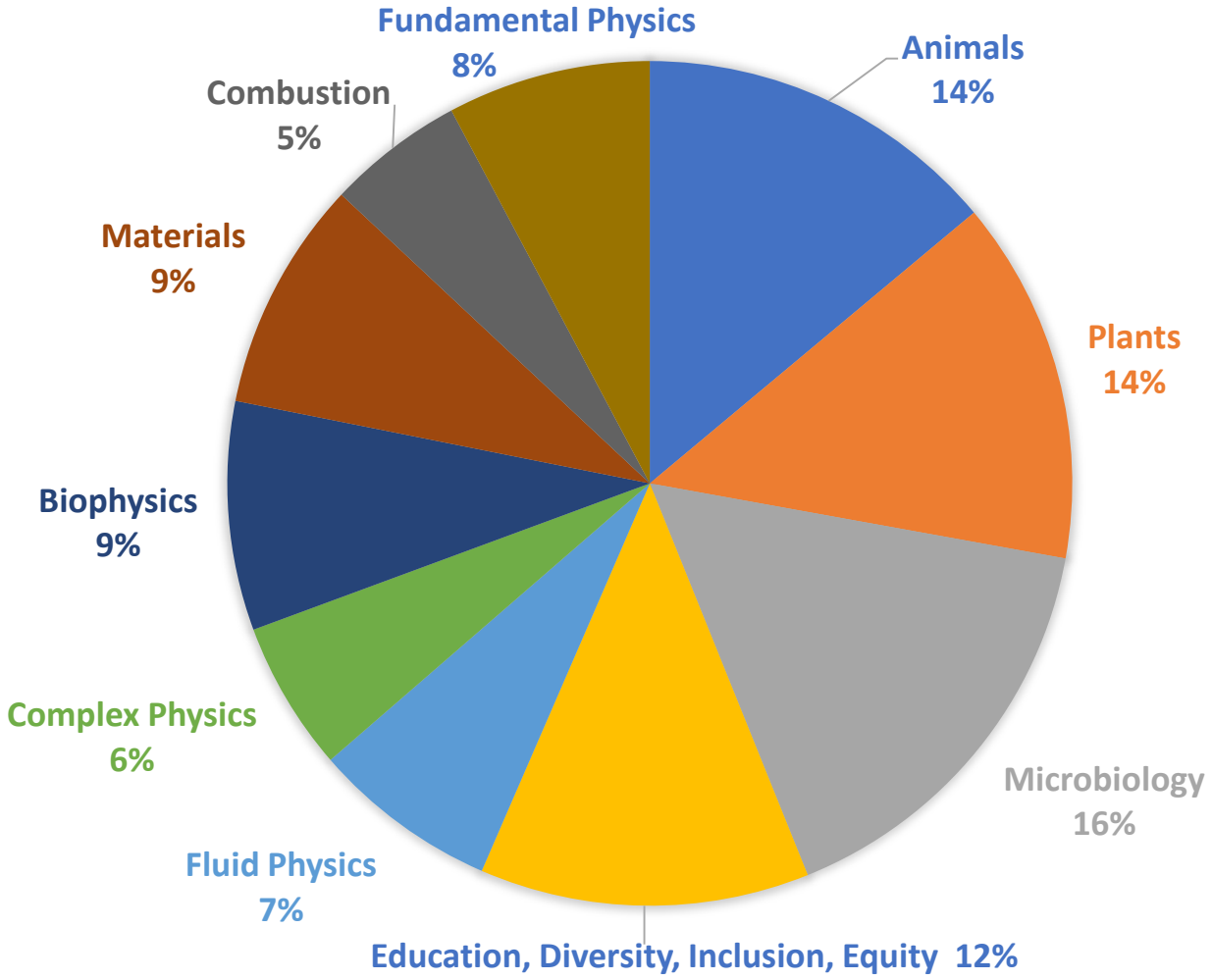

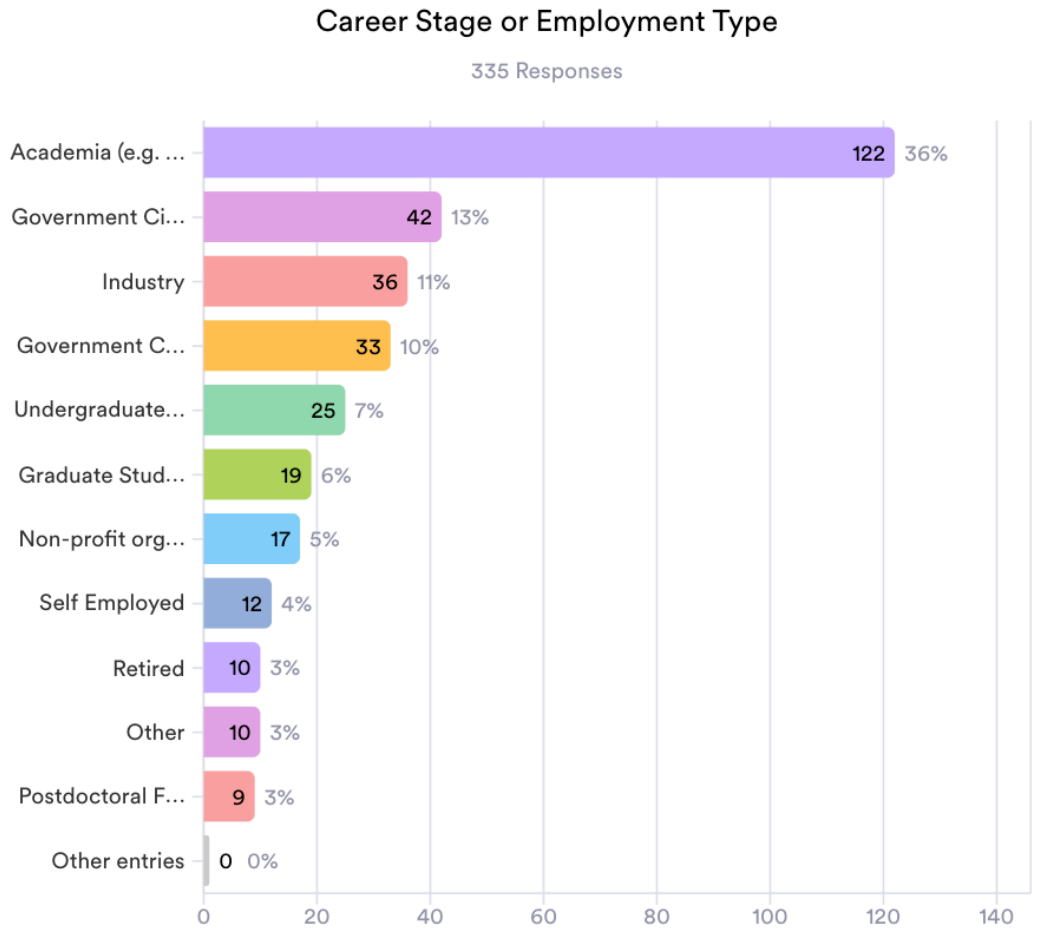

Pre-meeting material to stimulate discussion

Town Hall to be run as a series of break-out sessions

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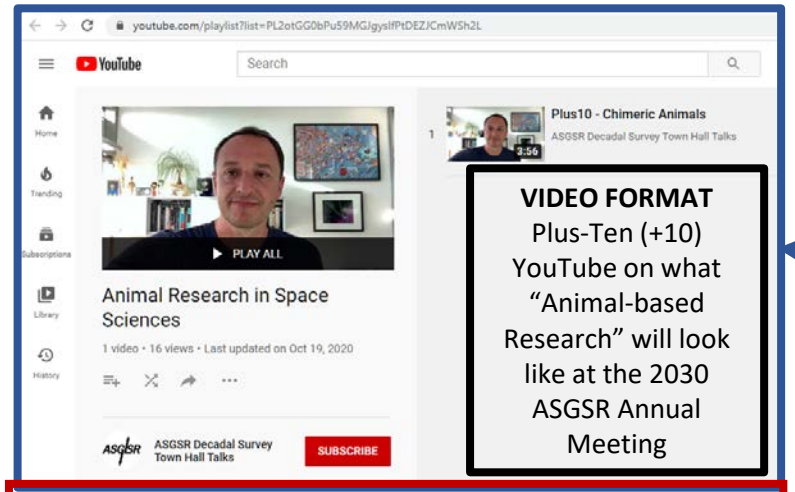
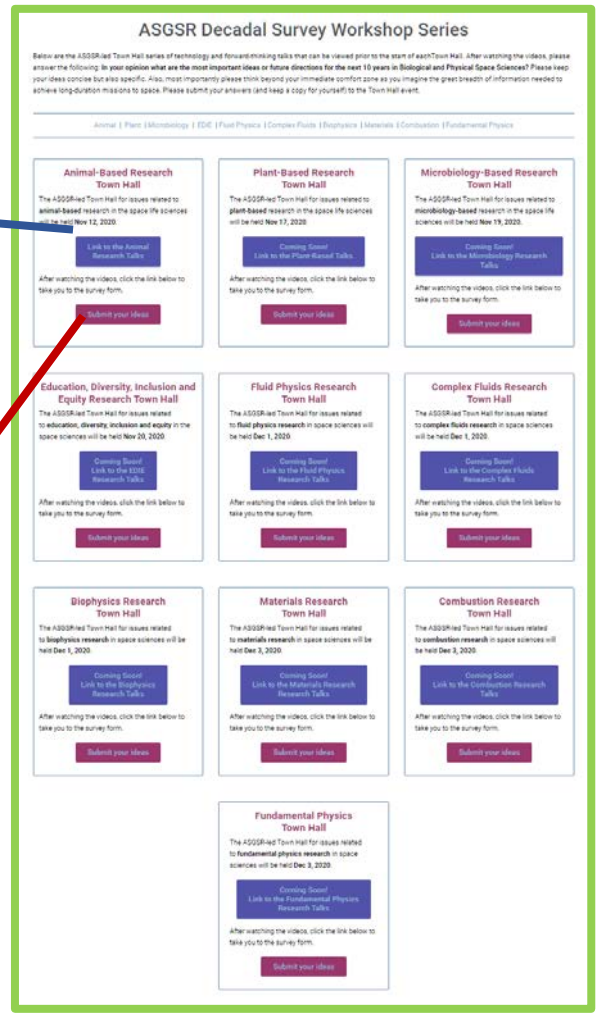
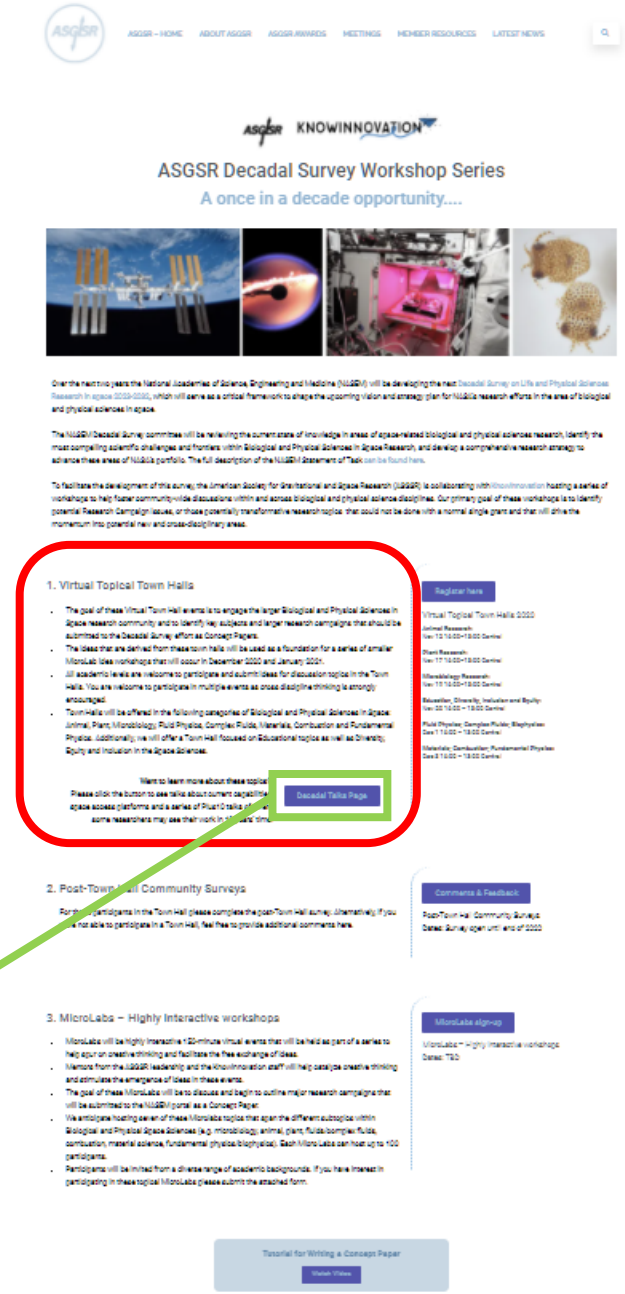


VIDEO FORMAT
Plus-Ten (+10) YouTube on what "Animal-based Research" will look like at the 2030 ASGSR Annual Meeting

WRITTEN FORMAT
In your opinion, what are the most important ideas or future directions for the next 10 years in "Animal Research" related to the field Space Life Sciences? What do you envision as a major Research Campaign for Biological and Physical Space Sciences?





Post-meeting Community Surveys to focus discussion

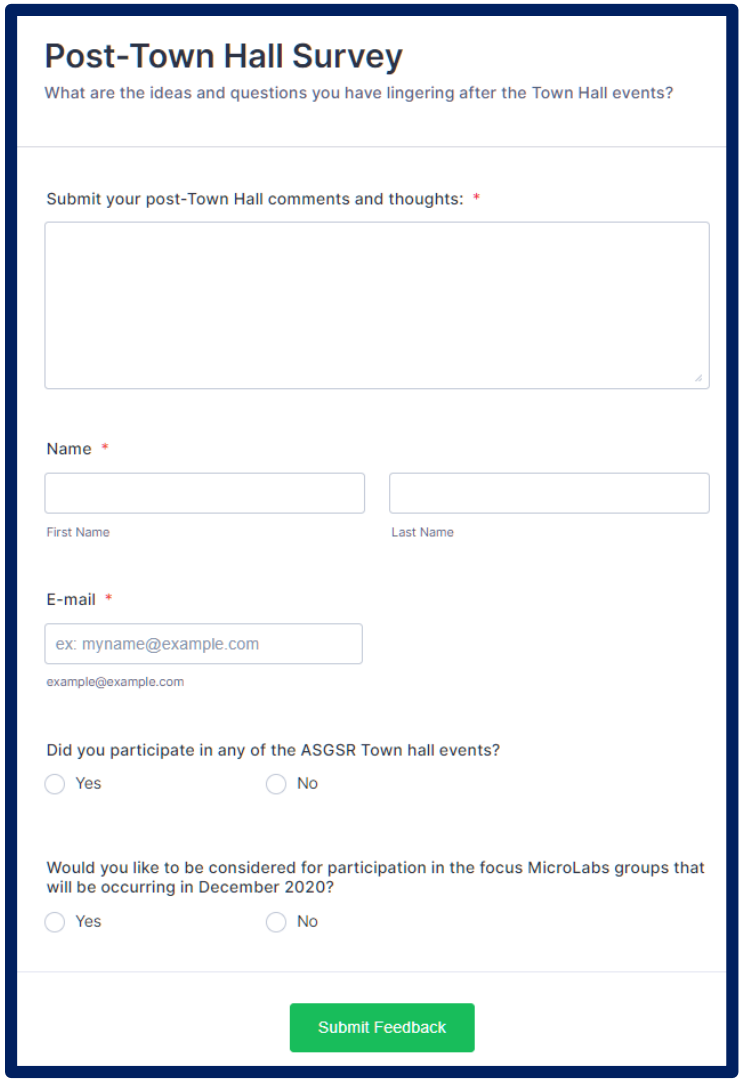
https://asgsr.org/decadal-survey/

ASANA COMMUNITY SURVEYS

Essentially virtual post-it note compilation of ideas
Coordinated by Knowinnovation using *Asana* online platform
and hosting a slack channel as a repository of community ideas

GOALS

Generate campaign topics
Identify participants for invitation to upcoming MicroLabs
Begin collation of larger emerging topical ideas



Post-Town Hall Survey

What are the ideas and questions you have lingering after the Town Hall events?

Submit your post-Town Hall comments and thoughts: *

Name *

First Name

Last Name

E-mail *

ex: myname@example.com

example@example.com

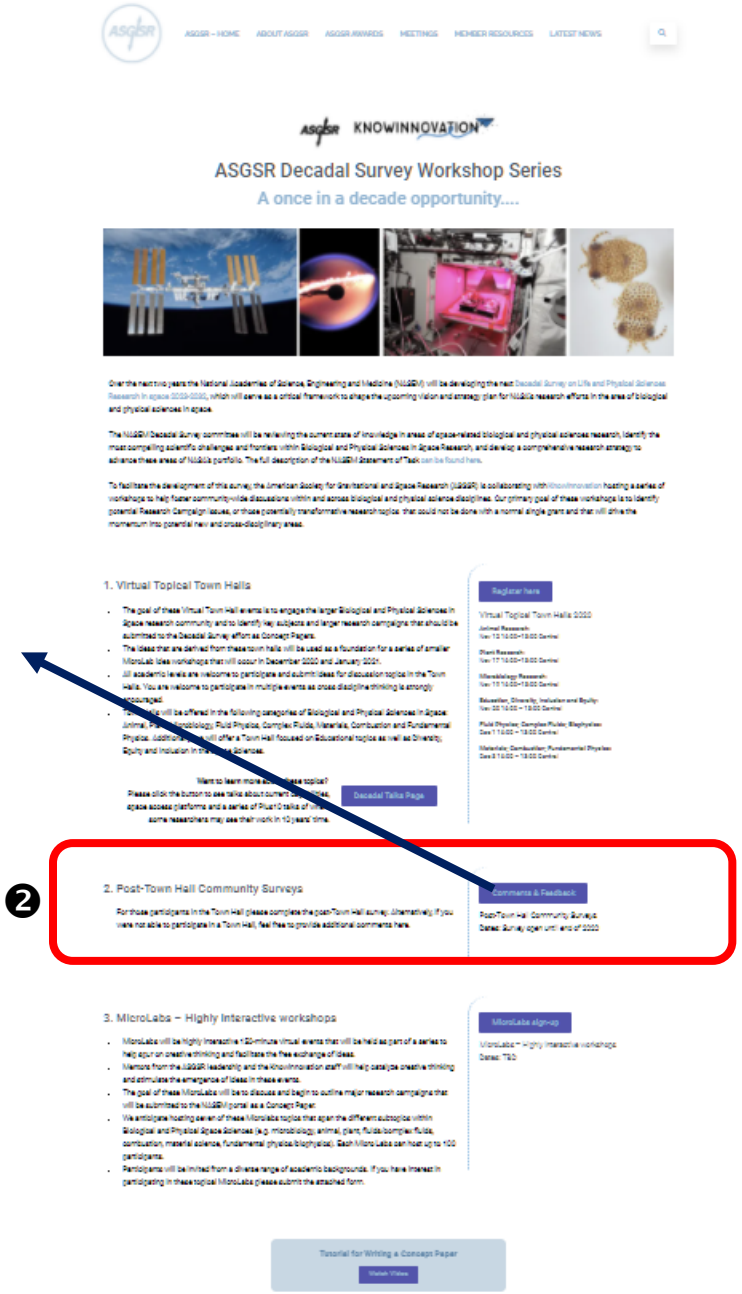
Did you participate in any of the ASGSR Town hall events?

Yes No

Would you like to be considered for participation in the focus MicroLabs groups that will be occurring in December 2020?

Yes No

Submit Feedback



MicroLab interactive workshops – January 2021

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

MicroLab WORKSHOPS

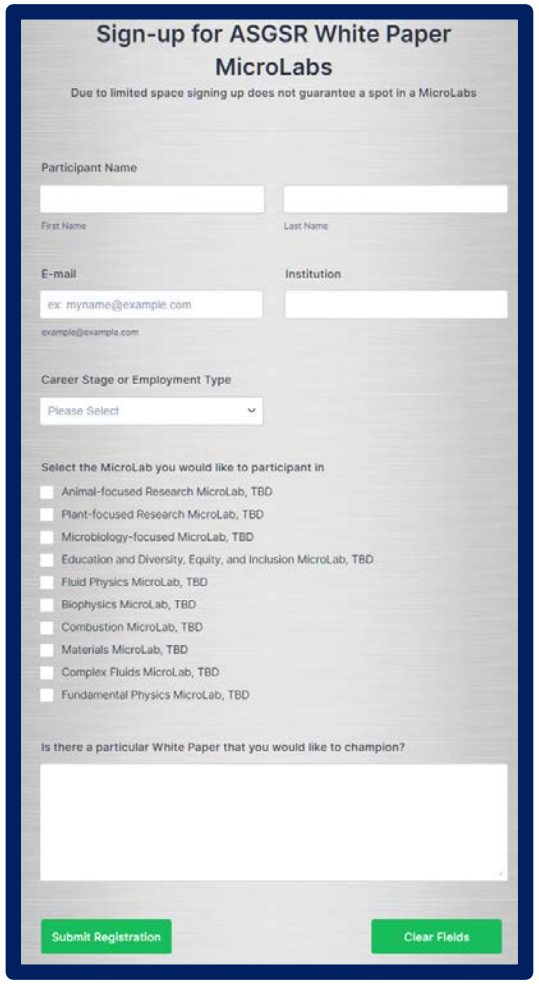
Up to 100 participants per MicroLab – 150 min virtual event
Outline major research campaigns based on outlines generated during the previous Town Hall and Survey activities

GOALS

Identify "Champion" who will lead each campaign
Identify writing team members for white paper development

APPROACH

Mentors from Knowinnovation will manage small-group interactive breakout sessions to catalyze creative thinking and stimulate the emergence of big-picture ideas



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jfoster@ufl.edu

Panel questions

TARGET: Transformative Science

APPROACH: White papers addressing

Keystone capabilities using focused facilities (existing → future)

Campaign development (cross-disciplinary)

Acknowledgements

Jamie Foster, Jeff Willey
Anna-Lisa Paul, David Urban
Gale Allen, Emily Eicher

Panel questions – "Current topics in Microgravity/Biological and Physical Sciences in Space"

After a detailed review of NASA's plans, what are the major challenges confronting experimentation in microgravity, including integration of new commercial and university contributors?

- Scheduling
  - Time delay from award to flight using existing hardware has severe budget impacts especially when NASA spreads out or compacts the milestones → continuous rebudgetting
  - Lack of time following flight to allow completion of ground-support activities with respect to unexpected /transformative results
- Reliability of on-time launches. Biological experiments are particularly sensitive to "rolling slips" and delays as many biological payloads have developmental or viability constraints that are compromised with delays – especially ones that keep rolling over day by day.
- Limited options on-orbit resources such as
  - preservation protocols such as need for "snap freezing" for biology (crucial for some downstream protocols)
  - habitats for biological organisms with reduction in extraneous environmental stresses; provide comparable ground units in sufficient abundance to conduct pre-flight verification tests.
  - Imaging and analysis capabilities
    - downlink capability
    - real-time monitoring
    - microscopy support
  - Traditional resource limitations: power, cooling, and limited crew time, which confines the complexity of experiments and technology development
- Restrictions of up-mass and down-mass curtail the kind of replicate numbers expected of most biological experiments, leads to storage problems on-orbit
- Prioritization of science - the perception in the academic, peer-reviewed scientific community is that commercial, tech demo, and political payloads sometimes trump access from experiments that have been peer-reviewed and are NASA grant supported.
- Emphasis on flight programs with limited portfolio of ground-based feeder projects – high risk/high reward is the defining characteristic of transformational research topics
- NRA structure
  - Timing of periodic release of overly restrictively targeted NRA topic – emphasis on a robust program at the expense of being nimble: lack of simultaneous continuity/adaptability
  - Silo-ed descriptions often stifle cross-disciplinary thinking. Examples are *Combustion* and *Materials* in Physical Sciences.
- Limited partial gravity platforms to investigate gravity as a continuum
- How to leverage international/interagency partnerships; how do they fit into the Decadal process?
- Outreach to industry needs improving – perception of high fiscal risk with severe operational limitations needs to be mitigated by education and seed funding

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Are there breakthroughs on the horizon that enable new insights into potential commercial products or new lines of research?

- Biological Sciences
  - Dynamic evolution of microbiome under spaceflight conditions
  - Use of probiotics to prevent disease, control biofilm development and improve spacecraft health
  - Application of synthetic biology for development of transgenic microbial, plant and animal species to improve survivability and productivity in space
  - "Micro-laboratory" technologies have the capacity to be utilized on orbit to an increasingly greater degree – such as DNA- and direct RNA-sequencing with nanopore technology. Some of the constraints to this tech are the processing power it will take to obtain useable data in real time (as opposed to just doing the reactions on orbit for further analysis on return).
  - Some of the new epigenomic technologies and tools (for post flight analyses) are getting very sophisticated and enable a look into changes in DNA structures, DNA-protein interactions, and alternative splicing in transcriptional responses. This aspect opens a new window into how biology physiologically adapts to spaceflight and how spaceflight might initiate new genomic strategies that are less commonly seen in the response to terrestrial stresses to which they evolved
  - Elimination of the "Hut – no Hut" debate to support rodent research. Space facilities with comparable ground-based control habitats are enabling to attract industry participation.

- Physical Sciences
  - Physical and Chemical Behaviors Near the Thermodynamic Singularity, when combined with the recent growth in molecular dynamics modeling, will reveal new phenomena and physics that are relevant to a wide range of advanced earth and space-based applications including energy, propulsion and synthesis of nanomaterials with novel physical properties.
  - Complex fluids and Fundamental Physics have a huge potential for transformational research contributions
  - Manufacturing in Space is a rapidly evolving field with direct impact on both exploration AND terrestrial industrial application
  - Resource management topics need higher emphasis (fuels, oxygen, water and waste recycling, dust mitigation, power balancing, in-situ resource utilization, etc.)