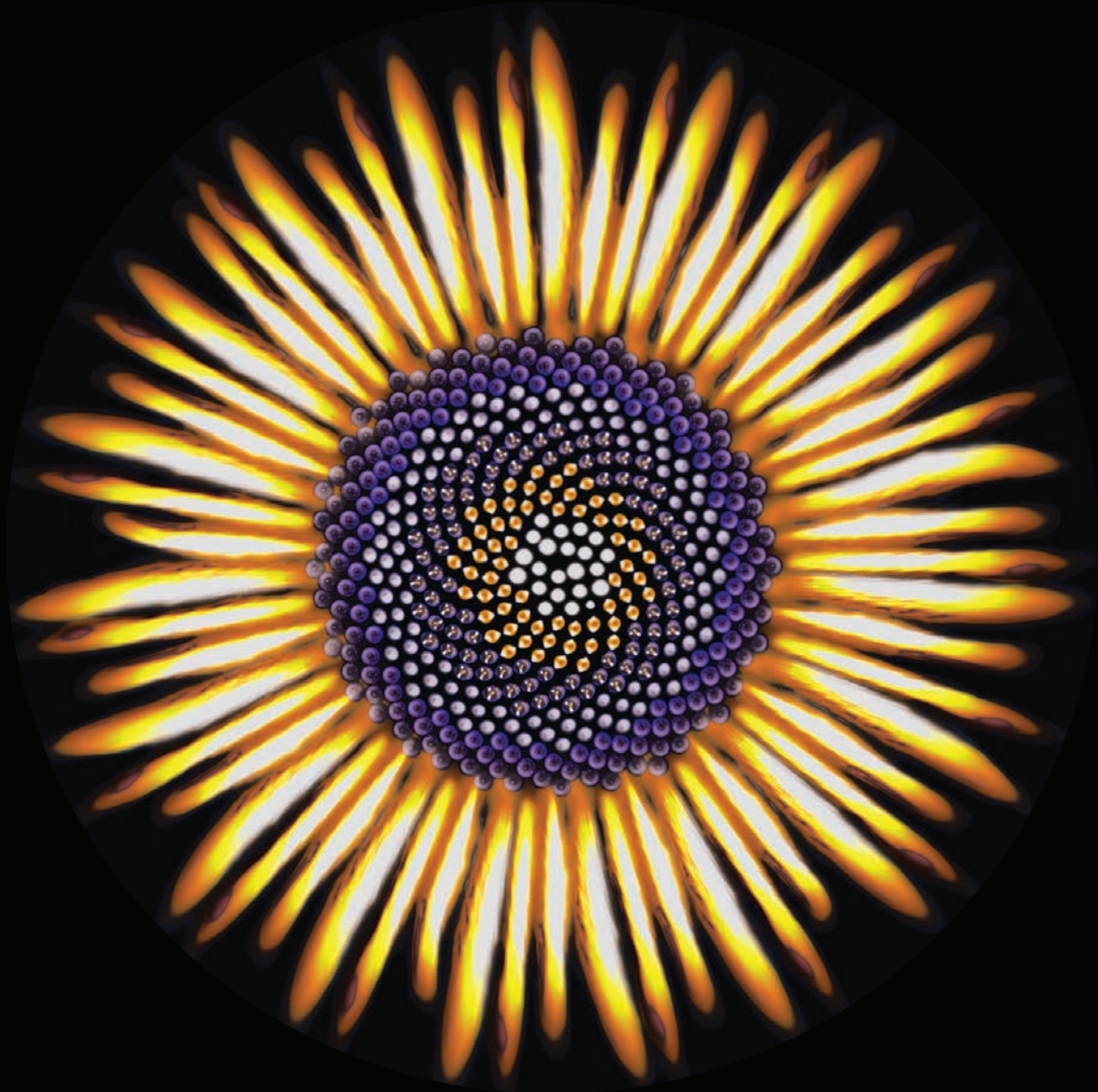




# meeting program



# ASGSR

33rd Annual Meeting  
Hyatt Regency Lake Washington,  
Seattle's Southport  
October 25-28, 2017

The Blossom of Heat  
by Yiren Shen, Cornell  
Yuhao Xu, Cornell  
Michael C. Hicks, NASA  
C. Thomas Avedisian, Cornell

VISIT THE ASGSR  
ONLINE MEETING PROGRAM  
[xcdsystem.com/asgsr/program](http://xcdsystem.com/asgsr/program)

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Visit the ASGSR Online Program for the latest meeting updates.

**ONLINE MEETING PROGRAM**  
[xcdsystem.com/asgsr/program](http://xcdsystem.com/asgsr/program)



# A Letter from Program Chair, April Ronca

Dear Colleagues,

On behalf of ASGSR President David Urban and the Program Committee, I want to welcome you to the 33rd Annual Meeting of the American Society for Gravitational and Space Research (ASGSR) October 25-28, 2017 at the Hyatt Regency on Seattle's Southport.

This year's program comprises a rich and varied combination of scientific, technological and educational activities. As in years past, the 2017 program hosts a broad range of symposia and workshops presenting new research results and opportunities in space and gravitational life and physical sciences. This year's Opening Plenary Session on October 25 begins with a lecture by Dr. Jonathan Clark from the Center for Space Medicine, Baylor College of Medicine, entitled Pushing the Human Envelope, followed by the President's Plenary Symposium on Farming in Space. Other joint life and physical sciences symposia are devoted to Biofilms in Spacecraft, Galactic Cosmic Particles, the Gravity Continuum, and Macromolecular Crystal Growth. Discipline-specific symposia focus on hot topics in the physical and life sciences, including Nanobots, Cool Flames, Saffire, and Organ-on-a-Chip, as well as Research Needs and Opportunities Enabling Exploration. These major symposia are complemented by a wealth of technical paper and poster sessions ranging from the biological and physical sciences to technological innovations and advancements. For the first time this year, the oral sessions will include student 'Lightning talks' - 5min (no Q&A) presentations highlighting selected posters.

Working with ASGSR, NASA TV will conduct interviews throughout the meeting showcasing our members' accomplishments. New this year, the latest scientific findings from our community will be captured in collaboration with the American Institute of Biological Sciences (AIBS) BioScience Talks Podcast Series, available via iTunes. This is an exciting time for our Society with many new prospects and challenges on the horizon as we work to shape the future of the space life and physical sciences. The program features updates from NASA Space Life and Physical Sciences, ISS/National Labs, Space Biology and Physical Sciences Programs, as well as a special presentation from the Chinese Space Agency. There will also be an interactive ASGSR Town Hall Meeting on the topic of ISS transition with an emphasis on the role of our community in low Earth orbit and beyond.

Ancillary activities associated with the conference include several pre-conference tours and workshops, our 2nd annual art in science competition, and exciting student competitions and networking opportunities. We are especially enthusiastic to continue our events devoted to High School Space Research involving special workshops, Meet-the-Mentors, and Poster sessions for high school students and their teachers. On Thursday October 26, we have a wonderful reception planned at the Museum of Flight, located a few miles from the hotel, for which transportation will be provided.

The society will use the conference to conduct its annual business meetings, committee meetings, editorial gatherings, and strategic planning sessions. We encourage all of our members to become engaged in these activities! In addition, the program schedule includes many opportunities for informal interactions and discussions with new friends and old. The conference concludes with Saturday's Banquet featuring food, drink, awards, and our guest speaker, Dr. G. Jane Cook, Chief Scientist for the Corning Museum of Glass, who will offer a unique glimpse into the world of high-tech glass and art, and the intersections of glass and space in the context of engineering, science, research, and art.

In closing, our annual meeting continues to evolve in scope and complexity. The Program Committee is comprised of the ASGSR Leadership and Society members who work to develop and organize the various program events. All of these folks deserve kudos for their thoughtful creativity, dedication and effort in the execution of what I anticipate will be a highly successful annual meeting!

We sincerely hope you enjoy the 2017 program.

April Ronca, ASGSR 2017 Program Chair

## Governing Board Members

Erika Wagner (Blue Origin, Kent, Washington)	Jamie Foster (University of Florida, Gainesville, FL)	Chris Wolverton (Ohio Wesleyan University)
Meredith (Med) Colket, (United Technologies Research Corporation)	April Spinale (Center for the Advancement of Science in Space, Melbourne, FL)	Jack Van Loon (Academisch Centrum Tandheelkunde Amsterdam - ACTA)
Elizabeth Blaber, (USRA, NASA Ames Research Center, Moffett Field, CA)	Steven Collicott (Purdue University)	Jennifer Barrila (Arizona State University)
Jeff Smith (NASA Kennedy Space Center, KSC, FL)	Portonovo Ayyaswamy (University of Pennsylvania, Philadelphia, PA)	Michael Pecaut (Loma Linda University)

## 2017 Student Officers

President-Samantha McBride, MIT	Education and Outreach Chair: Rai Munoz, City College of New York	Education and Outreach Committee: Meg Cheng-Campbell, Santa Clara University and Anjali Gupta, Sanford Burnham Prebys Medical Discovery Institute
Vice President-Ramya Bhaskar, UC Davis	Funding Committee: Alex Wentzel, Grand Valley State University	
Membership Coordinator: Nina Nishiyama, Loma Linda University	Student Advisor: Chitra Ajala, University of Louisiana at Lafayette	Social Committee: Mallika Sarma, University of Notre Dame
Treasurer: Pantelis Solomides, Temple University	Fundraising Committee: Niko Vlastos, Arizona State University	Political Action Committee: Jonah Peter, University of Pennsylvania
Social Chair: Claudia Lopez Camara, UC Irvine		
Secretary: Alice Zhang, Yale University		

# A Letter from Executive Director, Cindy Martin-Brennan



## Letter from the Executive Director:

Because of our member volunteers, our Board of Governors, and our very active student society, we continue to be a successful public forum for Gravitational and Space Research. We accomplished many things this past year, thanks to our hardworking part-time staff, Ms. Jobi Cook, and Mr. Paul George. We also added a new member to our staff, Ms. Emily Eicher who designed this year's meeting program, relaunched the newsletter, and will provide the technical support for our annual meetings. Also, massive thanks to our volunteer treasurer, Dr. Keith Chapes, who continues to keep us in the black every year.

This year on the operations front, we had some challenges as we overhauled the website, membership and meeting management processes. Our membership renewal system is now automated, and we plan to include a searchable member database, not only by name, but also by discipline. Thanks for your patience while we make these changes to our daily operations.

Our refereed online open access journal, Gravitational and Space Research, continues to publish excellent peer-reviewed articles twice a year. I want to thank Dr. Anna-Lisa Paul for serving as the journal editor for the last few years. However, as Dr. Paul assumes new duties as President for 2017-2018 and 2019 Annual Meeting Chair, she has resigned as the editor of Gravitational and Space Research. Dr. Jamie Foster, from the University of Florida, has graciously accepted the position as the new journal editor. She is joined by copy editors, Ms. Janet Powers from Alexandria, Virginia, and Dr. Andrew Schuerger from the University of Florida. You may recognize Janet's name since both her and husband are our meeting photographers. Dr. Timothy Mulkey from Indiana State University continues to serve as our publishing editor. Thanks to all the journal staff. Members please continue to submit your articles to the journal.

I also want to share that ASGSR is developing a collaborative relationship with Nature npj Microgravity, also an online-only open access journal. ASGSR has negotiated reduced article processing charges (APC) for ASGSR members only. More details will follow.

## Here are a few of our 2017 accomplishments:

- Membership continues to increase due to the excellent programming and venue at our annual meetings. Dr. Ronca and her 2017 organizing committee created a meeting program that resulted in the largest number of abstracts ever submitted – over 350.
- The 2016 annual meeting was the largest attendance record ever, including a noticeable increase in student attendance.
- Continued outreach with U.S. policy makers and stakeholders; over 60 contacts were made in Spring 2017, resulting in positive wording in the NASA Transition bill, public Law 115-10, section 301(a)(5).

We will continue to promote gravitational and space research through special events, including science panels in Washington, D.C., and community input events with the National Academies of Science, Committee on Biological and Physical Sciences in Space. With the new U.S. presidency, there is renewed focus on the U.S.'s role in space through the recreation of a National Space Council. In the NASA Transition Act of 2017, NASA was asked to provide a report on the steps to transition the International Space Station (ISS). Congress has clearly stated that (1) an orderly transition for United States human space flight activities in low-Earth orbit from the current regime, that relies heavily on NASA sponsorship, to a regime where NASA is one of many customers of a low-Earth orbit commercial human space flight enterprise may be necessary; and (2) decisions about the long-term future of the ISS impact the ability to conduct future deep space exploration activities, and that such decisions regarding the ISS should be considered in the context of the U.S. human exploration roadmap. As strategies are discussed, ASGSR will continue to give policymakers the knowledge they need to make informed decisions.

With the private sector leading the development of new launch and on-orbit capabilities we will need to continue collaboration with these entities. We are also seeing a sustained commitment to research funding by NIH and NSF. This is also a good sign for the future of gravitational and space research. We will keep an eye on emerging commercial scientific platforms, and keep you informed on opportunities beyond low earth orbit.

As you realize, we are primarily a volunteer organization, so we need your help to do all these things. I urge you to consider joining one of the many standing committees and becoming more engaged with society activities.

Respectfully yours, Cindy Martin-Brennan, 25 October 2017





Tuesday, October 24th, 2017

7:00am - 5:00pm  
**Registration Open**

8:00am - 5:00pm  
**Workshop I:  
NASA - CASIS Rodent  
Research Workshop**

Organizers: Dr. Mike Roberts,  
CASIS,  
Elizabeth Taylor, NASA Ames  
Research Center

12:00pm - 7:00pm  
**Exhibit  
Poster Set-up**

1:00pm - 2:00pm  
2:30pm-3:30pm  
**Boeing 737  
Plant Tours**

6:00pm - 8:30pm  
**ASGSR Board of  
Governors Meeting**

1:00pm - 4:00pm  
**Workshop II:  
Blue Origin/  
NanoRacks and Tour**  
Organizer: Dr. Erika  
Wagner, Blue  
Origin

### **Grand Stair Pre-Function**

**Grand Ballroom I-III.** Pre-registration required and limited to 75 participants.

#### **Schedule:**

7:30-8:00 am Breakfast  
8:00-8:15 am Welcome  
8:15-10:15 am Rodent Research Planning Updates  
10:15-10:30 am Break  
10:30-11:00 am Rodent Research Capabilities Updates  
11:00-11:30 am Tissue Preservation Assessment Preliminary Results  
11:30 am -12:00 pm BSP Coordination: Ground and Flight Approaches  
12:00-1:30 pm Lunch and Virtual Poster Discussion  
1:30-2:00 pm Rodent Research Standard Measures  
2:00-3:30 pm Breakout Groups Discussion - Standard Measures  
3:30-3:45 pm Break  
3:45-4:45 pm Breakout Groups Discussion Report Out  
4:45-5:00 pm Wrap Up

**Exhibits: Grand Ballroom VII-IX**

**Posters: Grand Ballroom Pre-Function Area**

### **Hotel Lobby**

Pre-registration is required to participate (limited to 50 participants in each tour). Please check in at registration desk to obtain your tour ticket. Bus transportation will be provided from the hotel to the Boeing Renton Facility as follows; when loading the bus, please present your tour ticket to the ASGSR attendant (Please make sure to have appropriate identification with you):

12:45 PM - depart hotel for the 1:00 pm tour  
2:15 PM - depart hotel for 2:30 pm tour

### **Executive Boardroom, 3rd Floor**

**Grand Ballroom IV-VI** Pre-Registration required for the Nanoracks/Blue Origin Workshop.

#### **Schedule:**

1:00-2:00 pm  
Flying your research on Blue Origin's New Shepard  
2:15-3:00 pm  
Nanoracks ISS Platforms - The Next Step  
3:00-4:00 pm  
Your Science Research - Case Studies and Lessons Learned



Wednesday, October 25th, 2017

7:00am - 8:00am  
**Continental Breakfast**

**Grand Ballroom VII-IX**

7:00am - 9:00pm  
**Exhibit Hall**

**Grand Ballroom VII-IX**

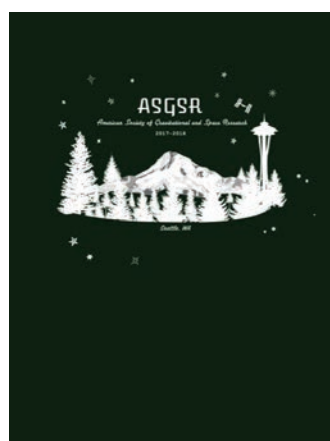
ALL DAY  
**Posters**

**Grand Pre-Function**

7:00am - 5:00pm  
**Registration Open**

**Grand Stair Pre-Function**

Purchase the 2017 ASGSR  
Student T-Shirt!



8:00am - 8:15am  
**Welcome and Opening Remarks**

**Grand Ballroom I-VI**

**LIVE WEBCAST**

Dr. David Urban, ASGSR President, NASA Glenn Research Center

8:15am - 9:00am  
**Opening Keynote Speaker**

**Grand Ballroom I-VI**

**LIVE WEBCAST**

Dr. Jonathan Clark, Baylor College of Medicine  
Humans in Freefall and Spaceflight

9:00am - 10:30am  
**Symposium I  
(President's Plenary):  
Farming in Space -  
Challenges and  
Opportunities**

**Grand Ballroom I-VI**

**LIVE WEBCAST**

1. Introduction to Food Production Challenges in Space, Molly Anderson, NASA
2. Integrating Bioregenerative Foods into the Exploration Spaceflight Food System, Grace Douglas, NASA Johnson Space Center
3. The physical challenges of space plant production, John McQuillen, NASA Glenn Research Center
4. The Impact of Plants on Spacecraft ECLSS, Raymond Wheeler, NASA
5. Managing Microbial Plant Pathogenesis in Space-based Bioregenerative Life Support Systems (BLSS), Andrew Schuerger, Dept. of Plant Pathology, Univ. of Florida
6. Space Plants for Inspiring the Next Generation of Explorers, Amy Padolf, Fairchild tropical Botanic Garden

Chair: David Urban, NASA  
Glenn Research Center  
Plants, Water Management  
& Life Support

10:30am-11:00am  
**Morning Break Service**

**Grand Ballroom VII-IX**

Wednesday, October 25th, 2017

11:00am – 12:30pm

**NASA Space Life and Physical Sciences Vision/  
International Space Station/National Labs Updates**

**Grand Ballroom I-VI**

**LIVE WEBCAST**

1. NASA ISS Transition and Exploration Gateway Concept – Mr. Sam Scimemi, ISS Director, NASA Headquarters
2. NASA Space Life and Physical Science Activities – Dr. Craig Kundrot, Director, Space Life and Physical Research and Applications Division, NASA Headquarters
3. International Space Station National Laboratory Activities – Dr. Randy Giles, Center for the Advancement of Science in Space Chief Scientist

12:30pm–2:00pm

**Multiple Events**

ASGSR Student Luncheon (Pre-registration required) – **Bellevue, 3rd Floor**

Lunch (on your own)

Standing Committee – Communications – **Renton Club, 3rd Floor**  
– All invited. Bring your own lunch.

Standing Committee – Journal – **West Seattle, 3rd Floor**  
– All invited. Bring your own lunch.

2:00pm–2:30pm

**Chinese Manned Space Program**

**Grand Ballroom I-VI**

**LIVE WEBCAST**

Recent achievement and progress in the space science and utilization area of China's manned space program. Gao Ming, Director General, Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences (CSU)

2:30pm–4:30pm

**Symposium II: Growth, Impact and Control of Biofilms in Spacecraft**

**Grand Ballroom I-VI**

**LIVE WEBCAST**

1. Polymicrobial Biofilms – A Widespread Mode of Bacterial Growth, Robert McLean, Texas State University
2. Impact of Biofilms on the Design and Operation of ISS Life Support Systems, Layne Carter, NASA Marshall Space Flight Center
3. Microbial communities and biofilm formation during spaceflight, Cynthia Collins, Rensselaer Polytechnic Institute
4. Microbial Biofilms, Matt Parsek, University of Washington
5. Mechanical Principles of Biofilm Formation, Jing Yan, Department of Molecular Biology/Department of Mechanical and Aerospace Engineering, Princeton University

Chair: Robert McLean,  
Texas State University

Co-Chair: Kevin Sato, NASA  
Space Biology Project,  
NASA Ames Research  
Center

4:30pm–5:00pm

**Afternoon Break Service**

**Grand Ballroom VII-IX**

5:00pm–6:00pm

**Town Hall:**

**Topic – “International Space Station transition – driving innovation between academia and the private sector”**

**Grand Ballroom I-VI**

As the private sector becomes more engaged in research and technology projects in space, what does the intersection of academic and private sector space look like? What would this look like if there are commercially operated space platforms? This panel will present various views on what this intersection may look like, and the prospective roles for the U.S. government, academia and the private sector for research, innovation and technology development activities in Low earth orbit and beyond. The panel will be followed by an engaging question and answer session from the audience.

6:00pm–9:00pm

**Investigator Poster Session and Welcome Reception**

**Exhibit Hall, Grand Ballroom VII-IX and Pre-Function Area**

Newly elected Board members will be announced  
Even Numbered Posters present 6:30 pm – 7:30 pm  
Odd Numbered Posters present 7:30 pm – 8:30 pm

Poster Listings on Page: 36

Thursday, October 26th, 2017

7:00am-8:00am  
Multiple Events

AIAA Board Meeting - **Executive Boardroom, 3rd Floor**

Continental Breakfast - **Grand Ballroom VII-IX**

ALL DAY  
Posters

**Grand Pre-Function**

7:00am - 5:00pm  
Exhibit Hall

**Grand Ballroom VII-IX**

7:00am - 5:00pm  
Registration Open

**Grand Stair Pre-Function**

8:00am-10:00am  
**Symposium III: Galactic  
Cosmic Radiation:  
Tracks and Risk**

**Grand Ballroom I-VI**

**LIVE WEBCAST**

1. Tracks and Risk: The Fluence-based Risk Concept and Track Structure, Stanley Curtis, Fred Hutchinson Cancer Research Center, University of Washington

2. Galactic Cosmic Particles: Understanding the Risk, John Norbury, NASA Langley Research Center

3. Biological validation of track structure by precision measurement of the 3D DNA lesion distribution, Johanna Mirsch, TU Darmstadt

4. Single-Track Effects in Microelectronics, Allan Johnston, NASA Jet Propulsion Laboratory (Retired)

Chair: Bill Atwell, The Boeing Company (retired)  
Co-Chair: Paul Todd, Techshot

10:00am-10:30am  
Morning Break Service

**Grand Ballroom VII-IX**

10:30am-12:00pm  
**Symposium IV: NASA  
Exploration Research  
Needs and Opportunities in  
Physical Sciences**

**Grand Ballroom I-VI**

**LIVE WEBCAST**

1. Application Approach to Identify Spacecraft Fire Safety Research for NASA's Exploration Mission, Gary Ruff, NASA Glenn Research Center

2. Challenges with Operating a Water Recovery System (WRS) in the Microgravity Environment of the International Space Station (ISS), Layne Carter, NASA Marshall Space Flight Center

3. Technology Challenges for In-Situ Resource Utilization (ISRU), Molly Anderson, NASA Johnson Space Center

4. Advancing Human Space Exploration with Additive Manufacturing, Kristin Morgan, NASA Marshall Space Flight Center

Chair: John McQuillan, NASA Glenn Research Center

10:30am-12:00pm  
**Symposium V: Enabling  
Exploration through Space  
Biology Research**

**Lake Washington I, 3rd Floor**

1. Space Biology research can enable human spaceflight exploration through a combination of push and pull, Craig Kundrot - Director, Space Life and Physical Research and Applications Division, NASA Headquarters

2. Space Biology Investigator Contributions, John Charles -Chief Scientist, NASA Human Research Program, Johnson Space Center

3. The Effects of the Space Environment on the Microbiome of Mice and Men: The need for Scientific Push and Pull, Fred Turek, Northwestern University

4. Future Food Production System Development Pulling From Space Biology Crop Growth Testing in Veggie, Gioia Massa, NASA Kennedy Space Center

Co-Chair: David Tomko, NASA Headquarters  
Co-Chair: Kevin Sato, NASA Ames Research Center



Thursday, October 26th, 2017

12:00pm-2:00pm  
**Lunch**

**On your own**

12:30pm-1:30pm  
**The Big Reveal: Space Station Research Exploration on NASA.GOV**

**Grand Ballroom I-IV**

Learn about NASA's latest tool to help International Space Station Researchers.

Chair: Dr. Kirt Costello, NASA International Space Station Deputy Chief Scientist

12:30pm-2:00pm  
**Standing Committee Meeting - Education and Outreach**

**Bellevue II, 3rd Floor**

All invited - bring lunch!

2:00pm-4:00pm  
**Concurrent Sessions**

Complex Fluids - **West Seattle, 3rd Floor**

Enabling Technologies I: Platforms and Approaches - **Seattle, 3rd Floor**

LS Systems I: Musculoskeletal System I - Muscle - **Lake Washington I, 3rd Floor**

Materials Science - **Rainier, 3rd Floor**

Microbial I: Microbial Diversity and Antibiotic Resistance - **Grand Ballroom I-VI** **LIVE WEBCAST**

Plants I: Plant Space Biology - **Bellevue I, 3rd Floor**

4:00pm-4:30pm  
**Afternoon Break Service**

**Grand Ballroom VII-IX**

4:30pm-6:00pm  
**Concurrent Sessions**

LS Systems III: Cardiovascular - **West Seattle, 3rd Floor**

Enabling Technologies II: Rodent and Mammalian Research - **Seattle, 3rd Floor**

LS Systems II: Gravity Sensing, Vision and the Brain - **Lake Washington I, 3rd Floor**

Microgravity Combustion I: Cool Flames - **Rainier, 3rd Floor**

Enabling Technologies III: Model Systems Research - **Grand Ballroom I-VI** **LIVE WEBCAST**

Fluids Physics I: Diagnostics - **Bellevue I, 3rd Floor**

7:00pm-9:30pm  
**Museum of Flight Reception**

Buses begin to leave at 6:30 pm from Hyatt Regency Lake Washington hotel lobby. Please wear ASGSR 2017 registration badge to the event. Continuous bus service will run between 6:30 pm and 9:30 pm to/from Hyatt Regency Lake Washington Hotel and Museum of Flight. Note: All registered ASGSR 2017 attendees will receive 10% discount at museum store. Must have ASGSR 2017 badge to receive discount. Cash Bar.



[fedex.com/spacesolutions](http://fedex.com/spacesolutions)

7:00am - 8:00am  
**Continental Breakfast**

**Grand Ballroom VII-IX**

7:00am - 5:00pm  
**Registration Open**

**Grand Stair Pre-Function**

ALL DAY  
**Posters**

**Grand Pre-Function**

7:00am - 5:00pm  
**Exhibit Hall**

**Grand Ballroom VII-IX**

8:00am-10:00am  
**Symposium VI: Gravity  
Across the Continuum**

**Grand Ballroom I-VI**  
**LIVE WEBCAST**

1. The Use of Altered Reality as a Tool to Understand Neurovestibular Mechanisms in Vertebrates, Richard Boyle, NASA Ames Research Center
2. The Columnar-to-Equiaxed Transition in TiAl-alloys Under Hypergravity and Microgravity Conditions, Ulrike Hecht, Aachen, Germany
3. Partial Gravity Environments: Bad to the Bone (and Muscle!), Susan Bloomfield, Texas A&M University
4. Einstein-Elevator: A New Facility for Research from  $\mu g$  to 5g, Wolfgang Ertmer, Leibniz Universität Hannover, Germany
5. Centrifuge in Free Fall: Combustion at Partial Gravity, Paul Ferkul, USRA, NASA Glenn Research Center

Chair: Jack van Loon, VU  
University Amsterdam

10:00am-10:30am  
**Morning Break Service**

**Grand Ballroom VII-IX**

10:00am-12:00pm  
**Student Investigator Poster  
Session - Graduate and  
Undergraduate**

**Grand Ballroom Pre-Function**

Even numbers present at 10:00 am - 11:00 am  
Odd numbers present. 11:00 am - 12:00 pm

Poster Listings on Page 37-39

12:00pm-2:00pm  
**Lunch**

**On your own**

12:30pm-2:00pm  
**Multiple Events**

Standing Committee Meeting - External Affairs - **Renton Club**

Standing Committee Meeting - Meetings and Workshops - **Bellevue II, 3rd Floor**

2:00pm-4:00pm  
**Concurrent Sessions**

Fundamental Physics - **West Seattle, 3rd Floor**

Microbial II: Biofilms - **Seattle, 3rd Floor**

LS Systems IV: Humans in Space - **Lake Washington I, 3rd Floor**

Microgravity Combustion II: Droplet Combustion/Solid Material Flammability - **Rainier, 3rd Floor**

Fluids Physics II: ISS Updates - Fluids Research - **Grand Ballroom I-VI** **LIVE WEBCAST**

Plants II: Plant Signaling - **Bellevue I, 3rd Floor**

3:30pm-4:00pm  
**Afternoon Break Service**

4:00pm-6:00pm  
**Symposium VII: Hot Topics - New Directions in Physical Sciences Research**

Chair: David Urban, NASA Glenn Research Center

**Grand Ballroom VII-IX**

**Lake Washington I, 3rd Floor**

1. Colloids, Granular and Soft Matter On Earth and In Space, Paul Chaikin, New York University
2. Toward Major Improvements in Efficiency and Emissions of Internal Combustion Piston Engines, Frederick Dryer, Princeton University
3. Saffire: A Novel Approach to Study of Spacecraft Fire Safety Using Un-manned Spacecraft, David Urban, NASA Glenn Research Center
4. Biomaterials for tissue engineering and biotechnological applications, Miqin Zhang, University of Washington
5. Quantifying Cohesive Sediment Dynamics for Advanced Environmental Modeling, Paolo Luzzatto-Fegiz, University of California at Santa Barbara

4:00pm-6:00pm  
**Symposium VIII: Hot Topics in Space Life Sciences Research - Organs On A Chip**

Co-Chair: Michael Pecaut, Loma Linda University  
Co-Chair: Liz Blaber, NASA Ames Research Center

**Grand Ballroom I-VI**

**LIVE WEBCAST**

1. Human Emulation on the International Space Station: A Platform for Studying Human Biology in Space, Chris Hinojosa, Emulate, Inc.
2. A 3D Organotypic Culture System to Study Composite Skeletal Tissue Physiology in Microgravity, Rocky Tuan, University of Pittsburgh
3. Preparing for SpX-15: Lab-on-a Chip Payload for Growth of Human Skeletal Muscle Cells in Low Gravity, Siobhan Malany, Sanford Burnham Prebys Medical Discovery Institute/micro-gRx
4. Nerve-on-a-Chip as a 3D Microphysiological Platform to Study Microgravitational Phenomena, Lowry Curley, AxoSim
5. Effects of Microgravity on the Structure and Function of Proximal and Distal Tubule MPS, Edward Kelly, University of Washington

7:00pm-9:30pm  
**ASGSR Student Mixer and Meeting**



**Lake Washington I, 3rd Floor**

Event open to all ASGSR students and event sponsor. Undergraduate and Graduate Student Competition Poster Awards and the CASIS ISS-National Laboratory Student Research awards will be announced at this event. The award winners will also be recognized at the ASGSR banquet on Saturday, October 28, 2017.

Sponsored by the Center for the Advancement of Science in Space (CASIS).

7:00am-8:00am  
**Continental Breakfast**

**Grand Ballroom VII-IX**

7:00am - 5:00pm  
**Registration Open**

**Grand Stair Pre-Function**

7:00am - 3:00pm  
**Exhibit Hall**

**Grand Ballroom VII-IX**  
Exhibit Tear-Down 3:00pm-6:00pm

8:00am-3:00pm  
**Posters**

**Grand Pre-Function**  
Posters remaining after 6:00 pm on Saturday, October 28, 2017 will be disposed of by ASGSR.

8:00am-10:00am  
**Middle/High School and Drop Tower Student Poster Session**

**Grand Ballroom Pre-Function**

Poster Listings on Page 40

9:30am-10:00am  
**Morning Break Service**

**Grand Ballroom VII-IX**

10:00am-12:00pm  
**Concurrent Sessions**

Forging a Path to the Future - **West Seattle, 3rd Floor**  
Microbial III: Microbial Adaptation in LEO and Beyond - **Grand Ballroom III** **LIVE WEBCAST**  
Microgravity Combustion III: Droplet Combustion/Solid Material Flammability - **Rainier, 3rd Floor**  
Fluids Physics III: Fluids Management - **Seattle, 3rd Floor**  
Plants III: Plant Production in Space - **Bellevue I, 3rd Floor**  
LS Systems V: Musculoskeletal System II - Bone - **Grand Ballroom I-II**

12:00pm-1:00pm  
**Middle/High School Students: Meet the Scientists**

**Lake Washington I, 3rd Floor**

12:30pm-2:00pm  
**Multiple Events**

ASGSR Board of Governors Meeting II - **Executive Boardroom, 3rd Floor**

Lunch (on your own)

12:30pm-2:00pm  
**Physical Sciences Informatics Workshop**

**Seattle, 3rd Floor**

This session will provide an update to NASA's Physical Sciences Informatics System (PSI) and the recent PSI NRA release and call for proposals.

NASA's Physical Sciences Research Program conducts fundamental and applied physical sciences research, with the objective of enabling exploration and pioneering scientific discovery. NASA's experiments in the various disciplines of physical science reveal how physical systems respond to the near absence of gravity. They also reveal how other phenomena which have a small influence on physical systems in earth's gravity, can dominate system behavior in space.

12:30pm-2:00pm  
**Life Sciences Program  
Updates**

**Grand Ballroom III**

NASA Space Biology Program Overview, David Tomko  
NASA Headquarters

1:00pm-3:30pm  
**Educational Opportunities  
for Training the Next  
Generation of Scientists**

**Lake Washington I, 3rd Floor**

This workshop will feature an introduction and opportunity for high school students to present their results. There will also be oral presentations and a short poster session/net-working opportunity at the end.

2:00pm-3:30pm  
**Symposium IX: ISS  
National Laboratory's  
Microgravity Molecular  
Crystal Growth Program  
Capabilities, Opportunities  
and Results**

**Grand Ballroom III LIVE WEBCAST**

Crystallography aboard the ISSNL continues to provide opportunities for a variety of entities to crystalize molecules that generate poor crystals on Earth. The symposium will present results for ISSNL crystallography projects from 2016-2017, provide background on why these entities chose to use the ISSNL and how the ISSNL merges with their Earth-based programs. An overview of the ISSNL Microgravity Molecular Crystal Growth Program will also be provided. Speakers include the following 2016-2018 ISSNL Crystallographers:

- Edward Snell, Hauptman-Woodward Medical Research Institute
- Larry DeLucas, Aerospace Corporation
- Paul Reichert, Merck
- Zorin Radic, University of California at San Diego
- Timothy Mueser, University of Toledo
- Kristofer Gonzalez-DeWhitt, formerly Eli Lilly and currently Bionetics consultant

3:30pm-4:00pm  
**Afternoon Break Service**

**Grand Ballroom VII-IX**

4:00pm-5:30pm  
**Concurrent Sessions**

Fluids Physics IV: Non-Mechanical Flows - **West Seattle, 3rd Floor**

Enabling Technologies IV: New Analytic Techniques - **Seattle, 3rd Floor**

Microgravity Combustion IV: Gaseous Flames - **Grand Ballroom III LIVE WEBCAST**

LS Systems VI: Gravity, Microbes and Health - **Bellevue I, 3rd Floor**

LS Systems VII: Reproduction, Development and Behavior - **Rainier, 3rd Floor**

Educating the Next Generation - **Grand Ballroom I-II**

6:00pm-7:00pm  
**ASGSR Reception**

**Lake Washington, 3rd Floor Pre-Function**

ASGSR would like to thank the Halstead family for their generous contribution towards the Thora Halstead Young Investigator Award to be announced at the banquet Saturday, October 28, 2017. (Cash bar)

7:00pm-10:00pm  
**ASGSR Banquet**

**Lake Washington, 3rd Floor**

Keynote Speaker, Dr. Jane Cook, Corning Museum of Glass

ASGSR Award Presentations

ASGSR Art Competition Results

AIAA Space Processing Award Presentation - Mark Weislogel Portland State University

Sponsored By:





Plants I: Plant Space Biology - **Bellevue I, 3rd Floor** - THURSDAY 2pm-4pm

**Chair: Dr. Sarah Wyatt**, Ohio University

- "Proteomics analysis of spaceflight seedlings offers insights into gravity signaling," Alexander Meyers, Ohio University
- "Space Effects In Brassica Seedlings – Gene Transcription By Tissue Type," Karl Hasenstein, University of Louisiana at Lafayette
- "Flight alters mechanical signaling networks related CML24 in Arabidopsis," Richard Barker, UW Madison
- "RNA-seq Analysis of Plants Exhibiting Novel Phototropic Responses in Conditions of Microgravity," Joshua Vandenbrink, University of North Carolina
- "Genetic Dissection of the Arabidopsis Spaceflight Transcriptome: Are Some Responses Unnecessary?" Anna-Lisa Paul, University of Florida
- "Characterizing a Novel ROS Gene Identified from Spaceflight Experiments," Natasha Sng, University of Florida
- "Fusarium oxysporum as an Opportunistic Fungal Pathogen on Zinnia hybrida Grown Onboard the ISS," Andrew Schuerger, University of Florida
- "A tale of 4 ISS Foxy isolates: Using genomics to track the source of fungal infected plants on ISS," Camilla Urbaniak, NASA JPL

Enabling Technologies I: Platforms and Approaches - **Seattle** - THURSDAY 2pm-4pm

**Chair: Dr. Jeff Smith**, NASA Kennedy Space Center

- "Ballooning for Biologists: Mission Essentials for Flying Experiments on Large NASA Balloons," David Smith, NASA Ames Research Center
- "SpaceShipTwo: A Suborbital Vehicle for Human Spaceflight and Microgravity Research," Sirisha Bandla, Virgin Galactic
- "BioSentinel: an adaptable platform for life science studies in multiple space environments," Sergio Santa Maria, NASA Ames
- "Mass Measurement Device: Applications for Space Life and Physical Sciences," John Wetzel, Sierra Nevada Corporation
- "NASA's GeneLab Phase II: Federated Search and Data Discovery," Dan Berrios, USRA, NASA Ames Research Center
- "Machine Learning Approaches to Increasing Value of Spaceflight Omics Databases," Diana Gentry, NASA Ames Research Center
- "Novel Molecular Biology Approach: Direct Nanopore Sequencing of mRNA Isolated by the ISS WetLab2 SPM," Cassandra Juran, USRA
- "Network Inference Analysis of Spaceflight Omics Datasets," Maya Ramachandran, Columbia University
- "Telomere Length Measure in Cells Exposed to Unloading in Microgravity: Direct Nanopore Sequencing," Kristin Ma, NASA Intern (High School Student)

Microbial I: Microbial Diversity and Antibiotic Resistance - **Grand Ballroom I-VI** - THURSDAY 2pm-4pm

**Chair: Dr. Jamie Foster**, University of Florida

- "AmpliSeq™ targeted amplification of AMR genes associated with ISS environments," Camilla Urbaniak, JPL
- "Expansion of Microbial Monitoring Capabilities on the International Space Station (ISS)," Christina Khodadad, Sierra Lobo, Inc.
- "Lessons Learned: ISS – Microbial Observatory project (Microbial Tracking 1)," Kasthuri Venkateswaran, JPL
- "Microbial Tracking-2: Observing Potential Pathogenic Bacteria, Fungi, and Viruses in the ISS," Crystal Jaing, Lawrence Livermore National Lab
- "BRIC-21 Status Update: Growth, Antibiotic Resistance, Transcriptomes, and Mutations in Space," Wayne Nicholson, University of Florida
- "AMR and virulence characteristics of the ISS environment, a metagenomics analysis," Nitin Singh, NASA JPL-Caltech
- "Whole Metagenome Profiles of Particulates Collected from the International Space Station," Aram Avila-Herrera, Lawrence Livermore National Lab
- "Identification of Novel Desiccation-Tolerant *S. cerevisiae* Strains for Deep Space Biosensors," Sofia Tieze, Haverford College, NASA ARC
- "Using Genetic Analysis of *S. cerevisiae* in the Stratosphere to Predict Effects of Deep Space Travel," Tristan Caro, UC Berkeley
- "The Transcriptional Response of Diverse *S. cerevisiae* Strains to Simulated Microgravity," Lily Neff, Wesley College

Complex Fluids - **West Seattle, 3rd Floor** - THURSDAY 2pm-4pm

**Chair: Dr. William Meyer**, USRA at NASA Glenn Research Center

- "Liquid Crystals of Nanoplates," Zhengdong Cheng, Texas A&M University
- "Growth and Interaction of Colloid Nuclei under Microgravity," Lou Kondic, New Jersey Institute of Technology
- "Requirements for ISS ACE-E Cell Design to Study Electric Field-Driven Structuring in Suspensions," Boris Khusid, New Jersey Institute of Technology
- "Role of Solid-Stabilized Interfaces on the Rheology of Pickering Emulsions," Max Kaganyuk, University of California, Irvine
- "Active Motion of Colloidal Molecules Under External Fields," Ning Wu, Colorado School of Mines
- "Dynamics and Structure in Supercooled Colloidal Liquid and Frustrated Colloidal Packings," Arjun Yodh, University of Pennsylvania
- "Ring-Sheared Drop (RSD) Module for the Study of Amyloid Fibril Formation," Aditya Raghunandan, Rensselaer Polytechnic Institute
- "Depletion in Complex Fluids with a Bimodal Particle Size Distribution under Microgravity," Gerold Willing, University of Louisville

Materials Science - **Rainier, 3rd Floor** - THURSDAY 2pm-4pm

**Chair: Dr. Michael Sansoucie**, NASA Marshall Space Flight Center

- "Retained Free Energy Theory," Douglas Matson, Tufts University
- "Effect of Macromolecular Transport in Microgravity Protein Crystallization," Lawrence DeLucas, Aerospace Corporation
- "Why is two-step nucleation selected?" Peter Vekilov, University of Houston
- "Dendrite Coarsening in the Low Volume Fraction Limit," Peter Voorhees, Northwestern University
- "Marangoni Effects on Bubble-Dendrite Interactions Under Microgravity and Terrestrial Conditions," Mohsen Eshraghi, CSU LA
- "Multifunctional hybrid cellular nanocomposites for extreme environment spacecraft structures," Ryan Yarbrough, UNC Greensboro
- "Recent Upgrades to the MSFC Electrostatic Levitation (ESL) Laboratory in Support of MaterialsLab," Michael SanSoucie, NASA
- "DECLIC, operational review and perspectives," Danièle Boucon, CNES

LS Systems I: Musculoskeletal System I - Muscle - **Lake Washington I** - THURSDAY 2pm-4pm

**Chair: Dr. Elizabeth Blaber**, NASA Ames Research Center

- "The Role of Oxidative Stress in Akt-mTOR Anabolic Signaling in Unloaded Skeletal Muscle," John Lawler, Texas A&M University
- "Molecular Muscle Experiment: Molecular mechanisms and countermeasures to muscle decline in space," Nathaniel Szewczyk, University of Nottingham
- "NOX2 Inhibition Prevents Skeletal Muscle Atrophy and nNOS Translocation in Hindlimb Unloaded Rats," Patrick Ryan, Texas A&M University
- "Effect of Microgravity on Nuclear Morphology in Human Fibroblast Cells," Srujana Neelam, NASA KSC
- "Investigation of Genes Responsible for Loss of Muscle Strength in *C. elegans* in Microgravity," Jennifer Hewitt, Texas Tech University
- "Investigation of Zebrafish Embryos Behavior as a Precursor for Suborbital Flights: Feasibility Study," Kristina Andrijauskaite, UT Health Science Center
- "Effects of MnSOD treatment on the properties of rat soleus during gravitational unloading," Yusaku Ozaki, Doshisha University
- "Characterizing the Effects of Radiation on Muscle Cells," Lori Caldwell, Utah State University
- "Age Differences in Skeletal Muscle Capillary Responses to Unweighting and Recovery," Noah Ichite, Marshall University
- "Effect of Fish Oil and Curcumin Supplementation on Muscle Cross Sectional Area, Anabolic Signaling," Dylan Holly, Texas A&M
- "Effect of EUK-134 on nNOS translocation and membrane repair proteins in unloaded skeletal muscle," Mariana Janini Gomes, Texas A&M
- "Profiles of linear ubiquitin assembly complex in skeletal muscle," Kodai Nakamura, Toyohashi SOZO University

Fluids Physics I: Diagnostics - **Bellevue I, 3rd Floor** - THURSDAY 4:30pm-6pm  
**Chair: Dr. John McQuillen**, NASA Glenn Research Center

- "Gravity effects on flow boiling heat transfer using temperature sensitive paints," Jungho Kim, University of Maryland
- "Molecular based optical diagnostics development for thermometry/velocimetry for the ZBOT experiment," Shahram Pouya, MSU
- "A novel method to determine accommodation coefficients of cryogenic propellants," Kishan Bellur, Michigan Technological University
- "Drop tower explorations of electrostatic orbits," Isabel Rodriguez, Portland State University
- "Evaporation-driven Marangoni Particle Motion in View of Vapor Recoil and Self-rewetting Pool Boiling," Abhilash Sankaran, University of Illinois Chicago

Microgravity Combustion I: Cool Flames - **Rainier, 3rd Floor** - THURSDAY 4:30pm-6pm  
**Chairs: Dr. Tanvir Farouk**, University of South Carolina; **Dr. Michael Hicks**, NASA - Glenn Research Center

- "Dynamics and Detailed Flame Structure of Dimethyl Ether/Methane Cool Diffusion Flames," Christopher Reuter, Princeton University
- "Non-Premixed - Partially Premixed to Diffusive Burning: Initial Transient of Direct Cool Flame Burn," Fahd Alam, University of South Carolina
- "On the Chemical Character and Structure of Multistage Ether Flames," Christopher Reuter, Princeton University
- "Multistage Cool Flame Combustion in Helium Enriched Ambient at Elevated Pressure Conditions," Tanvir Farouk, University of South Carolina
- "Spherical Cool Diffusion Flames Burning Gaseous Fuels," Peter Sunderland, University of Maryland
- "Pressure and Radiation Effects on the Dynamics of Hot and Cool Diffusion Flames," Yiguang Ju, Princeton University

LS Systems II: Gravity Sensing, Vision and the Brain - **Lake Washington I** - THURSDAY 4:30pm-6pm  
**Chair: Dr. Richard Boyle**, NASA Ames Research Center

- "Statolith Action by the Numbers: Physics and Feasibility," Paul Todd, Techshot, Inc.
- "Impact of spaceflight on retina in JAXA mice," Xiao Wen Mao, Loma Linda University
- "Human oligodendrocytes in simulated microgravity generate a unique secretome metabolic profile," Araceli Espinosa-Jeffrey, IDDRRC-UCLA
- "Spaceflight-induced Changes in White Matter Hyperintensity Burden in Astronauts," Noam Alperin, University of Miami
- "Chronic hypergravity induces changes in the dopaminergic neuronal system in Drosophila melanogaster," Andrew Pelos, NASA Ames
- "Automated Method to Quantify 3D Geometric Alterations of the Optic Nerve and Sheath in Astronauts," Austin Sass, Univ. of Idaho
- "Inter-operator Reliability Assessment of Optic Nerve Tortuosity in Long-duration Flight Astronauts," Jesse Rohr, Univ. of Idaho

LS Systems III: Cardiovascular - **West Seattle, 3rd Floor** - THURSDAY 4:30pm-6pm  
**Chair: Dr. Sharmila Bhattacharya**, NASA Ames Research center

- "Cardio-postural changes following 60-days head-down tilt bed rest," Andrew Blaber, Simon Fraser University
- "Effects Of Simulated Weightlessness On Cardiac Tissue," Sonette Steczina, Blue Marble Space at NASA Ames
- "Lifelong microG on the ISS impacts Drosophila heart function and extracellular matrix," Karen Ocorr, SBP Medical Discovery Institute
- "Effects of microgravity on heart and muscle function in flies with altered myosin ATPase activity," Anjali Gupta, SBP Medical Discovery Institute
- "Pulmonary gas exchange as an estimate of lung perfusion during changing gravity," Andreas Werner, Centre of Aerospace Medicine
- "The Effects of CDKN1a/p21 on Oxidative Stress and Mitochondrial Function During Spaceflight," Olivia Stimpel, Blue Marble Space at NASA Ames

Enabling Technologies II: Rodent and Mammalian Research - **Seattle** - THURSDAY 4:30pm-6pm  
**Co-Chairs: Dr. William McLamb; Melissa Rhodes, CASIS**

- "Surgical Robotics for Space Applications," John Raiti, Applied Dexterity
- "Vascular Patterning Analysis by VESGEN 2D/3D with Bioinformatics: Updates for Rodent Tissues," Patricia Parsons-Wingerter, NASA Ames
- "New Developments in NASA's Rodent Research Hardware..." Yasaman Shirazi-Fard, NASA Ames
- "A Microfluidics-based Approach to study Cancer Cell Migration in Microgravity," Atul Dhall, SUNY Polytechnic Institute
- "Towards a Microgravity-based Model for Studying Ovarian Cancer Invasion," Timothy Masiello, SUNY Polytechnic Institute
- "Biomechanical Analysis Tools & Methodologies for the Development of Spaceflight Countermeasures," Kaitlin Lostrosio, Student, University of South Florida
- "The Motorbar - A Small Radius Centrifuge Enabling Gymnast Astronauts," Daniel Gove, Student
- "Assessment of the Effects of External Radiation on the Operation of the ISS Bone Densitometer," Paul Todd, Techshot, Inc.

Enabling Technologies III: Model Systems Research - **Grand Ballroom I-VI** - THURSDAY 4:30pm-6pm  
**Chair: April Spinale, CASIS/Bionetics**

- "Ion Selective Optical Sensors for Biological Life Support Systems," Mike Dixon, University of Guelph
- "Deep Space Petri-Pod, a new platform for Astrobiology experiments beyond the Van Allen belts," Nathaniel Szewczyk, University of Nottingham
- "Tomatosphere: A Seventeen Year (and Counting) STEM Odyssey," Thomas Graham, University of Guelph
- "Accommodating Space Biology Sortie Missions in the Post-Space Shuttle Era," Robert Morrow, Sierra Nevada Corporation
- "Synthetic Biology: Enabling Nutraceutical and Materials Production from Mission Waste," Mark Blenner, Clemson University
- "Biology and Biotechnology Experiments on-board the ISS: Looking into the past for a better future," Fathi Karouia, NASA Ames
- "An ISS Co-orbital Free-flying Gravitational Biology Laboratory: G-Lab," Gary Hudson, The Space Studies Institute, Inc.

Fundamental Physics - **West Seattle, 3rd Floor** - FRIDAY 2pm-4:00pm

**Chair: Dr. Mark Lee**, NASA Headquarters

- "Cloud Manipulation in Protoplanetary Dust Simulation," Andrei Vedernikov, Universite Libre de Bruxelles, Belgium
- "Particle Velocity Distribution in a Three-Dimensional Dusty Plasma under Microgravity Conditions," Bin Liu, The University of Iowa
- "Critical phenomena studies in weightlessness utilizing DECLIC ALI-R," Inseob Hahn, NASA JPL
- "Single-diode atom interferometer for precision measurement in space," Xuejian Wu, University of California, Berkeley
- "Microgravity Studies of Few-Body Physics," Maren Mossman, Washington State University
- "Nonlinear Wave Synchronization in Dusty Plasmas," John Goree, The University of Iowa

Microbial II: Biofilms - **Seattle** - FRIDAY 2pm-4:00pm

**Chair: Dr. Wayne Nicholson**, University of Florida

- "Novel Materials for Biofilm Inhibition," Mary Hummerick, Vencore
- "Building Better Biosensors for Exploration into Deep-Space," Lauren Liddell, NASA Ames Research Center
- "Environmental impacts on Candida albicans biofilm formation," Rachel Juel, Montana State University
- "Effects of simulated microgravity on a host-pathogen system," Rachel Gilbert, NASA Ames Research Center
- "Mining the GeneLab Data System to Identify Common Responses of Bacteria Exposed to Spaceflight," Michael Morrison, Univ. of Florida
- "BioSentinel: Improving desiccation tolerance of yeast biosensors for deep-space missions," Sawan Dalal, SLSTP, NASA Ames
- "Geomicrobial Biofilms and the Weathering of Basalt under Different Gravity Conditions," Natasha Nicholson, University of Edinburgh
- "Growth and biofilm formation of Penicillium chrysogenum in simulated microgravity," Marta Cortesão, German Aerospace Center
- "Ground Testing of Biofilm Formation on Spaceflight-Relevant Materials," Zeena Nisar, BioServe Space Technologies, University of Colorado Boulder

LS Systems IV: Humans in Space - **Lake Washington I** - FRIDAY 2pm-4:00pm

**Chair: Dr. Andrew Blaber**, Simon Fraser University

- "Algorithmic Investigation of Sensorimotor Performance Using Biopotentials," Robert Stallard, Univ. of Louisville
- "Non-invasive Method for Intracranial Fluid Volume Shift Detection in a Microgravity Environment," Brandon Eckerman, Wichita State University
- "Physical Activity - A Countermeasure Against Distress During 30-days of Isolation?" Jan Webber, German Sport University Cologne
- "Investigating Passive RF-Sensor Capability for the Direct Measurement of Space Suit Fit," Reece Burns, Wichita State University
- "Non-invasive Method for Monitoring Microgravity Induced Bio-fluid shifts in Lower Limbs," Jacob Griffith, Wichita State University
- "Measuring Movement: Collecting Human Activity Intensity Energy Expenditure in Extreme Environments," Mallika Sarma, University of Notre Dame



Microgravity Combustion II: Droplet Combustion/Solid Material Flammability – **Rainier, 3rd Floor** – FRIDAY 2pm-4:00pm  
**Chairs: Dr. Vedha Nayagam**, Case Western Reserve University; **Dr. Paul Ferkul**, USRA at NASA Glenn

- “Unsteady droplet combustion with fuel thermal expansion,” Vedha Nayagam, Case Western Reserve University
- “Simulation of Multicomponent Surrogate Fuel Droplets Representative of Jet-A Fuel,” Tanvir Farouk, University of South Carolina
- “Droplet Combustion Analysis via Computer Vision,” Ramya Bhaskar, University of California at Davis
- “A new approach to quantitative data extraction from digital video images of droplet combustion experiments of soot producing fuels,” Anthony Reeves, Cornell
- “Combustion Program Update,” David Urban, NASA Glenn Research Center

Fluid Physics II: ISS Updates – Fluids Research – **Grand Ballroom I-VI** – FRIDAY 2pm-4:00pm  
**Chair: Dr. Paul Steen**, Cornell University

- “Flow Boiling and Condensation Experiment (FBCE) for the International Space Station,” Issam Mudawar, Purdue University
- “Behavior of a Salt-Water Solution Near the Critical Point Under Microgravity Conditions,” Uday Hegde, Case Western Reserve University
- “Numerical and Experimental Study of Gravity Effects on Bubble Capture by a Line Vortex in a Phase Se,” Chao-Tsung Hsiao, Dynaflow, Inc.
- “Modelling the Effect of Oscillation in an Evaporating Meniscus on the Heat Transfer Process,” Thao Nguyen, Rensselaer Polytechnic Institute
- “Precipitation of Sodium Sulfate from a Supercritical Water-Salt Solution in Microgravity,” Satya Nayagam, Strongsville High School
- “Investigation of Cyclonic Gas-Liquid Separator Performance in Microgravity Environment,” Yasuhiro Kamotani, Case Western Reserve University

Plants II: Plant Signaling – **Bellevue, 3rd Floor I** – FRIDAY 2pm-4:00pm  
**Chair: Dr. Alexander Meyers**, Ohio University

- “Calmodulins act as switches optimizing plant mechanical versus defense response,” Simon Gilroy, University of Wisconsin-Madison
- “An Integrated Omics Guided Approach to Lignification and Gravitational Responses: The Final Frontier,” Norman Lewis, Washington State Univ.
- “Influence of gravity and light on IGT genes and plant architecture,” Jessica Guseman, USDA-ARS Appalachian Fruit Research Station
- “Reactive oxygen species (ROS) and flavonols modulate the root gravitropic response,” Elizabeth Sarkel, Wake Forest University
- “Using mathematical modeling and natural variation to investigate Brachypodium root growth behavior,” Shih-Heng Su, Univ. of Wisconsin

Forging a Path to the Future - **West Seattle, 3rd Floor** - SATURDAY 10am-12pm

**Chair: Dr. Sylvain Costes**, NASA Ames Research Center

- "Successful 35-days Mouse Habitat in Micro & Artificial Gravity Environments on ISS and Live Return," Masaki Shirakawa, JAXA
- "Lessons learned on early stage commercialization and its potential benefits..." Ioana Cozmata, Space Portal/Science and Technology Corporation
- "Trustworthy Spaceflight 'Omics Measurements," Sylvain Costes, NASA Ames Research Center
- "Systemic Microgravity Response: Utilizing GeneLab to Develop Hypotheses for Spaceflight Risks", Afshin Beheshti, CMC Medical Center/ NASA AMES

Microbial III: Microbial Adaptation in LEO and Beyond- **Grand Ballroom III** - SATURDAY 10am-12pm

**Chair: Dr. Kasthuri Venkateswaran**, NASA Jet Propulsion Laboratory

- "Where is the Upper Altitude Boundary of Earth's Biosphere? New Results from a Stratosphere Mission," David Smith, NASA Ames
- "Long-term multi-generational evolutionary studies of bacteria in the spaceflight environment," Craig Everroad, NASA Ames
- "Investigating the Physiology and Fitness of *Shewanella oneidensis* MR-1 under Microgravity Conditions," Michael Dougherty, KBRWyle
- "Metabolic adaptation of yeast colonies mediated by oxidative status and stress defense..." Timothy Hammond, Department of Veterans Affairs
- "Reactivation of latent Epstein-Barr virus; a comparison after gamma rays and proton treatment," Satish Mehta, NASA Johnson Space Center
- "Effects of Spaceflight and Other Stresses on the Gastrointestinal Tract and Its Microbiota in Mice," Martha Vitaterna, Northwestern University
- "Novel Inexpensive Biomanufacturing Platforms for 3D Culture Models for Spaceflight Applications," Kunal Mitra, Florida Institute of Technology
- "Assessing the ability of a microgravity environment to promote the transfer of antibiotic resistance," Tristan Grams, Carthage College, NASA JPL
- "Simulated microgravity impedes CMV viral expansion in infected Kasumi-3 myeloid progenitor cells," Bridgette Rooney, University of Houston and NASA JSC

LS Systems V: Musculoskeletal System II - Bone - **Grand Ballroom I-II** - SATURDAY 10am-12pm

**Chair: Dr. Ruth Globus**, NASA Ames Research Center

- "Modulation of Osteoblastogenesis by Mechanical Load in Bone Marrow Primary Osteoprogenitors," Cassandra Juran, USRA
- "Spaceflight increases adaptive thermogenesis in female B6 mice," Russell Turner, Oregon State University
- "Dietary countermeasure protects from radiation-induced bone loss," Ann-Sofie Schreurs, NAMS/USRA
- "Group Housing During Hindlimb Unloading To Simulate Weightlessness," Candice Tahimic, NASA Ames Research Center/KBRWyle
- "Transcriptomic analysis of male and female mice exposed to long-duration spaceflight," Elizabeth Blaber, NASA Ames
- "To investigate the potential of the hFOB constructs formed in two different microgravity analog mode," Vivek Mann, Texas Southern University
- "75 Minutes of Daily Weightbearing can Prevent Hindlimb Unloading Induced Cancellous Bone Loss," Rihana Bokhari, Texas A&M
- "Knee and Hip Joint Damage from Reduced Weight-Bearing and/or Spaceflight Radiation," Andy Kwok, Wake Forest School of Medicine
- "Role of CDKN1a/p21 in Mouse Bone Turnover and Aging," Margareth Cheng-Campbell, Blue Marble Space at NASA Ames
- "Excessive Bone Marrow Adiposity Does Not Exacerbate Disuse Induced Bone Loss in Male ob/ob Mice," Jessica Keune, Oregon State
- "p21-dependent Mediation of Cellular Senescence in Bone Marrow Stem Cells," Esther Putnam, NASA Ames, SLSTP
- "The Role of Nuclear Cytoskeleton in the Osteocytic Response to Simulated Weightlessness," Hallie Touchstone, Boise State University

Microgravity Combustion III: Droplet Combustion/Solid Material Flammability - **Rainier, 3rd Floor** - SATURDAY 10am-12pm

**Chairs: Dr. Subrata Bhattacharjee**, SDSU; **Dr. Ya-Ting Liao**, Case Western Reserve University

- "Vibration Enhanced Flame Spread over Solid Fuels in Microgravity: A parabolic Flight Experiment", Evan Rose, Case Western Reserve
- "Analysis of High Speed Video of PMMA Rod Blowoff", Sandra Olson, NASA Glenn Research Center
- "Optimizing Terrestrial Simulation of Fire in Microgravity," Indrek Wichman, Michigan State University
- "Flames Spread Across Materials Used on Spacecraft at Varied Oxygen Levels in Simulated Microgravity," Alex Grassi, San Diego University
- "Influence of Edge Propagation on Downward Flame Spread over Three-Dimensional PMMA Samples," Subrata Bhattacharjee, SDSU
- "Preheating effects on the flammability of a thick fuel in low-stretch flow in microgravity," Michael Johnston, Case Western Reserve
- "Transient Flame Growth and Spread Processes over Thin Solids in Concurrent Low-Speed Flows in Microgravity..." Ya-Ting Liao, Case Western Reserve
- "Concurrent Upward Flame Spread over a Fire-Resistant Fabric under External Heating," Maria Thomsen, University of California Berkeley

Fluids Physics III: Fluids Management - **Seattle**- SATURDAY 10am-12pm

**Chair: Dr. Steven Collicott**, Purdue University

- "Zero-Boil-Off Tank (ZBOT) Experiment - Ground-Based Validation of Pressurization & Pressure Control," Mohammad Kassemi, National Center for Space Exploration
- "Room Temperature Bubble Point and Flow-through-Screen Experiments for Liquid Acquisition Devices," Jason Hartwig, NASA Glenn Research Center
- "Bubble absorption by an air-filled helically-supported capillary channel," Negar Beheshti Pour, Washington State University
- "Dropwise Condensation Heat Transfer and Temperature-Dependent Wettability," Jonathan Ludwicki, Cornell University
- "Simulating Self-Pressurization in Propellant Tanks Using an Energy of Fluid Approach," Amanda Winter, The University of Memphis
- "Large droplet generation by capillary migration in super-hydrophobic wedges," Logan Torres, Portland State University
- "Room Temperature Wicking Rate Experiments for Liquid Acquisition Device Screens," Jason Hartwig, NASA Glenn Research Center
- "Ground Studies of a DYNASWIRL® Phase Separator for Space Applications," Xiongjun Wu, Dynaflow Inc.

Plants III: Plant Production in Space - **Bellevue, 3rd Floor**- SATURDAY 10am-12pm

**Chair: Dr. Joshua Vandenbrink**, University of North Carolina at Greensboro

- "Duckweed: A Tiny Aquatic Plant with Enormous Potential for Bioregenerative Life Support Systems," Christine Escobar, Space Lab Technologies
- "Microbial community analysis to assess food safety of crops grown in Veggie Plant Chambers on ISS," Christina Khodadad, Sierra Lobo
- "Spectral Imaging within EDEN ISS for Plant Health and Productivity Assessment," Robert Ferl, University of Florida
- "Development of Ion-Selective Optrodes for Interplanetary Food Production and Water Sampling," Connor Kiselchuk, German Aerospace Center
- "Effects of White LEDs on Growth and Phytonutrients of 'Outredgeous' Romaine Lettuce when supplemented," Matthew Mickens, NASA Kennedy Space Center
- "Response of Arabidopsis thaliana Seeds to Simulated Galactic Cosmic Rays," Ye Zhang, NASA Kennedy Space Center
- "'Programmable' Ecosystems: Engineered Environments for the Study of Plant Environment Interactions," Ludovico Cademartiri, Iowa State University
- "Development of a novel growth unit to cultivate Brachypodium distachyon seedlings in microgravity," Shih-Heng Su, University of Wisconsin

Educating the Next Generation - **Grand Ballroom I-II** - SATURDAY 4pm-5:30pm

**Chair: Dr. Nancy Hall**, NASA Glenn Research Center

- "Layered Uses of 3D Models of Molecular Biology Dynamics Clarify Complex Processes," Victor Cooley, NASA
- "Worms in Space for Outreach on Earth," Nathaniel Szewczyk, University of Nottingham
- "Reliability Modeling & Analysis of Sounding Rocket Components Using Model-Based Systems Engineering," Olivier Meli, Morgan State University
- "Purdue's 'Zero-Gravity Glow Experiment' with a Second Grade Class," Steven Collicott, Purdue University School of Aeronautics and Astronautics
- "Student Design Contests in the NASA Glenn 2.2 Second Drop Tower," John McQuillen, NASA Glenn Research Center

Enabling Technologies IV: New Analytic Techniques - **Seattle** - SATURDAY 4pm-5:30pm

**Chair: Dr. Jeff Smith**, NASA Kennedy Space Center

- "The Advanced Plant Habitat (APH) Facility for Plant and Bioscience Research Studies on the ISS," Stephanie Richards, NASA Kennedy
- "On-Orbit In Vivo Multi-Spectral Fluorescent Imaging Capabilities," Stephanie Richards, NASA Kennedy
- "Development of APH Planting and Germination Protocols," Oscar Monje, NASA Kennedy
- "Toward biotechnology in space: High-throughput instruments for in situ biological research," Fathi Karouia, NASA Ames
- "Microfluidic network design for space-ready Lab-On-a-Chip devices," Daniele Paglialunga, MSU Space Science Center

Fluids Physics IV: Non-Mechanical Flows - **West Seattle, 3rd Floor** - SATURDAY 4pm-5:30pm

**Chair: Dr. Yongsheng Lian**, University of Louisville

- "Electrostatically Forced Faraday Instability - Theory and Experiments," Kevin Ward, University of Florida
- "Numerical Investigation of Nucleate Pool Boiling in Microgravity," Yongsheng Lian, University of Louisville
- "Influence of Gravitational Orientation and Convection on Desiccation Patterns," Samantha McBride, MIT
- "Single-Bubble Boiling on a Small Heater under Earth's and Low Gravity," Boris Khushid, New Jersey Institute of Technology
- "Evaporation Suppression of Film in Pure Binary Mixtures - Application of Heat Pipes," Dipin Pillai, University of Florida
- "Faraday Modes in a Thin Rectangular Channel - Comparison of Microgravity with Ground Experiments," Nevin Brosius, University of Florida

LS Systems VI: Gravity, Microbes and Health - **Bellevue, 3rd Floor** - SATURDAY 4pm-5:30pm

**Chair: Dr. Stephen Chapes**, Kansas State University

- "Biofilm Initiation and Growth of *Pseudomonas aeruginosa* on Various Surfaces in Orbital Space Flight," Paul Todd, Techshot, Inc.
- "Immune Modulation in Normal Human Peripheral Blood Mononuclear Cells," Elvis Okoro, Texas Southern University
- "Transcriptomics, NF- $\kappa$ B pathway, and their potential spaceflight-related health consequences," Honglu Wu, NASA JSC
- "Does p21 Mitigate Stress-Induced Immune Changes Due to Simulated Spaceflight?" Nina Nishiyama, Loma Linda University School of Medicine
- "Analysis of the Antibody Repertoire of the C57BL/6Tac Mouse After Flight Aboard the ISS," Trisha Rettig, Kansas State University

LS Systems VII: Reproduction, Development and Behavior - **Rainier, 3rd Floor** - SATURDAY 4pm-5:30pm  
**Chairs: Drs. Lane Christiansen and Joseph Tash**, University of Kansas Medical Center

- "Flight Implementation of In Vitro Studies of Cryopreserved Human and Bovine Sperm on the ISS," Eric Yarns, University of Kansas
- "The Effects of Simulated Spaceflight Conditions on the Mucin Lining of the Mouse Uterine Tube," Grayson White, East Tennessee State University
- "Development of a Novel Space Flight Plan to Monitor Female Mice Fertility Using Reduced Crew Time," Lane Christenson, University of Kansas
- "Estrous Cyclicity of Mice During Simulated Weightlessness," Eric Moyer, NASA Ames Research Center
- "A Sensitive Period for the Development of Motor Function in Rats: A Microgravity Study," Neeraj Singh, Albany Medical Center
- "Analysis of high-order social interaction of female mice on the International Space Station," Moniece Lowe, NASA Ames

Microgravity Combustion IV: Gaseous Flames - **Grand Ballroom III** - SATURDAY 4pm-5:30pm  
**Chairs: Dr. Fumi Takahashi**, University of Tsukuba; **Dr. Dennis Stocker**, NASA Glenn Research Center

- "Unsteady analysis and an alternative heat flux measurement technique for the Burning Rate Emulator," Akshit Markan, University of Maryland
- "Ground-Based Research Supporting Flame Design," Peter Sunderland, University of Maryland
- "Quantitative Schlieren Measurements in Laminar Jet Diffusion Flames in Microgravity," Fumiaki Takahashi, Case Western Reserve University
- "Theory of First-Stage Ignition Delay in Hydrocarbon NTC Chemistry," Wenkai Liang, Princeton University
- "Imaging strategies for accurate data collection in the ACME CLD Flame experiment," Davide Giassi, Yale University
- "Numerical Simulations of a Co-Flow Methane/Air Flame under Different Gravity Conditions" Claudia-Francisca Lopez-Camara, Univ. of CA - Irvine





## David Urban, NASA Glenn Research Center

Since 1991 Dr. Urban has worked with the Microgravity Combustion Science Branch at the NASA Glenn Research Center becoming the Branch Chief in 1997. Prior to that he held a postdoctoral position at Princeton University having completed his Ph.D. in Mechanical Engineering at UC Berkeley in 1987. His area of specialty is combustion research and spacecraft fire safety. His responsibilities have included managing and leading NASA's flight and ground-based microgravity combustion research program; collaborating in the definition of NASA's spacecraft fire safety research plan; and supervising researchers in spacecraft fire safety and reacting processes in reduced gravity. He has been the project scientist for several space flight experiments and the Principal Investigator for 3 space flight combustion experiments. He is currently the Principal Investigator for the Spacecraft Fire Safety Demonstration Project (Saffire) which is an entirely novel experiment in that it makes use of unmanned cargo vehicles as an experimental platform for hazardous experiments. He has published numerous papers in the areas of soot processes and flame structure in low gravity; material flammability; fire detection; soot and spacecraft fire safety.



## Robert McLean, Texas State University

Bob McLean is originally from Canada. He was born in Toronto, grew up in southwestern Ontario near Detroit, and received his undergraduate degree in microbiology at the University of Guelph in 1978. After working in the food industry around Toronto and western Canada for several years, he did his graduate work at the University of Calgary with JW Costerton from 1982-1986. Bob was first introduced to surface-adherent, bacterial growth (now referred to as biofilms), during his studies in the Costerton lab and has continued this work throughout his professional career. Bob's PhD work involved the study of a biofilm-related kidney stone infection. Following his PhD, Bob returned to central Canada and did a postdoc with Terry Beveridge at Guelph from 1986-1988, where he met his future wife, Martha. In Terry's lab, Bob was introduced to the interaction of bacterial cell surfaces with metal ions and resulting mineral formation in the newly developing field of geomicrobiology. In 1988, Bob began his independent academic career as a research faculty member at Queen's University in Kingston Ontario, where he continued studies on both biofilm-associated urinary infections and bacteria-metal interactions from 1988-1993. During this time, Martha's and Bob's two sons were born. In 1993, Bob and his family moved to central Texas where he had been appointed as an Assistant Professor in the Biology Department at Southwest Texas State University (renamed in 2003 as Texas State University). Bob rose through the academic ranks to full Professor. In 2012, he received the honorary title of Regents' Professor from the Texas State University System. While at Texas State, Bob switched his research program to a more general focus on the biology of biofilm growth, and more recently has expanded to studying the mechanisms of mixed culture interactions. Throughout the years, he has been blessed by the opportunity to interact with a number of outstanding collaborators and students. He currently has published 87 papers, 2 books, 11 book chapters, and has one patent submission. Notable contributions to the field of biofilms include the first description of quorum-signaling in biofilms, the first illustration of the importance of slow-growth genes in biofilm growth, and the first description of biofilm formation in microgravity. This latter study was made possible by an experiment flown on STS-95 in 1998. Bob's research has been supported through the years by a number of grants including NIH, EPA, Air Force, and NASA. He has current grant support from NASA to explore polymicrobial biofilm formation and their control under microgravity. Bob has supervised 27 MS theses, of whom approximately half entered PhD programs, and others entered professional programs such as medical or veterinary school. Several of Bob's former graduate students are now faculty members including three at Research One institutions. He is a member of several journal editorial boards including Applied and Environmental Microbiology, and has served on a number of NIH grant review panels and one NASA review panel. He is very active with the American Society for Microbiology (ASM) and is a former president of the Texas Branch ASM.



## Jack van Loon, VU University of Amsterdam

van Loon started to work in the field of gravity and space related research in 1988 and obtained his PhD at the department of Oral Cell Biology of the Academic Center for Dentistry Amsterdam (ACTA) at VU-University on the subject of bone cell biology and mechanosensing. For his PhD he performed experiments in Shuttle (Spacelab/Biorack) and the unmanned Russian satellite Bion using the Biobox. Later more studies were done in Spacelab and SpaceHab. While working for Bradford Engineering for some years, he initiated the development of the Middeck locker facility BioPack and worked on the development of e.g. the Microgravity Science Glovebox (MSG) and the Life Sciences Glovebox (LSG) as part of the Centrifuge Accommodation Module (CAM) that, very unfortunately, never made it into orbit. Van Loon was co-I and PI of various space flight experiments in biology and education of which the Seeds-in-Space during the Dutch Soyuz TMA-4 Mission, DELTA in 2004. Van Loon coordinated all life sciences and education experiments for that mission. Van Loon also pursues and encourages the application of ground based research facilities such as Random Positioning Machines for microgravity simulation and centrifuges to explore.



## Bill Atwell, The Boeing Company (Retired)

Bill Atwell is an internationally-recognized expert in the field of radiation physics that includes space radiation environments (geomagnetically-trapped Van Allen radiation, solar proton events, and galactic cosmic radiation), radiation effects on humans and onboard electronics/avionics systems, spacecraft and satellite 3-D CAD modeling and shielding analysis, development and use of high-energy particle transport/dose codes, active and passive detectors/dosimetry, and space radiation mission support (late Mercury, Gemini, Apollo, Skylab, ASTP, Space Shuttle, and the International Space Station programs). His career covered 42 years with The Boeing Company, Houston, TX, and he retired as a high-level Boeing Technical Fellow in June 2014. During his career he was a Co-Investigator on the Mir-Shuttle Radiation Analysis Team, the MARIE solid-state radiation instrument on the Mars Odyssey spacecraft, the Human Phantom Torso that flew on STS-91 and ISS Expedition 2, and the ESA/German Space Agency "Matroshka" Phantom Torso experiment. He has mentored MS/PhD students at Colorado State University, University of Southern California, University of Maryland, and Texas A & M University, and he has been serving on the University of Houston-Clear Lake Physics Advisory Board for several years. Bill has been active as an Associate Fellow in the American Institute of Aeronautics and Astronautics (AIAA), Committee on Space Research (COSPAR), the American Society for Gravitational and Space Research (ASGSR) professional societies, and the International Conference on Environmental Systems (ICES) where he has organized and chaired space radiation technical sessions. In addition, he has over 300 scientific and technical publications and presentations. He has an MS and BS from Indiana State University (Major: Physics/Math with an English minor) and did his PhD work in Nuclear Engineering at the University of Florida. Since retiring in 2014, he has been an Advisor on various projects within Boeing/Houston, and with a Science Research Team that has been flying space radiation measurement systems on high-altitude NASA aircraft (DC-8s and ER-2s) at NASA Armstrong Flight Research Center with the goal of characterizing the space radiation environment from (commercial) aircraft altitudes to low earth orbit and beyond.



## Paul Todd, Techshot

Dr. Paul Todd is currently Chief Scientist Emeritus at Techshot, Inc. in Greenville, Indiana. Prior to joining Techshot he was, in chronological order, Lecturer in the Department of Physics, University of California, Professor of Biophysics at Penn State University (20 years) where he also served as chairman of the graduate program in genetics, founding director of Philadelphia's Bioprocessing and Pharmaceutical Research Center (a NASA Center of Excellence in Microgravity Research), Physicist, National Institute of Standards and Technology, Research Professor of Chemical Engineering at the University of Colorado (10 years) where he also served as Associate Director of BioServe Space Technologies (a NASA Center for Space Commercialization), and Chief Scientist, Techshot, Inc. (14 years). He received his education at Bowdoin College, Harvard University, MIT, University of Rochester and University of California. He co-edited eight books or proceedings in the fields of bioprocessing and of space research, including Space Radiation Biology (Academic Press, 1973) and recently (2003) co-authored a textbook in bioprocess engineering, Bioseparations Science and Engineering (Oxford University Press). He served on DOE's Health and Environmental Research Advisory Committee and on the former NAS/NRC Space Applications Board and on the editorial boards of Radiation Research, Cytometry, Journal of Biochemical and Biophysical Methods, and Gravitational and Space Research. He is co-author of 320 scientific papers and co-inventor on 5 issued patents. He has made use of several million dollars in grants and contracts in fields ranging from cancer research (prevention, diagnostics and therapeutics) to the biophysics of cells and organisms in space. Honors have included an Eleanor Roosevelt Cancer Research Fellowship, a shared R & D 100 inventors' award, a shared engineering textbook award, and he has been a NASA Institute for Advanced Concepts (NIAC) Fellow. Dr. Todd received two senior research awards from the American Society for Gravitational and Space Biology, where he also served a term as president.



## John McQuillen, NASA Glenn Research Center

John McQuillen is a senior aerospace engineer in the Fluid Physics and Transport Branch at the NASA Glenn Research Center in Cleveland, Ohio. He has spent the majority of his career in the area of reduced gravity two-phase flows, including studies of the governing flow physics, separator design, boiling and thermal management systems. He was the Principal Investigator for the Intravenous Fluid Generation (IV-GEN) project, and is currently active as the project scientist in the Multiphase Flow Heat Transfer (MFHT) Experiment and the Zero Boil Off Tank (ZBOT) Experiment. Previously, he was the project scientist for the Two Phase Flow Separator Experiment (TPFSE) and the Microheater Array Boiling Experiment (MABE) and a researcher studying Liquid Acquisition Devices in cryogenic tanks. He has authored or co-authored over 94 publications including 22 journal articles. He was the recipient of NASA's Exceptional Achievement Award and the Silver Snoopy Award.



Jonathan Clark, Baylor College of Medicine

Jonathan Clark is an Associate Professor of Neurology and Space Medicine at Baylor College of Medicine, teaches at the Center for Space Medicine (CSM) and is the Space Medicine Advisor for the National Space Biomedical Research Institute (NSBRI). He is a Clinical Assistant Professor in the Department of Preventive Medicine and Community Health at the University of Texas Medical Branch in Galveston and teaches at the UTMB Aerospace Medicine Residency. He is also a Senior Research Scientist at the Florida Institute for Human Machine Cognition (IHMC). Dr. Clark served 26 years on active duty with the U.S. Navy, and qualified as a Naval Flight Officer, Naval Flight Surgeon, Navy Diver, U.S. Army parachutist and Special Forces Military Freefall Parachutist. His assignments including heading a research centrifuge facility, an aeromedical department at a Marine aviation squadron and also the Neurology and Hyperbaric Medicine sections at the Naval Aerospace Medical Institute.



Jane Cook, Corning Museum of Glass

After nearly 4000 years, glasses are still yielding up valuable secrets about their complex atomic structures and solution chemistry, and implications for engineered macroscopic properties for new applications. The glass art community, in Seattle and around the world, is accustomed only to access to glass formulae 100s to 1000s of years old; but lately they've turned their attention to the "exotic" materials born from these new discoveries and materials. Always looking for new avenues for aesthetic expression, artists are seeking for colleagues among scientists and engineers, able to bridge the perceived gap between art and science, to enable exploration of aesthetics born of materials and processes outside the traditional boxes of hand-made glass. In this talk, I'll present the modern understanding of glass, give some exciting examples of glass art-science collaboration at the Corning Museum of Glass, the Seattle area, and elsewhere, and muse (and invite dialog) on the topic of future art glass for, and made in, space.



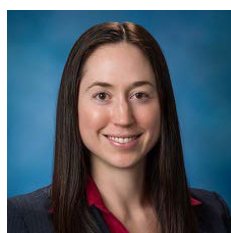
## Raymond Wheeler, NASA

Ray Wheeler is a plant physiologist in NASA's Exploration Research and Technology Office at Kennedy Space Center, FL. Ray received BS in astronomy from Penn State University (1975), and an MS (1978) and Ph.D. (1981) in plant physiology from Utah State University, where he studied plant gravitational responses. Following graduate school, Ray worked as a postdoctoral associate at the University of Wisconsin studying potatoes for bioregenerative life support systems for space exploration. Ray moved to Kennedy Space Center in 1988 where he conducted research on crop responses to light and CO<sub>2</sub>, hydroponic cultivation techniques, and measurements of whole canopy photosynthesis and transpiration. In addition, he has participated in several space flight experiments, including the first demonstration of potato tuber development in -gravity using the Astroculture hardware, and growth of edible salad crops in the Russian Lada and NASA's Veggie plant chambers. Ray currently serves as the lead for the Advanced Life Support research group at Kennedy Space center, and as Vice Chair for the Life Sciences Commission of COSPAR--the International Committee on Space Research.



## Amy Padolf, Fairchild Tropical Botanic Garden

Amy Padolf is the Director of Education at Fairchild Tropical Botanic Garden in Miami, FL where she oversees national and international multidisciplinary environmental science education programs for pre-kindergarten through post graduate studies as well as teacher professional development, adult education and crowd sourcing for conservation research. For nearly 20 years, Ms. Padolf has been developing and implementing STEM education programming with local, national and international audiences. She holds a BA in Rhetoric from the University of Pittsburgh and a MS in Science Education from Duquesne University. Her most recent accomplishments include working to establish the nation's first botany magnet high school in collaboration with Miami-Dade County Public School District; receiving the 2017 Marsh Christian Award for excellence in internationally botanic garden education; presenting at TEDxCoconutGrove on Fairchild's innovative work in partnership and funded by NASA; and participating in the 2017 Brainstorming Innovative Open Source Approaches to Food Production in Space workshop in collaboration with NASA, MIT, Florida Institute of Technology.



## Grace Douglas, NASA Johnson Space Center

Dr. Grace Douglas serves as the lead scientist for NASA's Advanced Food Technology research effort to determine methods, technologies, and requirements to develop a safe, nutritious, and palatable food system that will promote astronaut health during long duration space missions. Her responsibilities include assessing the risk of an inadequate food system to crew based on vehicle design and mission concept and developing the research path that will ensure the food system meets crew health requirements on both commercial and NASA spaceflight vehicles. She holds degrees in food science from Penn State and North Carolina State University, and a Ph.D. in Functional Genomics from North Carolina State University.



## Andrew Schueger, Dept. of Plant Pathology, Univ. of Florida

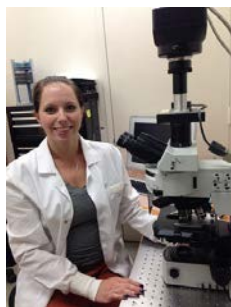
Dr. Andrew C. Schueger received his BS (1979) and MS (1981) degrees from the University of Arizona and his Ph.D. (1991) from the University of Florida studying microbiology and plant pathology. His dissertation studied the effects of temperature and pH on spore attachment of the fungal pathogen, *Fusarium solani* f. sp. *phaseoli*, to roots of mung bean plants grown in hydroponic systems. Dr. Schueger worked for 18 years (1982-2000) at The Land (a hydroponic research and education facility) at Epcot Center, FL developing disease management programs for viral, bacterial, fungal, and nematode diseases of vegetable and agronomic crops. His research interests have closely paralleled NASA's Advanced Life Support (ALS) and Astrobiology programs in which he has published numerous papers on plant-pathogen interactions in semi-closed plant growing systems, survival of terrestrial microorganisms under Martian conditions, and microbial ecology of human missions to Mars. In 1997 Dr. Schueger joined the Dynamac Corporation (a NASA contractor at the Kennedy Space Center, FL specializing in environmental and life sciences) to pursue research on the remote sensing of plant stress, Mars astrobiology, and ALS plant pathology issues. In 2003 Dr. Schueger joined the Dept. of Plant Pathology at the University of Florida as a Research Assistant Professor to continue his Mars astrobiology and ALS research activities.



## Molly Anderson, NASA

Mrs. Anderson earned a B.S. Chemical Engineering from University of Virginia and a Masters of Chemical Engineering from University of Houston (2005). She has participated in and led a wide range of technology development, architecture analysis, and conceptual design. She began her career developing simulations of advanced closed-loop life support system components, and performing trade studies examining the integration of new technologies into systems. She led the Advanced Life Support (ALS) System Integration Modeling and Analysis (SIMA) team and has led technology development projects for life support, EVA, and thermal system components. She has participated in many conceptual design studies many exploration vehicles, including landers, space habitats, surface mission components, and asteroid mission development. She was the life support system lead for the Altair Lunar Lander, and led development of a Deep Space Habitat for the Exploration Mission Systems Office. She is a graduate of the NASA Mid-Level Leadership Program and performed a rotation in the Office of Agency Council Staff at NASA Headquarters. She most recently served as deputy project manager for the GCD Next Generation Life Support project.





## Elizabeth Blaber, NASA Ames Research Center

Dr. Blaber's research interests focus on investigating the influence of mechanical load on stem cell-based tissue regeneration with a focus on the role that the cell cycle and CDKN1a/p21 plays in this process. Dr. Blaber is a new investigator and is an associate and collaborator of Dr. Almeida in the Bone and Cell Signaling Laboratory at NASA Ames Research Center. She is specifically interested in how the cellular and molecular mechanisms of bone regeneration are altered in microgravity as well as the effects of altered load on mesenchymal and hematopoietic stem cell populations and processes during tissue regeneration. To investigate this, Dr. Blaber participated in research on mouse and stem cell experiments flown on the Space Shuttle BSP experiments on STS-131, and STS-133 and, Space Tissue Loss – Stem Cell Regeneration on STS-135. Through these experiments she identified the CDKN1a/p21 molecule as a potential mediator of the inhibition of bone tissue regeneration observed in microgravity. Dr. Blaber continued to investigate the role of CDKN1a/p21 on mechanical unloading induced bone and tissue loss during my NASA Postdoctoral Program Fellowship at Ames and also participated in the US/Russia collaborative Bion-M1 Mouse Biospecimen Sharing Program in Moscow, Russia. Dr. Blaber's contributions to Space Biosciences include articles defining cellular, molecular and tissue mechanisms of bone loss in microgravity as well as the effects of microgravity mechanical unloading on mesenchymal and hematopoietic stem cell proliferation and differentiation during tissue regeneration. Dr. Blaber was recently awarded a NASA Space Biology spaceflight grant to continue investigating the influence of CDKN1a/p21 on somatic stem cell differentiation in space.



## Robert McLean, Texas State University

See Symposium Chairs for biography.



## Layne Carter, NASA Marshall Spaceflight Center

Layne Carter was hired by NASA in 1988 after receiving a B.S. degree in Chemical Engineering from Oklahoma State University. He also received a M.S. degree in Environmental Engineering from the University of Alabama in Huntsville. During his 28 years at NASA, Mr. Carter has worked on the development, design, delivery and operation of the ISS Water Recovery System (WRS), which includes the Water Processor Assembly (WPA) and Urine Processor Assembly (UPA). His current role is the ISS Water Subsystem Manager, for which he is responsible for the ongoing operation of the water management and WRS on ISS. In addition, he is the co-Lead for NASA's Advanced Exploration Systems (AES) Wastewater Processing and Water Management team, which has the responsibility for developing the technologies to be used for NASA's future manned missions.



## Cynthia Collins, Rensselaer Polytechnic Institute

Cynthia Collins joined the Department of Chemical and Biological Engineering at Rensselaer in March 2008 as an assistant professor. Cynthia grew up in Winnipeg, Manitoba, Canada. She obtained her Honours B.Sc. in Chemistry and Biochemistry from the University of Toronto in 2000, and her Ph.D. in Biochemistry and Molecular Biophysics from Caltech in 2006. She subsequently completed a postdoctoral fellowship in Michael Surette's lab at the University of Calgary, where she was the recipient of a prestigious Alberta Ingenuity Post-Doctoral Fellowship. Communities of microorganisms are ubiquitous in nature and play important roles in processes that directly impact human life, from environmental remediation, wastewater treatment and assistance in food digestion to biofouling, biofilm-related corrosion and hospital-acquired infections. The Collins Lab focuses on fundamental and applied aspects of microbial consortia and combines multiscale modeling of biological networks (from gene to protein to organism to community), metabolic and biochemical engineering, synthetic biology and engineered cell-cell communication with the complexities of coexisting communities of bacteria. Applications range from engineering biosensors, to bioprocessing, bioremediation and bio-energy production, and may also include the development of therapeutics that specifically target the balance between good and bad bacteria in the human body.





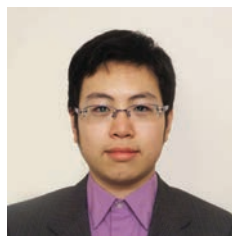
## John McQuillen, NASA Glenn Research Center

See Symposium Chairs for biography.



## Matt Parsek, University of Washington

Dr. Parsek received his BS in biology from the University of Illinois at Champaign-Urbana. He received his PhD from the lab of Ananda Chakrabarty at the University of Illinois at Chicago Medical Center. He did a post-doctoral fellowship at the University of Iowa with Peter Greenberg. He has been a Professor in the Department of Microbiology at the University of Washington since 2011. He is a member of the American Academy of Microbiology and was named a Kavli fellow by the National Academy of Sciences.



## Jing Yan, Princeton University

Dr. Jing Yan obtained his bachelor degree in the College of Chemistry and Molecular Engineering in Peking University. As a graduate student, he studied soft matter physics in the Department of Materials Science and Engineering at University of Illinois at Urbana-Champaign. During his Ph.D., he developed a series of nonequilibrium colloidal materials driven by external electromagnetic fields. He then transitioned to biology, working at Princeton jointly in the Department of Molecular Biology and Mechanical Engineering, on understanding the formation of bacterial biofilms. He is now a Burroughs Wellcome Fellow working at the interface between biology and engineering.



## Stanley Curtis, Fred Hutchinson Cancer Research Center, University of Washington

After graduating from Carleton College (Northfield, MN) in physics (1954), attended the University of Washington (Seattle, WA), where I first became interested in particle tracks, studying momentum-loss in sea-level muons with a Wilson cloud chamber under Seth Neddermeyer, their co-discoverer. After obtaining my Ph.D. (1962), went to Lockheed California Company (1962-63) working on the radiation hazard at SST altitudes, then back to the Northwest at Boeing (1963-65) to work on SST and space radiation hazards, settling at the Lawrence Berkeley Laboratory (1965-1994) in the Radiation Biophysics Group headed by Cornelius Tobias. Worked in groups developing beams for radiotherapy: first, negative pion beams and then, more extensively, heavy ion beams. Was interested in the interface between physics of the tracks and the biology going on to produce an effect. Was in the Radiation Research Society (Physics Counselor, Board of Editors, Program Committees, etc.), also a member of COSPAR, NCRP and other governmental Committees. After retirement at Berkeley (1994), returned to the Northwest to work at the Fred Hutchinson Cancer Research Center on mathematical models of carcinogenesis and was Affiliate and Graduate Professor at the University of Washington in the School of Public Health until my final retirement (2008).



## John Norbury, NASA Langley Research Center

Dr. John W. Norbury is Lead Research Physicist in the Space Radiation Group at NASA Langley Research Center. He holds Bachelor and Master degrees in experimental nuclear physics from the University of Melbourne (Australia) and a Ph.D. in theoretical nuclear physics from the University of Idaho (USA). He has held positions as Professor of Physics and Physics Department Chair at the University of Wisconsin - La Crosse, the University of Wisconsin - Milwaukee and Worcester Polytechnic Institute. From 1998 to 2000 he served as Director of the NASA Wisconsin Space Grant Consortium, and from 2014 to 2016 he served as Scientific Director of the NASA Space Radiation Summer School held at Brookhaven National Laboratory. He has published approximately 100 papers in externally refereed journals and has supervised seven doctoral dissertations. In 2004, he received the Distinguished Undergraduate Teaching Award from the University of Wisconsin - Milwaukee. In 2016, he was awarded the NASA Exceptional Achievement Medal, and in 2017 he was inducted into the University of Idaho Hall of Fame. Dr. Norbury is a Fellow of the Institute of Physics.



## Johanna Mirsch, Technical University of Darmstadt, Germany

Johanna Mirsch is a postdoctoral researcher and project manager in the lab of Prof. M. Löbrich at the Technical University of Darmstadt (Germany). She earned her PhD in radiation biology, where she investigated the biological effects of low doses of ionizing radiation. Human exposure to these low doses is common due to medical diagnostics and natural background radiation, making it critical to understand the biological consequences and risks. To this end, she utilized the exceptional sensitivity of the gamma-H2AX foci assay to analyze the induction and repair of DNA damage from radiation doses as low as a few milligray. She was the first to examine the 3-dimensional DNA damage pattern of single ion traversals in tissue and found these correlated well to the radial dose distribution around the ion path. She was a fellow of the interdisciplinary Graduate College 1657 - Molecular and cellular responses to ionizing radiation - funded by the German Research Foundation (DFG) and was a participant in the 2014 NASA Space Radiation Summer School. For her PhD work, she received the KVSF Young Investigator award from the German Ministry of Education and Research. Her current projects focus on understanding how low-dose radiation differentially affects the repair capacity of cells relative to the higher doses traditionally studied.



## Allan Johnston, NASA Jet Propulsion Laboratory (Retired)

Allan Johnston received B. S. and M. S. degrees in physics from the University of Washington in Seattle. He joined Boeing Aerospace in 1965, specializing in radiation effects in microelectronics, and managed the Microelectronics Research Lab at the Boeing High Technology Center from 1986-1992. In 1992 he joined the NASA Jet Propulsion Lab, retiring in 2013 after supporting numerous NASA space programs, as well as leading research efforts in radiation effects on microelectronics and optoelectronics at JPL. He has published more than 100 papers in refereed journals on radiation effects and reliability in microelectronics, two book chapters, and authored a book, Reliability and Radiation Effects in Compound Semiconductors, published by World Scientific in 2010. He was Technical Chair of the IEEE Nuclear and Space Radiation Effects conference (NSREC) in 1997, and General Chair in 2003. He received the Outstanding Paper Award from the NSREC in 1999. He has given short courses on radiation effects at the NSREC, International Reliability Physics Symposium, and the European RADECS Conferences, and participates in the IEEE Distinguished Lecturer program. He is a Fellow of the IEEE, and is currently chair of the Radiation Effects Committee of the IEEE Nuclear and Plasma Sciences (NPS) Committee that oversees the annual IEEE conference on radiation effects.



## Gary Ruff, NASA Glenn Research Center

Dr. Gary A. Ruff joined NASA John H. Glenn Research Center in 2001 and since then has served as the Spacecraft Fire Safety Project Scientist where he planned and executed projects to develop fire safety technologies for NASA's exploration missions. He currently is the Project Manager for the Spacecraft Fire Safety Demonstration Project and co-investigator for the Spacecraft Fire Experiment (Saffire). He also leads NASA's System Maturation Team for spacecraft fire safety. While at NASA, Dr. Ruff has worked on various research projects in low-gravity combustion including the determination of material flammability limits, droplet combustion, fire suppression, and post-fire cleanup. From 1990 - 2000, Dr. Ruff was a tenured professor of mechanical engineering at Drexel University in Philadelphia. He taught undergraduate and graduate courses in thermodynamics, fluid mechanics, and experimental methods. Prior to 1990, Dr. Ruff held research positions at Arnold Engineering Development Center and NASA Lewis Research Center. Dr. Ruff received his B.S. degree in Aerospace Engineering from The Ohio State University in 1981 and his M.S. in 1985 from the University of Tennessee. He received his Ph.D. in Aerospace Engineering from the University of Michigan in 1990.



## Kristin Morgan, NASA Marshall Space Flight Center

Kristin Morgan is an Engineering Project Manager within the Science and Technology Office at the Marshall Space Flight Center in Huntsville, Alabama. She is the Additive Manufacturing lead for MSFC and is responsible for managing Marshall's plan to certify additively manufactured spaceflight hardware. Kristin has been with NASA since 2007, and has also acted as a strategic advisor to the Space Launch System Engines Office and materials engineer to the MSFC Damage Tolerance Assessment Team. Prior to joining NASA, she served as an engineer at Lockheed Martin Aeronautics in Fort Worth, TX and Lockheed Martin Space Systems in New Orleans, Louisiana. Kristin holds a Master's in Materials Science and Engineering from the University of Florida.



## Craig Kundrot, NASA Headquarters

Dr. Craig Kundrot is the Director of the Space Life and Physical Sciences Research and Applications (SLPSRA) Division in NASA's Human Exploration and Operations Missions Directorate. Craig is an erstwhile structural biologist who studied protein and RNA structure-function relationships using x-crystallography. He joined NASA's biotechnology program in 1998 at Marshall Space Flight Center as a senior scientist before assuming science management positions for biotechnology and materials science. In 2006, he moved to the Human Research Program at NASA's Johnson Space Center where he served as the Deputy Chief Scientist and as the first Mission Scientist for the HRP's Twins Study. He also served as Chair of the Institutional Review Board at NASA Johnson Space Center helping formulate NASA's genetic research policy for astronauts. In 2015, Dr. Kundrot became the Life Sciences Lead in the Office of the Chief Scientist at NASA Headquarters to coordinate life science research in astrobiology, human research, planetary protection and space biology within NASA and with other organizations.



## Fred Turek, Northwestern University

Dr. Fred Turek graduated from Stanford University in Stanford, California in 1973, receiving a PhD in Biological Sciences; he then completed a two-year postdoctoral fellowship at the University of Texas, where he studied in the Department of Zoology before becoming an Assistant Professor at Northwestern University in 1975. He is presently the Director of the Center for Sleep and Circadian Biology and is the Charles E. and Emma H. Professor of Biology in the Department of Neurobiology and Department of Neurology at Northwestern. Dr. Fred Turek is also the author of over 365 articles on sleep and circadian rhythms. Research in Dr. Turek's laboratory is focused on the study of sleep and circadian rhythms, with a special interest in identifying genes and gene networks regulating sleep and circadian rhythms. Recent studies demonstrating that disruption of the circadian rhythms by environmental or genetic perturbations can alter the structure of the microbiota in the gut have led to collaborative work with colleagues at Rush University Medical Center and University of Illinois at Chicago to examine the effects of the space environment on the microbiota of both mice and men. In addition to having research support from NASA, Dr. Turek's research is supported by the DOD (Office of Naval Research, DARPA), NIH and the pharmaceutical industry.



## Gioia Massa, NASA Kennedy Space Center

Gioia Massa is a NASA scientist at Kennedy Space Center working on food production for the International Space Station and future exploration endeavors. She led the science team for the Veggie hardware validation on space station and she heads an interdisciplinary group to study fertilizer and light impacts on nutrition and flavor of Veggie-grown crops. In addition to Veggie she helps with science needs for other space station hardware and works with external PIs to get their science to function on station. She also is involved with education and outreach programs related to plants in space.



## John Charles, NASA Johnson Space Center

John B. Charles, Ph.D., is the Chief Scientist of NASA's Human Research Program (HRP), responsible for the scientific direction of human research and technology development enabling astronauts to go beyond low Earth orbit and eventually to Mars. Previously he was HRP's Associate Manager for International Science and led NASA's space life sciences planning for the joint US/Russian one-year mission on ISS and the Twins Study. Dr. Charles earned his B.S. in biophysics at The Ohio State University and his doctorate in physiology and biophysics at the University of Kentucky. He came to the Johnson Space Center in 1983 a postdoctoral fellow and became a civil servant in 1985. He is co-developer of the fluid-loading countermeasure to help protect Space Shuttle astronauts from fainting during re-entry and landing, and investigated the cardiovascular effects of space flight using ultrasound, re-entry data recording and in-flight lower body negative pressure on Space Shuttle astronauts and on crewmembers of the Russian space station Mir. He coordinated all of the NASA-sponsored biomedical, biological and microgravity science investigations as Mission Scientist for American astronaut missions on Mir, on STS-95, John Glenn's Shuttle flight, and on STS-107, Columbia's last mission in January 2003. He was also the life sciences representative to NASA's human Mars mission planning activities in the 1990s. He is a Fellow of the Aerospace Medical Association and has been a member since 1983. He is also a Full Member of the International Academy of Astronautics (IAA) and co-chaired the 18th IAA "Humans in Space Symposium" in Houston in 2011. He has published 75 scientific papers and space history articles and has received several professional awards, including National Space Club and Foundation Eagle Manned Mission Award (2017), the "Joe Kerwin Award" (2011) and the "Hubertus Strughold Award" (2001) of the Aerospace Medical Association, and the NASA Exceptional Service Medal (2000) and the NASA Exceptional Achievement Medal (2014).



## Richard Boyle, NASA Ames Space Center

Richard Boyle is a Senior Scientist and Head of the Vestibular Biophysics Lab at NASA Ames Research Center in Mountain View, California. He received a B.A. in (bio) psychology from the University of Colorado, Boulder, a M.Sc. in physiology from McGill University, Montréal, Canada, and a Ph.D. in biological sciences from the Scuola Normale Superiore, Pisa, Italy. After receiving his Ph.D., Boyle was awarded a 1-year postdoctoral position at the Consiglio Nazionale della Ricerche (Rome) to conduct muscle spindle research, a 2-year postdoctoral fellowship from the Alexander von Humboldt Stiftung in the Neurology Clinic at the University of Düsseldorf, Germany to study optokinetic and ocular smooth pursuit neural mechanisms, and an individual NIH postdoctoral fellowship in the Departments of Otolaryngology and Neurobiology at Washington University, St. Louis to investigate inner ear morphophysiology. In 1986, he was appointed to the faculty of the Department of Otolaryngology/Head-Neck Surgery at the Oregon Health Sciences University (OHSU) in Portland. Since 1984, he has regularly conducted hair cell studies at the Marine Biological Laboratory, Woods Hole, Massachusetts. In April 2000, he joined the National Research Council and the Space Lifes Research at NASA Ames. He served as the science lead on numerous shuttle missions and the unmaned Russian Foton and Bion missions, serves on numerous scientific committees and boards, and recently accepted the Chief Section Editor for the new section Environmental, Aviation and Space Physiology in *Frontiers in Physiology*. Boyle's research goals are to elucidate the neural mechanisms of sensory transduction of head acceleration, the neural control of posture and equilibrium from reflex to voluntary movements, the neural mechanisms underlying adaptation to altered gravity, and modeling/simulation. His collaborations frequently include physiologists, physicians, mechanical and electrical engineers, and theoretical and mathematical physicists. The research uses functional techniques of electrophysiology and application of natural stimuli, microscopy from light to scanning and transmission electron, mathematical models, and uses preparations from isolated mollusk nervous system to subhuman primates. His previous research continues to be motivate his external collaborations that include: 1) robotic design: to apply a biologically valid model of the inner ear and central nervous vestibular mechanisms to the design of balance and motor control of robotic explorers, thereby enhancing their autonomy, and improving the reliability and quality of acquired scientific data, enhancing their navigation over varying terrains, and allowing access to difficult sites (e.g. ocean caves). 2) Image data fusion: to develop image processing and data fusion techniques on multi-modality image datasets, such as computerized tomography, nuclear medicine study and 4D ultrasound. The goal is to develop a high fidelity model of anatomical subsystems and their physiological function to evaluate the design and efficacy of countermeasures to ensure astronaut health. The research has been funded by NIH, NSF, and NASA continuously from 1984.



## Ulrike Hecht, Access e.V., Aachen, Germany

Ulrike Hecht studied Metallurgical Engineering at the University of Brasov, Romania, and earned her PhD from the RWTH Aachen, Germany. She works as a senior scientist at Access e.V., an independent non-profit Research Center associated with the RWTH Aachen. Research fields and expertise include materials science and engineering with focus on thermodynamics and phase transformation kinetics, microstructure formation and novel materials design. She contributed to joint European Projects on various aspects of solidification in microgravity and hypergravity conditions, being funded by the German Space Agency DLR and the European Space Agency ESA.



## Susan Bloomfield, Texas A&M University

Susan Bloomfield, PhD, currently serves as Associate Dean for Research in the College of Education & Human Development at Texas A&M University. She is also Professor of Kinesiology and an Associate Member of the TAMU Health Science Center Graduate Studies Faculty. The long-standing objective of her laboratory's research is use an integrative physiology approach to integrate interactions of bone with other tissues/systems and how other stressors modulate the bone response to either increased loading (exercise) or decreased loading (immobilization, microgravity). Related lines of inquiry focus on nutritional modifiers of the bone response to exercise (restricted caloric intake and mechanisms related to metabolic hormone disruption) and to simulated microgravity (iron overload contribution to oxidative stress during unloading and/or radiation exposure). She currently serves on two National Academies of Sciences, Engineering and Medicine committees that are advisory to NASA. Dr. Bloomfield is a Fellow of the American College of Sports Medicine and was awarded ACSM's Citation Award in 2016. She was elected Fellow in the National Academy of Kinesiology in 2017.





## Wolfgang Ertmer, Leibniz Universität Hannover, Germany

Academic Education with Degree: 1978

PhD Thesis in Physics: 1985

Habilitation in Physics

Professional Career: 1982–1984

Visiting Scientist at the Joint Institute for Laboratory Astrophysics, Boulder, Colorado (collaborating with John L. Hall)

Since 1994 Professor for Experimental Physics at the Institute for Quantum Optics, Leibniz Universität Hannover

1997 Gottfried Wilhelm Leibniz Award

Since 2009 Dean of the QUEST Leibniz-Forschungsschule

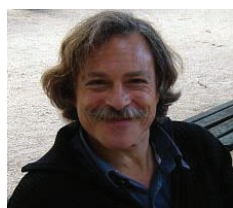
Since 2013 member of the Executive Committee DFG (German Research Foundation)

Since 2013 Chairman Scientific Board of Directors, Laser Zentrum Hannover e.V.



## Paul Ferkul, USRA at NASA Glenn Research Center

Staff Scientist; Universities Space Research Association at NASA Glenn Research Center Project scientist for SoFIE Solid Fuel Combustion Facility for the ISS; Research scientist for the Saffire project; Project scientist and investigator for the BASS and BASS-II projects Ph.D. Fluid and Thermal Science, Case Western Reserve University 1993



## Paul Chaikin, New York University

Paul Chaikin is a Silver Professor of Physics at NYU and co-founder of the Center for Soft Matter Research. He is a condensed matter experimentalist with interests in both soft and hard matter systems. Current research includes: artificial systems that self-replicate and evolve, self-assembly and self-organization, active matter and driven systems, nanolithography with diblock copolymers, photonic non-crystals and low-dimensional conductors and superconductors. He published the graduate-level textbook *Principles of Condensed Matter Physics*, which he coauthored with Professor Tom Lubensky (UPenn), which rapidly assumed iconic status worldwide as the bible of “soft” condensed-matter physics (in the BBC comedy *Keeping Up Appearances*, the textbook was favorite bedtime reading for Hyacinth’s brother, Onslow). Previous positions included professorships in Physics at UCLA, the University of Pennsylvania, and Princeton University where he is the Henry DeWolf Smyth Professor of Physics Emeritus. He has been a consultant at NEC Research, Solvay, MARS, and is a long time consultant at Exxon Research. At Princeton, Paul’s interests expanded to include problems in which Planck’s constant is irrelevant. These include phase transitions of hard spheres, arrays of polystyrene balls, ordering of polymers and diblock copolymers, liquid crystals, and closed-packing of spheres and ellipsoids. In the past two decades, these problems have benefited greatly from the infusion of ideas from traditional condensed-matter physics and field theory. Paul and his students devised experiments of ever-increasing sophistication to study phase transitions in colloidal particles. Eventually, his interest expanded to include all aspects of melting in hard-sphere problems, as well as to close-packing involving spheroids and ellipsoids. These experiments, increasingly sensitive to the unwanted effects of the earth’s gravity, led to experiments run on space shuttles and the International Space Station (ISS) to exploit their micro-gravity environment. He received his B.S. in Physics from Caltech in 1966 and PhD in Physics from the University of Pennsylvania in 1971. He is an elected fellow of the American Physical Society (1984), the Institute of Physics (London) (2004), the American Academy of Arts and Sciences (2003) and a member of the National Academy of Science (2004). He has served on many APS committees including McMillan and Buckley Prizes, Nominating Committee and DCMP Nominating Committee and is the past Chair of the Forum on Outreach and Engaging the Public. Likewise he has been on many NRC and NAS committees including the Solid State Sciences Committee. His honors include: Sloan, Guggenheim and Rothschild-Mayent Fellowships, the 2009 World Technology Award for Materials, and lectureships at Harvard (Loeb), Toronto (Welsh), UC London (Bragg) and Oxford (Hinshelwood) among others.



## Frederick Dryer, Princeton University

Dr. Dryer (BAE'66, Rensselaer Polytechnic Institute) obtained his Ph.D. in Aerospace and Mechanical Sciences at Princeton University (1971) and has been engaged in combustion research at Princeton for more than 50 years. He was a tenured Professor in the Mechanical and Aerospace Engineering Department from 1981 and joined the emeritus faculty and Professional Research Staff (currently, Research Scientist) in July 2013. Along with a number of collaborators, Dr. Dryer continues to be actively engaged in experimental and computational research involving a wide spectrum of topics in fuels property effects relevant to optimizing the fuels/energy conversion interface for ground-based power generation/transportation, and aircraft applications. His fundamental research interests are focused on applications-driven needs for advancing energy resource (carbon) utilization efficiencies, reducing air-pollutant emissions, and mitigating fire safety related hazards associated with gaseous and liquid flammable production and use. Dr. Dryer continues to work on microgravity research topics, particularly those associated with isolated droplet burning experiments and detailed modeling, an interest that began in 1981 through research collaborations involving NASA Glenn (then Lewis Research Center) researchers and Prof. F.A. Williams of the University of California, San Diego. The insights derived through these early collaborations inspired the methodologies utilized in three shuttle missions and (currently) on the International Space Station to develop, experimentally investigate, and numerically analyze microgravity isolated droplet burning phenomena for a wide range of fuels. Dr. Dryer received the 2014 AIAA Propulsion and Combustion award, the Egerton Gold Medal (2012) and a Silver Medal Paper Award (2000) from the International Combustion Institute, and the International Journal of Chemical Kinetics most-referenced-paper award (2007-2011). He is a Fellow member of the Society of Automotive Engineers (2003) and the American Society of Mechanical Engineers (2010), and an Associate Fellow of the American Institute of Aeronautics and Astronautics (2010). He is a former associate editor of Combustion Science and Technology and co-editor of two volumes of the Combustion Symposium proceedings, with over 325 contributions to the archival literature.



## David Urban, NASA Glenn Research Center

See Symposium Chairs for biography.



## Miqin Zhang, University of Washington

Miqin Zhang, Ph.D., is Kyocera Professor in Department of Materials Science and Engineering, professor in the Department of Neurological Surgery, and adjunct professor in the Departments of Radiology, Bioengineering, Orthopedics & Sports Medicine, University of Washington. Dr. Zhang received her Ph.D. in Materials Science and Engineering from University of California at Berkeley in 1999 and joined the University of Washington as an Assistant Professor in 1999, was promoted to Associate Professor in 2005 and to Full Professor in 2008. Dr. Zhang's research focuses on nanomaterials for controlled drug delivery, cancer diagnosis and therapy; biocompatible and biodegradable composite scaffolds for tissue engineering and regenerative medicine; and biosensors for anti-cancer drug screening and toxin detection. She is named in "Pharmacology & Toxicology" as one of "Highly Cited Researchers" by Thomson Reuters in 2014, 2015, and 2016, and has more than 25 issued/pending patents.



## Chris Hinojosa, Emulate

Chris is currently the Director of Discovery at Emulate, a company that creates living products, based on the Organ-chip technology, for understanding how diseases, medicines, chemicals, and foods affect human health. These Organ-Chips — such as lung, liver, intestine, and brain — accurately recreate human biology and disease states by employing engineering principles to recreate the micro-environment experienced by cells in the human body. In his role leading the Discovery team, he works on new applications of the technology and developing the next generation of the Organ-Chips, instrumentation, and analytical tools. He is currently a Principal Investigator on NIH-NCATS Tissue-Chip grant for modifying Emulate's terrestrial instrumentation and Brain-Chip for experiments on the International Space Station. Before Emulate, he was part of the team who pioneered the Organs-on-Chips technology at the Wyss Institute for Biologically Inspired Engineering at Harvard University. There he helped develop an automated instrument for linking ten organ-chips together to create a "human-body-on-a-chip". As an NSF Graduate Research Fellow he conducted research in the physics of fluids on the microscale, microgravity capillary-fluidics, and computational modeling of the microenvironment in microfluidic stem cell cultures.



## Rocky Tuan, University of Pittsburgh

Rocky S. Tuan, PhD, received his BA in 1972 from Berea College (Chemistry) and his PhD in 1977 from the Rockefeller University in New York. His postdoctoral research fellowship was at Harvard Medical School in Boston, first in the Department of Orthopaedic Surgery at the Children's Hospital, and then from 1978 to 1980 in the Developmental Biology Laboratory at the Massachusetts General Hospital. In 1980, Dr. Tuan was appointed as Assistant Professor in the Department of Biology, University of Pennsylvania in Philadelphia, and was promoted to Associate Professor in 1986. In 1988, Dr. Tuan joined Thomas Jefferson University, Philadelphia, to be the Director of Orthopaedic Research and Professor and Vice Chairman in the Department of Orthopaedic Surgery with a joint appointment in the Department of Biochemistry and Molecular Biology. From 1992-1995, Dr. Tuan was the Academic Director of the MD/PhD program at Jefferson, and in 1997, he established the nation's first Cell and Tissue Engineering PhD program at Jefferson, with the mission of training the next generation of "cross-cultural" biomedical scientists committed to regenerative medicine and the development of functional tissue substitutes. In the fall of 2001, Dr. Tuan joined the Intramural Research Program of the National Institute of Arthritis, and Musculoskeletal and Skin Diseases (NIAMS), National Institutes of Health (NIH), as Chief of the newly created Cartilage Biology and Orthopaedics Branch. In 2004, Dr. Tuan received the Marshall Urist Award for Excellence in Tissue Regeneration Research of the Orthopaedic Research Society. In the Fall of 2009, Dr. Tuan was recruited by the University of Pittsburgh School of Medicine to be the Founding Director of the Center for Cellular and Molecular Engineering, and as Arthur J. Rooney, Sr Chair Professor and Executive Vice Chairman of the Department of Orthopaedic Surgery, with a joint appointment as Professor in the Department of Bioengineering. Dr. Tuan is currently Co-Director of the Armed Forces Institute of Regenerative Medicine, a U.S. Department of Defense funded, national, multi-institutional consortium focused on developing translational regenerative therapies for battlefield injuries. Two recent appointments include (1) Associate Director of the McGowan Institute for Regenerative Medicine, and (2) Founding Director of the Center for Military Medicine, both at the University of Pittsburgh. At the University of Pittsburgh, he was appointed Distinguished Professor of Orthopaedic Surgery in 2014, and received the Chancellor's Distinguished Research Award in 2015. In 2016, Dr. Tuan received the Carnegie Science Award in Life Sciences and the Clemson Award from the Society for Biomaterials. Dr. Tuan joined the Chinese University of Hong Kong in 2016 as a Distinguished Visiting Professor, and the Founding Director of the Institute for Tissue Engineering and Regenerative Medicine. Dr. Tuan is also a Trustee in his alma mater, Berea College. A widely cited author of over 450 research papers, Dr. Tuan has lectured extensively, and is currently Editor of the developmental biology journal, BIRTH DEFECTS RESEARCH and Founding Editor of STEM CELL RESEARCH AND THERAPY.





## Siobhan Malany, Sanford Burnham Prebys Medical Discovery Institute/micro-gRx

As Director of Translational Biology at Sanford Burnham Prebys Medical Discovery Institute at Lake Nona (SBP), Dr. Malany's team, working closely with medicinal chemistry and screening automation scientists, focuses on receptor target pharmacology as well as on developing phenotypic cell based models merging human stem cell-derived cell biology, imaging platforms, and transcriptomic approaches for target pathway and therapeutic discovery for cardiometabolic and liver diseases. In 2015, Dr. Malany launched micro-gRx, a company focused on study the effects of microgravity on human muscle myocytes grown on the International Space Station using an automated lab-on-a-chip system as proof of concept for micro-scale modeling of age-related musculoskeletal disease for drug discovery and development. The research is funded by Space Florida Florida-Israel Innovation Program and the Center for Advancement of Science in Space (CASIS). Prior to joining SBP in 2010, Dr. Malany led receptor pharmacology drug discovery efforts at San Diego based companies including Neurocrine Biosciences and Tanabe Mitsubishi Pharma. She received her Ph.D. in physical organic chemistry and enzymology at the University of Iowa and completed a postdoctoral fellowship in pharmacology at the University of California, San Diego prior to extending her studies at the Max-Planck Institute for Brain Research, Frankfurt, Germany as an Alexander von Humboldt Fellow.



## Lowry Curley, AxoSim

J. Lowry Curley, PhD is the CEO of AxoSim. Since its inception, he has driven the vision and implementation for product development and industry adoption of AxoSim's Nerve-on-a-Chip, with the goal of making a significant global impact on healthcare and medicine. Lowry received his PhD at Tulane University in biomedical engineering, focusing on tissue engineering and neuroscience. Following several postdocs, including a stint in Belgium working on neural interfacing technology, Lowry realized the only way to translate research breakthroughs outside of the lab was through commercialization, which drove him to return to New Orleans and begin AxoSim's efforts. AxoSim has been the recipient of numerous small business grants from the NIH, NSF, and CASIS. Although his plans to be an astronaut never quite panned out, he hopes to watch the launch of AxoSim's Nerve-on-a-Chip into space in the near future. He is also a graduate of Clemson University and is enjoying the recent success of his tigers.



## Edward Kelly, University of Washington

Dr. Kelly earned his PhD in Biochemistry from the University of Washington in the laboratory of Dr. Richard Palmiter, developing transgenic and knockout mouse models to study the function of the metal-binding protein metallothionein. Following a postdoctoral fellowship in molecular toxicology at the UW Department of Environmental Health with David Eaton, he ventured into Biotech, managing the Preclinical Bioanalytics group at Targeted Genetics Corporation, evaluating the safety and efficacy of gene therapies for diseases such as cystic fibrosis, rheumatoid arthritis and hemophilias. Upon his return to academia, his research interests have stayed within the realm of preclinical biology. His lab works on developing novel models to study normal human physiology and disease states, with a particular focus on cytochrome P450 enzymes and their role in endobiotic/xenobiotic metabolism. Active areas of research in the Kelly lab include studies on the function of the "orphan" P450 CYP4V2 in the heritable eye disease Bietti's Crystalline Dystrophy and ex vivo modeling of human organ physiology and toxicological responses to drug/xenobiotic challenge. This latter project makes use of "organs on chips" or microphysiological systems (MPS) populated with primary and stem-cell derived cell types to recapitulate two key ADME organs, the liver and kidney. Recent work is extending MPS technologies to model select human diseases as well as how organs respond to the extreme environment of microgravity on the International Space Station. Dr. Kelly holds the position of Associate Professor in the Department of Pharmaceutics, Adjunct Associate Professor in the Department of Environmental and Occupational Health Sciences and also serves as Co-Director of the Pharmaceutical Bioengineering Extension Program.



## Erika Wagner, Blue Origin

Erika serves as Business Development Manager for Blue Origin, a developer of vehicles and technologies to enable human space transportation. Prior to joining Blue Origin, Dr. Wagner worked with the X PRIZE Foundation as Senior Director of Exploration Prize Development and founding Executive Director of the X PRIZE Lab@MIT. Previously, she served at MIT as Science Director and Executive Director of the Mars Gravity Biosatellite Program. Today, she serves on the Boards of the American Society for Gravitational and Space Research and Seattle's Museum of Flight, as well as the National Academies Committee on Biological and Physical Sciences in Space. Her interdisciplinary academic background includes a bachelor's in Biomedical Engineering from Vanderbilt University, a master's in Aeronautics & Astronautics from MIT, and a PhD in Bioastronautics from the Harvard/MIT Division of Health Sciences and Technology.



## Jeff Waksman, NASA Headquarters

Dr. Waksman is a Policy Analyst in NASA's Office of Strategy and Plans. In addition to being a Presidential appointee at NASA, he was a member of the President Elect's transition team, where he helped write the NASA Agency Action Plan for the Trump Administration. Prior to serving at NASA, he worked as a Research Fellow for U.S. Rep. David Schweikert (R-AZ). He also worked as a research staff scientist at IBM's Thomas J. Watson Research Laboratory, where he performed advanced semiconductor research, including quantum computing and heterogeneous integration. He received his PhD in Physics from the University of Wisconsin-Madison, and also has Masters Degrees in Nuclear Engineering and Physics.



## Michael Roberts, CASIS

Dr. Michael Roberts is Deputy Chief Scientist of the Center for the Advancement of Science in Space (CASIS) where he works to imagine and enable science in space for life on Earth utilizing the International Space Station National Lab. Prior to joining CASIS, Michael worked as a microbial ecologist, molecular biologist, group lead, and principal investigator in the NASA Advanced Life Support program at the Kennedy Space Center and conducted flight experiments on Shuttle and ISS focused on bacterial recombination, plant-microbe interactions, and forward osmosis membrane technology for water recovery in microgravity. He has a B.A. from Maryville College, a Ph.D. in microbiology from Wesleyan University, and was a post-doctoral researcher in the Center for Microbial Ecology at Michigan State University and the RIKEN Institute in Wako-shi, Japan.



## Daniel Dumbacher, Purdue University

Daniel Dumbacher is a professor of Engineering Practice, School of Aeronautics and Astronautics at Purdue University. At Purdue, Mr. Dumbacher specializes in program and project management, complex, state-of-the-art systems engineering, and propulsion and power systems engineering. He has been instrumental in the development of the Purdue Systems Collaboratory, an effort to integrate better the engineering disciplines with business, political science, communications, and philosophy. Mr. Dumbacher began his career at NASA in 1981 where he served in numerous engineering and management roles for a wide variety of missions. Prior to Purdue, Mr. Dumbacher served as deputy associate administrator in the Exploration Systems Development Division, for the Human Exploration and Operations Mission Directorate at NASA Headquarters. Prior to this, he served as director of the Engineering Directorate at NASA's Marshall Space Flight Center, leading 1,400 civil service and 1,200 contractor employees supporting the Space Shuttle propulsion elements, Ares I and Ares V launch vehicle development, earth science payloads, planetary science payloads, lunar science payloads, International Space Station global science operations, International Space Station environmental and life support activities. He has been awarded NASA's Silver Snoopy Award, the NASA Distinguished Service Medal and the Presidential Rank Award for Meritorious service, and Purdue's W. A. Gustafson Outstanding Teacher Award, among others. He earned his M.B.A. from the University of Alabama, and completed the Senior Managers in Government study program at Harvard University. Mr. Dumbacher has authored several publications and given numerous presentations, in addition to offering Congressional testimony. He currently serves as co-chair of an ad hoc committee at National Academies of Sciences, Engineering and Medicine, to do a midterm assessment of implementation of the Decadal Survey on Life and Physical Sciences Research at NASA.



## Benjamin Roberts, Moon Express

Ben Roberts is Vice President of Washington Operations for Moon Express. From March 2015 until March 2017, he was the Office of Science and Technology Policy's (OSTP) Assistant Director for Civil and Commercial Space. He came to OSTP from the Office of Management and Budget (OMB), where he served as a program examiner in the Commerce and Science/Space Branches, and as a Special Assistant in the OMB Director's Office. Prior to joining the Executive Office of the President, Ben worked as a Deputy Attorney General for the State of Hawaii and as a strategy and operations consultant for Deloitte Consulting in northern California. He holds a B.A. in Economics from Carleton College, a J.D. from the University of Michigan Law School, and a M.P.P. in Science and Technology Policy from the Harvard Kennedy School of Government.

- (IP-1)** Mechanisms for Plant Adaptation to Spaceflight Stresses through the Unfolded Protein Response, Federica Brandizzi, MSU-DOE Plant Research Laboratory
- (IP-2)** Towards identification of vacuole-amyloplasts association that may be important gravity perception., Carla Brillada, North Carolina State University
- (IP-3)** Microgravity Plate Reader on the International Space Station, Carl Carruthers, NanoRacks, LLC
- (IP-4)** Forces Associated with SpaceX Launch do not Impact Bone Healing but Unloading Inhibits Bone Regenera, Jesse Lynch, USACEHR
- (IP-5)** Purdue's "Zero-Gravity Glow Experiment" with a Second Grade Class, Steven Collicott, Purdue University School of Aeronautics and Astronautics
- (IP-6)** NASA HUNCH Program, Nancy Hall, NASA Glenn Research Center
- (IP-7)** Student Design Contests in the NASA Glenn 2.2 Second Drop Tower, Nancy Hall, NASA Glenn Research Center
- (IP-8)** Teachers in Space: High Altitude Balloon Mission Payload Process Flow, Elizabeth Kennick, Teachers in Space, Inc.
- (IP-9)** Comparative transcriptomics in spaceflight studies indicate changes in cell wall organization, John Kiss, UNCG
- (IP-10)** NASA AMES Institutional Scientific Collection (ISC), Danielle Lopez, Wyle/NASA
- (IP-11)** Retinal oxidative damage in low-dose radiated and hindlimb unloaded mice, Xiao Wen Mao, Loma Linda University
- (IP-12)** Science Capabilities of the Light Microscopy Module (LMM), ISS Microgravity Microscope, William Meyer, USRA at NASA Glenn Research Center
- (IP-13)** The Rules of Gene Mutation in Antibody Encoding Genes in Space Environment and Its Payload for the ISS Space Flight, Mary Murphy, NanoRacks
- (IP-14)** BRIC-LED: An Expansion of Research Capability for Petri Dish Science on ISS., Stephanie Richards, Kennedy Space Center
- (IP-15)** Planetary Protection in Service to Astrobiology, Earth Safety, and Future Development of Outer Space, John Rummel, SETI Institute
- (IP-16)** Engineering Rheology of Electrolytes for Microbial Electrochemical Systems in Space, Rajesh Sani, South Dakota School of Mines and Technology
- (IP-17)** Hypergravity alters antimicrobial resistance in bacteria and haloarchaea, Rebecca Thombre, Modern College, S.P.Pune University
- (IP-18)** ATP, Cell Metabolism, and Induced Gravitational Strain in Rotating, Orbiting, Earthbound Bodies, Steve Thorne, Cellll.org
- (IP-19)** Response of Arabidopsis thaliana Seeds to High-LET Titanium Ions, Presenter: Jeffrey Richards, NASA/KSC
- (IP-20)** Transcriptomic Changes in Arabidopsis thaliana Seedlings Exposed to Simulated Galactic Cosmic Rays, Presenter: Stephanie Richards, Kennedy Space Center
- (IP-21)** Myogenic differentiation is accelerated by hypergravity culture through epigenetic regulations, Takeshi Imura, Hiroshima University
- (IP-22)** Simulated microgravity culture increases the neuroprotective potential of mesenchymal stem cells, Takeshi Imura, Hiroshima University
- (IP-23)** Estimation of the adaptation in the properties of rat soleus muscle to stay on the Mars and the Mars, Hisashi Kato, Doshisha University

- (SP-1)** Acoustic microfluidic mixing for remote sample preparation, Daniel Allen, University of Louisville
- (SP-2)** A novel method to determine accommodation coefficients of cryogenic propellants, Kishan Bellur, Michigan Technological University
- (SP-3)** Faraday Modes in a Thin Rectangular Channel – Comparison of Microgravity with Ground Experiments, Nevin Brosius, University of Florida
- (SP-4)** Characterizing the Effects of Radiation on Muscle Cells, Lori Caldwell, Utah State University
- (SP-5)** Role of CDKN1a/p21 in Mouse Bone Turnover and Aging, Margareth Cheng-Campbell, Blue Marble Space at NASA Ames
- (SP-6)** Growth and biofilm formation of *Penicillium chrysogenum* in simulated microgravity, Marta Cortesão, Institute of Aerospace Medicine, German Aerospace Center (DLR)
- (SP-7)** A Microfluidics-based Approach to study Cancer Cell Migration in Microgravity, Atul Dhall, SUNY Polytechnic Institute
- (SP-8)** Towards a Microgravity-based Model for Studying Ovarian Cancer Invasion, Timothy Masiello, SUNY Polytechnic Institute
- (SP-9)** Some aspects of HSF2 and HSF4 in differentiation of skeletal muscle cell, Risa Fujimoto, Toyohashi SOZO University
- (SP-10)** Effect of Fish Oil and Curcumin Supplementation on Muscle Cross Sectional Area, Anabolic Signaling, Dylan Holly, Texas A&M University
- (SP-11)** Effect of EUK-134 on nNOS translocation and membrane repair proteins in unloaded skeletal muscle, Mariana Janini Gomes, Texas A&M University
- (SP-12)** Directed assembly of Janus microparticles by controlling the polarity of solvent, Seong-Geun Jeong, Chungnam National University
- (SP-13)** Excessive Bone Marrow Adiposity Does Not Exacerbate Disuse Induced Bone Loss in Male ob/ob Mice, Jessica Keune, Oregon State University
- (SP-14)** Knee and Hip Joint Damage from Reduced Weight-Bearing and/or Spaceflight Radiation, Andy Kwok, Wake Forest School of Medicine
- (SP-15)** Heat Transfer Analysis Within Non-Thermally Thin PMMA Burned in a Narrow Channel Apparatus, Nicholas Lage, San Diego State University
- (SP-16)** Biomechanical Analysis Tools & Methodologies for the Development of Spaceflight Countermeasures, Kaitlin Lostroschio
- (SP-17)** Analysis of high-order social interaction of female mice on the International Space Station, Moniece Lowe, NASA Ames
- (SP-18)** Mouse Digit Tip Regeneration is Inhibited by Mechanical Unloading, Connor Dolan, Texas A&M University
- (SP-19)** Microgravity Effects on Chronoamperometric Ammonia Oxidation at Platinum Nanoparticles on Modified M, Camila Morales-Navas, University of Puerto Rico Rio Piedras campus
- (SP-20)** Mining the GeneLab Data System to Identify Common Responses of Bacteria Exposed to Spaceflight, Michael Morrison, University of Florida
- (SP-21)** Informing rodent behavior in space: Gene Expression and Hyper-Emotionality Following Prenatal Stress, Eric Moyer, NASA Ames Research Center
- (SP-22)** Nutritional Countermeasure to prevent Spaceflight-induced Bone Loss, Ons M'Saad, SLSTP, Yale University
- (SP-23)** Profiles of linear ubiquitin assembly complex in skeletal muscle, Kodai Nakamura, Toyohashi SOZO University
- (SP-24)** Geomicrobial Biofilms and the Weathering of Basalt under Different Gravity Conditions, Natasha Nicholson, University of Edinburgh
- (SP-25)** Effects of MnSOD treatment on the properties of rat soleus during gravitational unloading, Yusaku Ozaki, Doshisha University
- (SP-26)** Analysis of the Antibody Repertoire of the C57BL/6Tac Mouse After Flight Aboard the ISS, Trisha Rettig, Kansas State University

- (SP-27)** Inter-operator Reliability Assessment of Optic Nerve Tortuosity in Long-duration Flight Astronauts, Jesse Rohr, University of Idaho
- (SP-28)** Simulated microgravity impedes CMV viral expansion in infected Kasumi-3 myeloid progenitor cells., Bridgette Rooney, University of Houston and NASA/JSC
- (SP-29)** Developmental Research in Space: Predicting Adult Neurobehavioral Phenotypes via Metabolomic Imaging, Julia Schorn, OSSl
- (SP-30)** Fabrication of multicompartmental particles with geometrical and chemical anisotropy, Gyurak Shim, Chungnam National University
- (SP-31)** Positive Impact of 70 Days of Low-Dose Rate Radiation on Lean Mass and Total Body BMD in Older Mice, Alexandra Slavinsky, Texas A&M University
- (SP-32)** Characterizing a Novel ROS Gene Identified from Spaceflight Experiments, Natasha Sng, University of Florida
- (SP-33)** Effect of Temperature on EHD Conduction Pumping for use in Future Aerospace Thermal Control Systems, Michal Talmor, Worcester Polytechnic Institute
- (SP-34)** Role of Mitochondrial Oxidative Stress in Spaceflight-Induced Tissue Degeneration, Samantha Torres, Blue Marble Space Institute of Science
- (SP-35)** Behavioral Adaptations of Female Mice on the International Space Station, Ian Strieter, OSSl
- (SP-36)** Skeletal responses to long-duration simulated microgravity in rats, Julia Adams, Space Life Sciences Training Program- KBR Wyle
- (SP-37)** Effects of 2G on gene expression of stress-related hormones in rat placenta, Sophie Benson, Harvard University
- (SP-38)** Droplet Combustion Analysis via Computer Vision, Ramya Bhaskar, University of California at Davis
- (SP-39)** Effects of Spaceflight on Immunoglobulin Variable Regions of Unchallenged Mice, Bailey Bye, Kansas State University
- (SP-40)** Using Genetic Analysis of *S. cerevisiae* in the Stratosphere to Predict Effects of Deep Space Travel, Tristan Caro, University of California at Berkeley
- (SP-41)** MicroStrat: Examining the effects of upper atmosphere conditions on *Paenibacillus xerothermodurans* balloon-launched across the continental United States during the 2017 solar eclipse, Tristan Caro, University of California at Berkeley
- (SP-42)** BioSentinel: Improving desiccation tolerance of yeast biosensors for deep-space missions, Sawan Dalal, Space Life Sciences Training Program, NASA Ames Research Center; University of Houston
- (SP-43)** The Motorbar - A Small Radius Centrifuge Enabling Gymnast Astronauts, Daniel Gove, US Gymnastics University
- (SP-44)** Assessing the ability of a microgravity environment to promote the transfer of antibiotic resistance, Tristan Grams, Carthage College, Jet Propulsion Laboratory
- (SP-45)** Aerial Vehicles to Detect Plume Material Associated with Habitable Areas in Extreme Environments, Onalli Gunasekara, NASA
- (SP-46)** Analysis of Early Response Genes in Arabidopsis Gravitropism, Ava Heller, Ohio University
- (SP-47)** Age Differences in Skeletal Muscle Capillary Responses to Unweighting and Recovery, Noah Ichite, Marshall University
- (SP-48)** Characterizing the effects of chronic 2G centrifugation on the rat skeletal system, Aimee Johnson, Space Life Sciences Training Program
- (SP-49)** The Effects of Mechanical Unloading on Bone and Cartilage of p21 Knockout Mice, Shiyin Lim, Blue Marble Space at NASA Ames; Santa Clara University
- (SP-50)** Characterizing Plant Gravity Perception Systems on the ISS: Ground Data, Maddie Meyer, Ohio Wesleyan University
- (SP-51)** The Transcriptional Response of Diverse *S. cerevisiae* Strains to Simulated Microgravity, Lily Neff, Wesley College

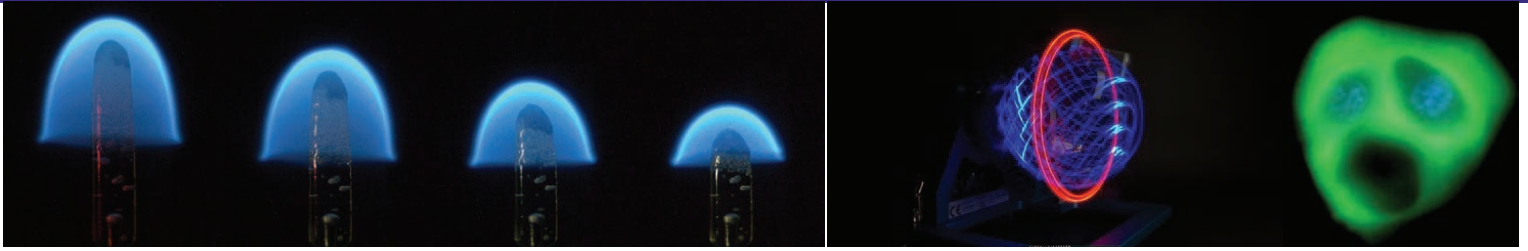
- (SP-52)** Ground Testing of Biofilm Formation on Spaceflight-Relevant Materials, Zeena Nisar, BioServe Space Technologies, University of Colorado Boulder
- (SP-53)** Quantitative Analysis of Biofilm of *Pseudomonas aeruginosa* Strains Starved in Water, Miranda Poore, Bluefield State College
- (SP-54)** p21-dependent Mediation of Cellular Senescence in Bone Marrow Stem Cells, Esther Putman, Space Life Sciences Training Program, NASA Ames
- (SP-55)** Network Inference Analysis of Spaceflight Omics Datasets, Maya Ramachandran, NASA Ames Research Center
- (SP-56)** Reactive oxygen species (ROS) and flavonols modulate the root gravitropic response, Elizabeth Sarkel, Wake Forest University
- (SP-57)** Automated Method to Quantify 3D Geometric Alterations of the Optic Nerve and Sheath in Astronauts, Austin Sass, University of Idaho
- (SP-58)** Identification of Fungal Colonies on Ground Control and Flight Veggie Plant Pillows, Jessica Scotten, NASA
- (SP-59)** The Effects of CDKN1a/p21 on Oxidative Stress and Mitochondrial Function During Spaceflight, Olivia Stimpel, Blue Marble Space at NASA Ames
- (SP-60)** Identification of Novel Desiccation-Tolerant *S. cerevisiae* Strains for Deep Space Biosensors, Sofia Tieze, Haverford College, PA Space Grant Consortium, NASA ARC
- (SP-61)** The Role of Nuclear Cytoskeleton in the Osteocytic Response to Simulated Weightlessness, Hallie Touchstone, Boise State University
- (SP-62)** Investigating the Fitness of an Exoelectrogenic Microorganism Under Simulated Microgravity Condition, Joseph Vlastos, KBRWiley
- (SP-63)** Physical Activity – A Countermeasure Against Distress During 30-days of Isolation?, Jan Weber, German Sport University Cologne
- (SP-64)** The Canopy Near-Infrared Observing Project: NanoSatellites and Forestry, Jeremiah Putman, Carthage College CaNOP CubeSat Team
- (SP-65)** Telomere Length Measure in Cells Exposed to Unloading in Microgravity: Direct Nanopore Sequencing, Kristin Ma, NASA Interns



- (PC-1)** 3D-printed Objects with Capillary Flow Channels and Their Diving Performance in Microgravity, Sang-Hyon, Grafton High School
- (PC-2)** Capillary Phenomena in Drop Tower: Effects of Various Throat Structures on Abrupt Expansion, Kotaro Kojima, Kei Kojima, Broadway Creek Homeschool Academy
- (PC-3)** Hydrophilicity Impact on Micro-Gravity Underwater Travel, Xiaoge Zhang, Liam Squire, and Zichao Hu, St.Vincent-St. Mary High School
- (PC-4)** Hydrophilic Coating and Increased Contact Length Submerges Floating Object in Microgravity, Morgan Smith and Abigail Amonett, Saint Ursula Academy
- (PC-5)** Manipulation of Capillary Channels Promises Control of Fluid Velocity in Microgravity., Brooke Heerdegen, St. Ursula Academy
- (PC-6)** The effect of triangular cavities on capillary action in microgravity, Phoebe Wall, The Overlake School
- (PC-7)** Effect Of Angle On Upwards Capillary Flow In A Microgavity Environment, Austin Susa, Gates Chili High School
- (PC-8)** Testing Roughness' Effect on Submerged Mahogany Blocks in Microgravity, Adam Dionne, Kevin Feeny, Ian Washburn, and John Lawrence, Sturgis Charter Public School West
- (PC-9)** The Effect of Microgravity and Tardigrades on Ethanol Production of Yeast, Depeng Kong and Rebecca McCoy, Carmel Christian School
- (PC-10)** The Effect of Microgravity on the Magnetic Qualities of Magnetorheological Fluids over Time, Jieun Lee and Ashley Villanueva, Carmell Christian School
- (PC-11)** Analysis of Microgravity Effects on Curved and Rectangular Channels, Kevin Cheng, Canyon Crest Academy
- (PC-12)** Quantitative Analysis of Biofilm of Pseudomonas aeruginosa Strains Starved in Water, Katelynne Berland, Grafton High School
- (PC-13)** DIVER Microgravity Challenge - Team Hydrodynamics, Katelynne Berland, Grafton High School
- (PC-14)** The Effects of BAM-FX Plant Nutrient Solution on Plant Growth in Microgravity Experiment, Shiva Balachander and Athena Chang, Valley Christian High School
- (PC-15)** The Effects of an Electric Field on Plant Growth in Microgravity Experiment, Alexander Vu and Shane Grover, Valley Christian High School
- (PC-16)** Prevention of Biofilm Formation in Microgravity Using an Antimicrobial Copper Paint Experiment, Alexander Vu and Shane Grover, Valley Christian High School
- (PC-17)** Lactococcus Fermentation in Microgravity Experiment, Hunter Liu and Meena Rakasi, Valley Christian High School
- (PC-18)** The Efficacy of Sharklet Material in Preventing Growth of Escherichia Coli in Microgravity, Zachary Shah and Michelle Tang, Valley Christian High School
- (PC-19)** The Effects of Microgravity on the Electrochemical Characteristics and Power Output of a Microbial Fuel Cell Experiment, Mihir Kasmalkar and Vittal Thirumalai, Valley Christian High School
- (PC-20)** Water Crystallization in Microgravity Experiment, Mihir Kasmalkar and Vittal Thirumalai, Valley Christian High School
- (PC-21)** The Effects of Microgravity on Brine Shrimp Experiment, Allie Restani and Jackson Conte, Valley Christian High School
- (PC-22)** Pumping Ferrofluid in Microgravity Experiment, Allie Restani and Jackson Conte, Valley Christian High School
- (PC-23)** Observing Background Radiation and Magnetic Fields in Microgravity, Allie Restani and Jackson Conte, Valley Christian High School
- (PC-24)** Low Cost Hitch Hiker's Guide to the ISS in under 9 months, Andy Nadir, Valley Christian High School
- (PC-25)** ISS Program Special Development Projects, Andy Nadir, Valley Christian High School
- (PC-26)** Copper Crystalization Experiment, Grace Kirkpatrick, Minnehaha Academy



# ASGSR COMPETITIONS



## KEN SOUZA MEMORIAL STUDENT SPACEFLIGHT RESEARCH COMPETITION

The Ken Souza Memorial Student Spaceflight Research Competition honors the memory of our long-time friend and leader by encouraging the next generation of student investigators to develop their own ideas for the future of gravitational research. Student members of ASGSR, including high school, undergraduate and graduate students, developed creative research proposals in the fields of space life and physical sciences, pairing their experiment with a public outreach plan to share the excitement of the field with others.

The award announcement for the 2017 winning proposal will be made at the ASGSR annual meeting in Seattle, Washington on the evening of October 28, 2017. The top proposal will receive a \$1,000 grant to develop their ideas, and a free spaceflight for their science on Blue Origin's New Shepard rocket, which is supported through the Program.

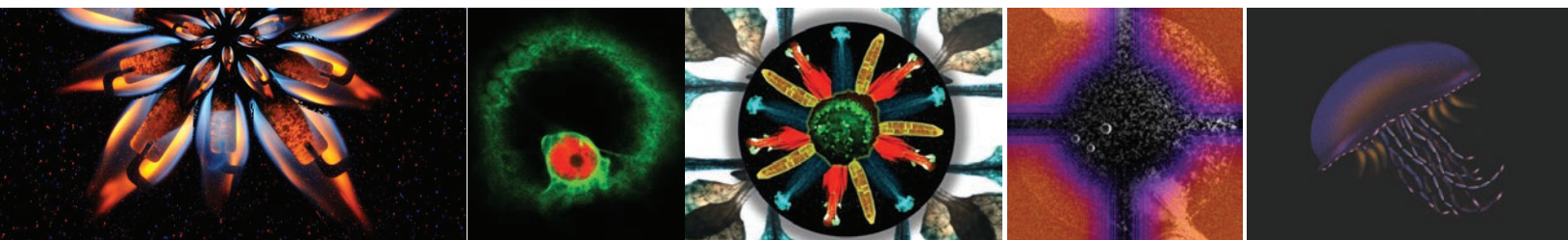
## ASGSR ART COMPETITION

Eligible entries to the competition include (but are not limited to): images (photographs or computer-generated), paintings, drawings, or sketches of gravitational and space research phenomena. Rearrangement, assembly, or other creative mixing of images into an art-form is appropriate and encouraged. Some examples of art are shown above.

Entries will be displayed during the conference and a democratic vote will be taken to determine the winners. Awards will be given for both Artistic Merit and Technical Merit categories and presented on October 28th, 2017.

## DIVING INTO EXPERIMENTAL RESEARCH MICROGRAVITY CHALLENGE - "DIVER"

The NASA Glenn 2.2 Second Drop Tower is one of two drop towers located at the NASA site in Brook Park, Ohio. The tower, which began life as a 100-foot high fuel distillation tower, dangles over a bluff at the Glenn Research Center. The tower has been used for over 50 years by researchers from around the world to study the effects of microgravity on physical phenomena such as combustion and fluid dynamics, and to develop new technology for future space missions. Today it is also actively used by student scientists. This past year, the DIVER program challenged student teams of grade 9-12 to design and build diving objects that will submerge in water as far as possible when exposed to microgravity in NASA's 2.2 Second Drop Tower. The experiments were put in vessels of water and dropped 24 meters (79 feet), during which they will 2.2 seconds of apparent near weightlessness, i.e., microgravity. The students who participated in this program will present their results on Saturday, October 28, 2017 during the High School Student Poster Session. Please come by and listen to the students share their interesting results. For future student drop tower competitions, check out <https://spaceflightsystems.grc.nasa.gov/education-outreach/>



# ASGSR STANDING COMMITTEES

All members are invited to attend the committee meetings being held during the Annual Meeting and are encouraged to commit to continued involvement in the committee activities throughout the year. The committees have direct interaction with the board and can make a difference in the success of the society.

## JOURNAL COMMITTEE

Chair: Dr. Jamie Foster, University of Florida

The Journal Committee prepares and solicits articles relevant to ASGSR interests for ASGSR publications and other journals, including international publications, as well as providing technical reviewers upon request. The journal committee supports outreach activities that promote the advancement of gravitational and space.

At minimum, the Journal Committee should annually:

- Solicit input and assemble the articles for ASGSR publications, including the ASGSR refereed journal.
- Provide an editor(s) for ASGSR publications.
- Promote the Society's publications, including providing access to the publications for Society members through the website.
- Provide guidance with regards to the evolution of ASGSR publications.
- Facilitate the promotion of ASGSR authored articles to the general public and lay press.
- Provide input for the ASGSR newsletter and website.

## EDUCATION AND OUTREACH COMMITTEE

Chair: Dr. Gioia Massa, NASA Kennedy Space Center

If creating educational opportunities for emerging scientists is your interest, consider joining this committee. The Education and Outreach Committee promotes and conducts education activities (student poster and design competitions) and can develop specific projects to increase knowledge and awareness of gravitational space and research throughout ASGSR sponsored public and professional forums. Annually, ASGSR supports the Graduate and Undergraduate Student Poster Competition at the annual meeting. This committee would be responsible for coordination and administration of the competition.

At minimum, the Education and Outreach Committee should annually:

- Coordinate participation in the ASGSR student poster competition including promoting event and recruiting student competitors.
- Organize and select judges for the ASGSR student poster competition. The student poster competition includes cash awards that are pre-determined annually.
- Update slide sets on ASGSR Web site.
- Develop and coordinate outreach event(s) for the annual meeting. (e.g., high school participation)

## EXTERNAL AFFAIRS COMMITTEE

Chair: Ms. Cindy Martin-Brennan, ASGSR

The External Affairs committee is responsible for organizing the ASGSR's involvement with key policy makers and other professional organizations that promote ASGSR's positions and key issues. The committee, with coordination by the ASGSR board and executive director, develops key messaging for the society. The messaging can be short-term and long-term (i.e., strategic). This committee provides assistance in updating and publishing educational materials used for policy makers and will coordinate with other organizations (e.g., AIAA) to establish cooperation, keeping in mind future plans of jointly held sessions and workshops at ASGSR conferences. This committee will also be active in inviting state and local ASGSR members to key meetings.

At minimum, the External Affairs Committee should annually:

- Prepare and organize ASGSR positions and key issues with coordination and approval by the ASGSR board and executive director.
- Coordinate development of position papers (also a role for the Communications Committee).
- Facilitate collaboration with other organizations.
- Coordinate appropriate activities with ASGSR local, regional, and student members.

# ASGSR STANDING COMMITTEES

## MEETINGS AND WORKSHOPS COMMITTEE

Chair: Dr. David Urban, NASA Glenn Research Center

Do you have new ideas for workshops, sessions or symposiums for the 2017 meeting? If so, we encourage you to participate with the meetings and workshops committee. The Meetings and Workshops Committee is responsible for assisting the conference chair in organizing technical sessions for the ASGSR annual meeting. The ASGSR past president serves as the Program Chair for the Annual Meeting. Each year, this committee will work with Program Chair to identify the technical program. The committee will also work with the ASGSR board of governors to identify candidate geographic locations for the annual meeting. The committee also identifies other venues for ASGSR technical participation, such as the AIAA Aerospace Sciences Meeting (ASM), ELGRA, and ISGP. If other venues are identified, the committee submits a short proposal to the ASGSR board of directors, and executive director for approval, especially if there is an anticipated expenditure of funds. The committee will coordinate with other conference committees for joint sponsored conferences, co-located meetings, and workshops.

At minimum, the Meetings and Workshops Committee should annually:

- Assist the Program Chair in organizing technical sessions for the ASGSR annual meeting
- Seek and coordinate joint venue activities at other conferences (e.g., ASM, ELGRA, ISGP) that promote gravitational and space research.

## MEMBERSHIP/COMMUNICATIONS COMMITTEE

Chair: Dr. Kevin Sato, KBRWyle, NASA Ames Research Center

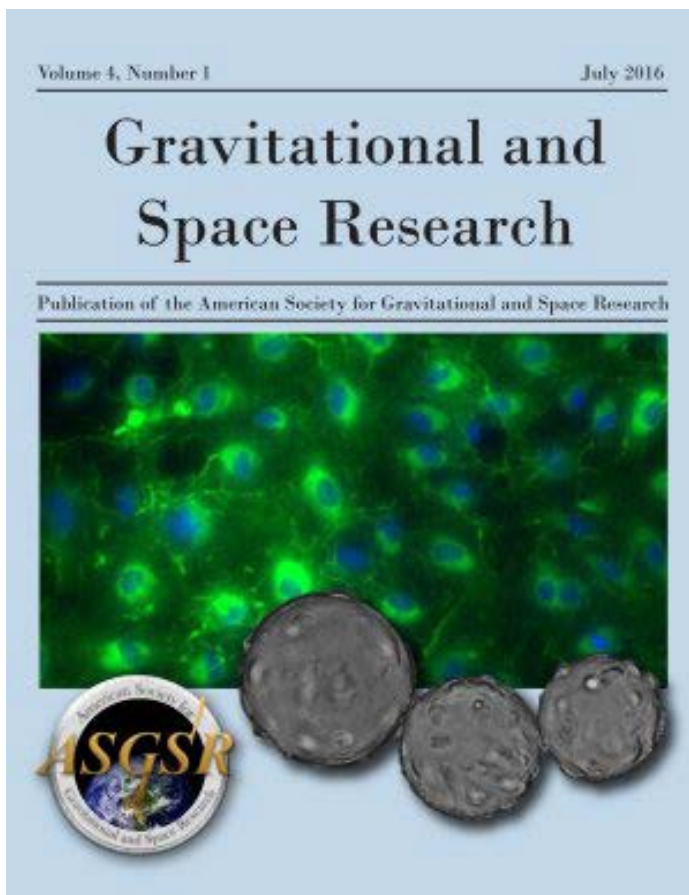
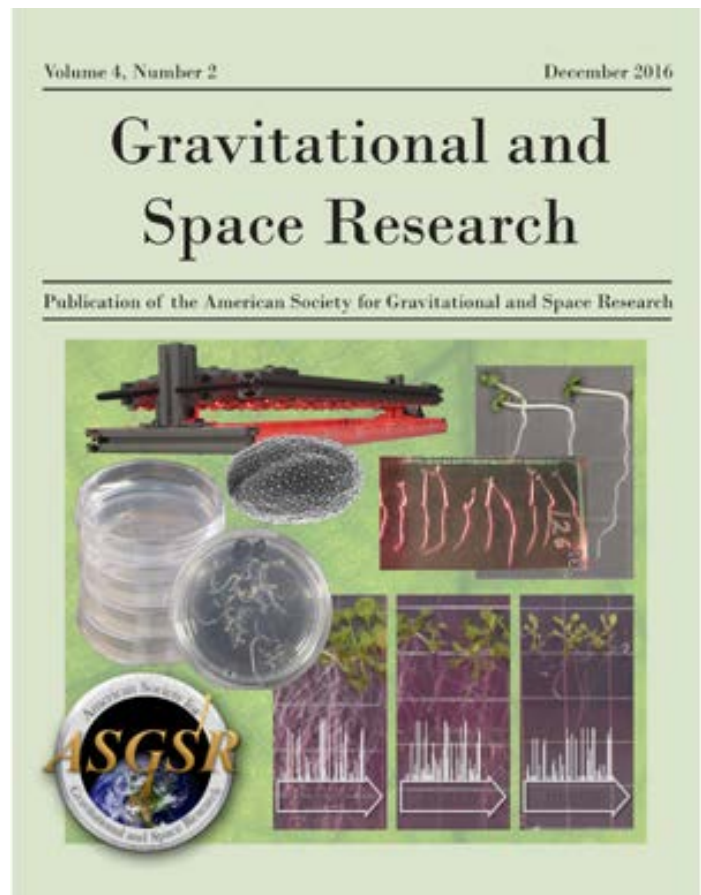
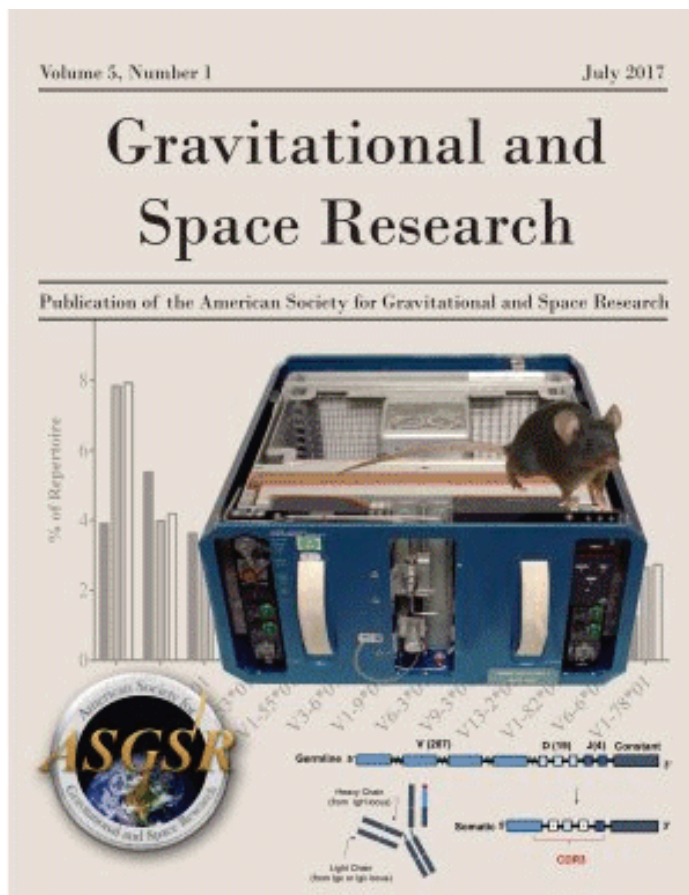
The Membership/Communications Committee recruits qualified new individuals who wish to promote gravitational and space biology and related technology development. Overall, the committee works to enhance ASGSR membership, working closely with the executive administrator, who maintains the membership database. The committee will work to keep balanced membership across organizations and fields of expertise and ensure that current members remain sufficiently active in ASGSR. In addition to planning recruitment of new members, the committee will develop and implement a plan to re-engage past members.

Furthermore, the committee supports outreach activities that promote the advancement of gravitational and space biology. The committee also assists in the publication of the ASGSR quarterly newsletter. This committee can also coordinate the development of position or white papers (also a role for the external affairs committee). The ASGSR Web site will be monitored by the committee, with a member(s) designated as content manager.

At minimum, the Membership/Communications Committee should annually:

- Monitor member participation (meetings, voting and committee membership).
- Recruit new members (including international and student members) and follow up with welcome letters and information.
- Work with the Nominating Committee (standing committee) to identify candidates for the board of directors and president-elect.
- Solicit input and assemble the articles for ASGSR website and newsletter.
- Promote the Society's publications, including providing access to the publications for Society members through the website.
- Annually update and prepare the ASGSR membership-marketing brochure and make it available to membership committee and members to distribute at appropriate events.
- Provide content updates for the ASGSR Web site as needed.
- Assist in the publication of the ASGSR newsletter.
- Facilitate the promotion of ASGSR authored articles to the general public and lay press.





Gravitational and Space Research is the peer reviewed, open access journal of the American Society for Gravitational and Space Research.

Information on submission and instructions to authors for GSR can be found on the journal's web site:

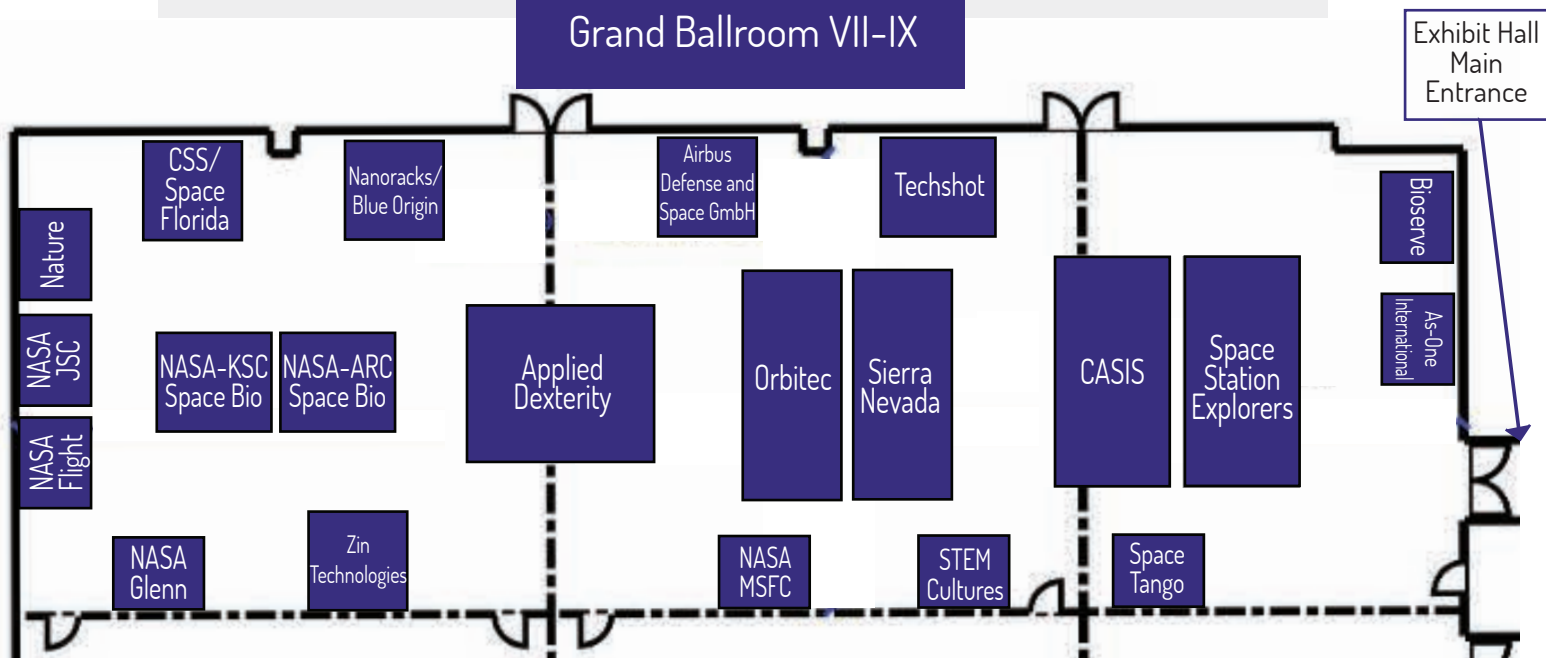
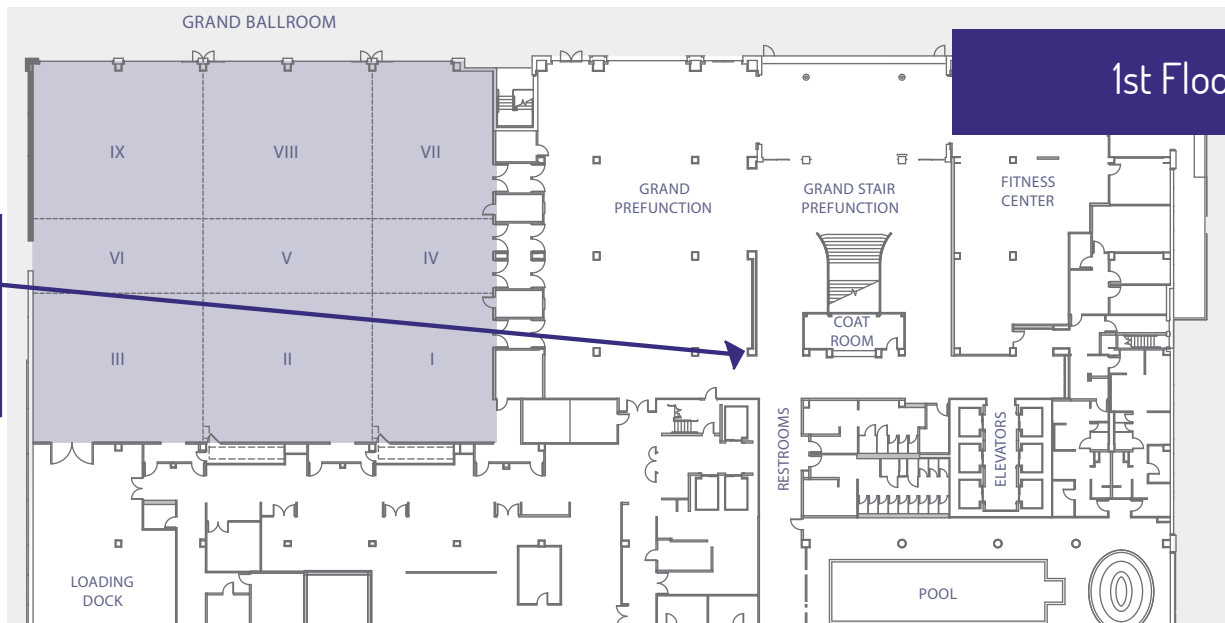
[GravitationalAndSpaceResearch.org](http://GravitationalAndSpaceResearch.org)

Also available on the web site are a template in Word, and an EndNote™ style file. GSR is an open access, peer re-viewed journal which is indexed with Google Scholar, EB-SCOhost, and is under review with MedLine and Thomson-Reuters. Due to its open access format, content can also be found just by typing search terms into any web browser search engine. There are no Open Access Fees.

Submission is open to all. Research topics include – but are not limited to – gravitational and space biology, astrobiology, analog environment research, advanced life support (ALS), biophysics, radiation biology, hardware engineering and development, fluid physics, materials science, combustion science, and acceleration in altered gravity environments. The categories of papers include Short Communication, Methods, Research, Hypothesis and Review.

We look forward to receiving many high-quality papers that strongly reflect the exciting research of our members. We are the face of ASGSR.

Dr. Jamie Foster, Editor in Chief



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ASGSR Leadership and the ASGSR Student Society sincerely acknowledge the following sponsors for their above and beyond contribution to the 2017 annual meeting: Center of the Advancement of Science in Space (CASIS) as sponsor of the ASGSR student mixer, and CASIS student space flight awards, Logyx, Inc. for their contribution to towards lunch for the ASGSR students; KBRWyle for its contribution towards travel support for the ASGSR student officers; Fed Ex Space Solutions for their support to provide transportation of valuable space assets (you!) back and forth from the Museum of Flight, and Sierra Nevada Corporation for their contribution towards the participation of our featured banquet speaker, Dr. G. Jane Cook.