



**National Research Council
Space Studies Board
Board on Science Education
2014 Workshop**

**Sharing the Adventure with the
Student:
Exploring the Intersections of
NASA Space Science and
Education**

December 2-3, 2014

**The National Academy of Sciences Building
NAS Auditorium
2101 Constitution Avenue, N.W.
Washington, DC 20001**



Welcome!

Sharing the Adventure with the Student: Exploring the Intersections of NASA Space Science and Education – A Workshop

Brought to you by the Space Studies Board and the Board on Science Education

Your active participation in the workshop discussions and activities is greatly encouraged and is crucial to the success of this event!

Each of the first 5 sessions will include time for the audience to join in the discussion with the speakers and panelists.

Session 3 – Collaboration Among NASA SMD and K-12 Districts, Schools, and Teachers – will include a poster session where all of the workshop participants will be encouraged to circulate among the 15 invited posters and record their thoughts on aspects of successful collaborations. Notes pages are provided in the agenda booklet for this purpose. Audience members will be encouraged share their thoughts during the ensuing panel discussion.

Session 6 – Enabling Actions – will also require audience participation. All participants will be requested to join one of 5 breakout groups, each focusing on a question based upon one of the prior sessions. The results of these breakout sessions will be collected by the moderators and shared with the full audience.

Other important details:

- Notes pages for each session are also included in your agenda booklet.
- Coffee, snacks, and lunch will be provided. There is also a full-service cafeteria on the lower level of the building.
- Please stay for the reception at the end of the day, December 2, to continue discussions over a glass of wine.

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THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

Division on Engineering and Physical Sciences

Space Studies Board
Board on Science Education

Sharing the Adventure with the Student: Exploring the Intersections of NASA Space Science and Education - A Workshop

December 2-3, 2014

**National Academy of Sciences Building, Auditorium
2101 Constitution Ave NW, Washington DC**

Tuesday, December 2, 2014

7:30 am	Registration Opens	
8:30 am	Welcome and Introduction <i>Outlining the Goals of the Workshop</i>	Michael Moloney <i>SSB Director</i> Committee Co-Chairs: Phil Christensen <i>Arizona State University</i> Brett Moulding <i>Utah Partnership for Effective Science Teaching and Learning</i>
8:40 am	Welcome from NASA	Kristen Erickson <i>NASA SMD</i>
8:50 am	Introduction to the Keynote Speaker	
8:55 am	Keynote Presentation: <i>Sharing the Adventure with the Student: How do Authentic Experiences Reach Students</i> <i>Interaction with the audience</i>	John Mather <i>NASA GSFC</i> <i>(35 minutes)</i> <i>(20 minutes)</i>
9:50 am	Setting the Stage Discussion Panel: NASA Education Forum Leads <i>Laura Peticolas, University of California, Berkeley</i> <i>Theresa Schwerin, Institute for Global Environmental Strategies</i> <i>Stephanie Shipp, Lunar and Planetary Institute</i> <i>Denise Smith, Space Science Telescope Institute</i>	<i>(40 minutes)</i>
10:30 am	Coffee Break	

11:00 am **SESSION 1: A New Vision for K-12 Science and Engineering Education and NASA SMD Education**

Moderator: Brett Moulding, *Utah Partnership for Effective Science Teaching and Learning*

Guiding Questions and Focus:

- Present an overview of NGSS and the role of NASA in supporting science and engineering education.
- How can/does NASA interact effectively with the education system to support K-12 science and engineering education?
- What opportunities does NASA SMD have to better support the new vision described in the NRC's *A Framework for K-12 Science Education*?
- How can/does NASA integrate the science and engineering talent of NASA SMD into the SMD education programs?

Keynote Presentation: (30 minutes)
Stephen Pruitt, *Achieve*

Panel Discussion: (20 minutes)
Maya Garcia, *Office of the State Superintendent of Education D.C.*
John Ristvey, *University Corporation for Atmospheric Research*
Holly Ryer, *Space Telescope Science Institute*
Sam Shaw, *South Dakota Department of Education*

Audience Joins the Discussion (20 minutes)

12:15 pm **Lunch Provided in the Great Hall**

1:30 pm **SESSION 2: Space Science Education Curriculum and Materials**

Moderator: Richard McCray, *NAS, University of California, Berkeley*

Guiding Questions and Focus:

- How do the instructional strategies advocated for in the NASA education programs match the Vision for Science Education described in the NRC Framework for K-12 Science Education?
- How can NASA best encourage and support teachers to use NASA education resources in the classroom?
- What is the mechanism by which NASA education programs' instructional content material will be aligned to the Framework and NGSS?
- How will NASA programs measure how well NASA EPO materials align to the NGSS?
- Information technology is changing the way science is done (data mining and simulations, for example) – what new possibilities does this development raise for the science classroom?

Keynote Presentation: (30 minutes)
Edna DeVore, *SETI Institute*
Bringing Space Down to Earth and into the Classroom

Panel Discussion: (25 minutes)
Beth Johnston, *Principal at Endeavour Elementary School*
Mordecai Mac Low, *American Museum of Natural History*
Cassandra Soeffing, *Institute for Global Environmental Strategies*
Belinda Wilkes, *Chandra X-Ray Center*

Audience Joins the Discussion (35 minutes)

3:00 pm **Coffee Break**
3:30 pm **SESSION 3: Collaboration Among NASA SMD and K-12 Districts, Schools, and Teachers**

Moderator: Mitchell Nathan, *University of Wisconsin- Madison*

Guiding Questions and Focus:

- What are institutional arrangements that provide effective platforms for facilitating successful collaborations?
- How are evidence-based models for successful collaborations or partnerships being communicated across NASA education programs?
- How are proven models or strategies for scaling up and sustaining collaborations and partnerships being used in the NASA education programs?
- What are the barriers to accomplishing common goals across collaborating organizations? How can these barriers be overcome?

Keynote Presentation: (20 minutes)
Gordon Kingsley, *Georgia Tech*
Building the STEM Partnership Toolkit: Choosing Your Spots Carefully, Measuring Twice, and Finding Your Spanner When You Need It

Poster Session: (45 minutes)

Nancy Ali
Space Sciences Lab
Lindsay Bartolone
Southwest Research Institute
Lin Chambers
NASA Langley Research Center
Troy Cline
NASA GSFC
Anita Davis
Sigma Space
Bonnie Eisenhamer
Space Telescope Science Institute
Dorian Janney
NASA GSFC
Andrea Jones
Planetary Science Institute

Sheri Klug-Boonstra
Arizona State University
Keliann LaConte
Lunar and Planetary Institute
Kathleen Lestition
Chandra X-Ray Center
Nancy Maryboy and
David Begay
Indigenous Education Institute
Tony Murphy
The GLOBE Program
Luisa Rebull
Spitzer Science Center
Daniella Scalice
NASA Ames Research Center

Panel Discussion: (25 minutes)

Kathryn Flanagan, *Space Telescope Science Institute*

James Lochner, *Universities Space Research Association*

Michelle Thaller, *NASA GSFC*

Audience Joins the Discussion (30 minutes)

5:30 pm **Adjourn for the day**

5:30 - 7:30 pm **Reception in the Great Hall**

All workshop participants are welcome

Wednesday, December 3, 2014

8:00 am	Registration Opens	
9:00 am	Welcome <i>Summary of Day 1</i>	Committee Co-Chairs Phil Christensen Brett Moulding
9:15 am	SESSION 4: Supporting Science and Engineering Teachers through Professional Development	

Moderator: Albert Byers, *National Science Teachers Association*

Guiding Questions and Focus:

- How are standards for professional development used in NASA professional development programs?
- How do the mechanisms and programs by which NASA programs meet the needs of in-service teachers, and how does this differ from the ways NASA programs meet the needs of pre-service teachers?
- What are the most effective and widely used delivery models (online, train the trainers, professional learning communities, summer seminars, internships) for NASA professional development programs?
- What are example strategies for partnering scientists and educators?

Keynote Presentation: *(30 minutes)*

Bill Penuel, *University of Colorado, Boulder*

Preparing Teachers to Support Three-Dimensional Science Learning

Panel Discussion: *(25 minutes)*

Annette DeCharon, *University of Maine*

Sheri Klug-Boonstra, *Arizona State University*

Mariel Milano, *Orange County Public Schools, Florida*

Audience Joins the Discussion *(35 minutes)*

10:45 am **Coffee Break**

11:15 am **SESSION 5: Part 1 – Evaluation of Education**

Moderator: Theresa Schwerin, *Institute for Global Environmental Strategies*

Guiding Questions and Focus:

- What are current leading theories of STEM education evaluation (e.g., evidence-based, logic models)?
- Selecting the most appropriate assessment(s) for a given situation is a common challenge across education evaluation. What are leading factors or best practices that you recommend in selecting the most appropriate assessment(s) for a given situation?

- The goal of many STEM-related professional development efforts is to facilitate a change or increase in teacher effectiveness that in turn increases student learning. Additionally many efforts aspire to increase students' awareness/interest in STEM careers or students' desire to pursue more STEM-related coursework during high school and college. These impacts are sometimes challenging to capture as part of an evaluation. What are some methods or data that might shed light on these often elusive goals?
- What can we realistically measure? What can't we?
- What are the attributes of the evaluation tools that are consistent with effective evaluation of education programs?

Keynote Presentation: (45 minutes)

Martin Orland, WestEd, and Steve Schneider, WestEd

Making the Right Choices: How to Get the Most Value out of eVALUation!

12:00 pm **Lunch provided in the Great Hall**

1:15 pm **SESSION 5: Part 2 – Evaluation in Practice within NASA SMD**

Moderator: Theresa Schwerin, *Institute for Global Environmental Strategies*

Guiding Questions and Focus:

- Why and how does NASA evaluate the programs it executes?
- What are examples of evidence that the evaluation of NASA's programs is providing useful information to improve the programs?
- How does NASA make a difference in STEM education, and how is this known?
- What are the greatest challenges or barriers that people have encountered related to SMD education evaluation? What strategies have been used or recommended for addressing these barriers?
- How does the evaluation of NASA programs compare to the model presented for education by the speaker in Part 1 of this session?
- What is the mechanism by which the results of evaluation change NASA education programs?

Keynote Presentation: (20 minutes)

Hilarie Davis, TLC Inc.

Using Evaluation to Increase and Measure the Impact of Education

Panel Discussion: (25 minutes)

Bonnie Eisenhamer, Space Telescope Science Institute

Jenny Gutbezahl, Brandeis University

Frances Lawrenz, University of Minnesota

Audience Joins the Discussion (30 minutes)

2:30 pm

SESSION 6: Enabling Actions

Moderator: James Manning, *Education Consultant*

Engage the audience in breakout groups related to each of the previous sessions.

<i>Instructions</i>	<i>(5 minutes)</i>
<i>Discussion/Breakout Groups Meet</i>	<i>(40 minutes)</i>

Breakout 1: Aligning to Standards

- What actions can NASA take to build upon, leverage, and/or expand its current efforts to align to and support the new vision described in the NRC's *A Framework for K-12 Science Education*, NGSS, and other standards initiatives?
- What new opportunities can be explored, and what challenges need to be overcome?

Breakout 2: Curriculum Support Resources

- What actions can NASA take to build upon, leverage, and/or expand its current efforts to translate its science into curriculum support materials and resources for formal and informal education and encourage educator use?
- What new opportunities can be explored, and what challenges need to be overcome?

Breakout 3: Collaborations

- What actions can NASA take to build upon, leverage, and/or expand its current collaborations among scientists, teachers, and formal and informal education institutions?
- What new opportunities can be explored, and what challenges need to be overcome?

Breakout 4: Professional Development

- What actions can NASA take to build upon, leverage, and/or expand its current efforts to provide professional development support to pre-service and in-service teachers and informal educators?
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Breakout 5: Evaluation

- What actions can NASA take to build upon, leverage, and/or expand its current efforts in measuring and assessing its impact in science and engineering education?
- What new opportunities can be explored, and what challenges need to be overcome?

3:15 pm

Coffee Break

3:30 pm	SESSION 6: Enabling Actions Continued	
	Moderator: James Manning, <i>Education Consultant</i>	
	<i>Reporting of Group Discussions</i>	<i>(10 minutes per group, 5 minutes for questions)</i>
4:45 pm	Summary and Wrap Up	Committee Co-Chairs Phil Christensen Brett Moulding
5:00 pm	Adjourn	

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Guiding Questions

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- What opportunities does NASA SMD have to better support the new vision described in the NRC's *A Framework for K-12 Science Education*?
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Your Thoughts

SESSION 2: Space Science Education Curriculum and Materials

Guiding Questions

- How do the instructional strategies advocated for in the NASA education programs match the Vision for Science Education described in the NRC Framework for K-12 Science Education?
- How can NASA best encourage and support teachers to use NASA education resources in the classroom?
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Your Thoughts

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Guiding Questions

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- Selecting the most appropriate assessment(s) for a given situation is a common challenge across education evaluation. What are leading factors or best practices that you recommend in selecting the most appropriate assessment(s) for a given situation?
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- What can we realistically measure? What can't we?
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Your Thoughts

SESSION 5: Part 2 – Evaluation in Practice within NASA SMD

Guiding Questions

- Why and how does NASA evaluate the programs it executes?
- What are examples of evidence that the evaluation of NASA's programs is providing useful information to improve the programs?
- How does NASA make a difference in STEM education, and how is this known?
- What are the greatest challenges or barriers that people have encountered related to SMD education evaluation? What strategies have been used or recommended for addressing these barriers?
- How does the evaluation of NASA programs compare to the model presented for education by the speaker in Part 1 of this session?
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Breakout 4: Professional Development

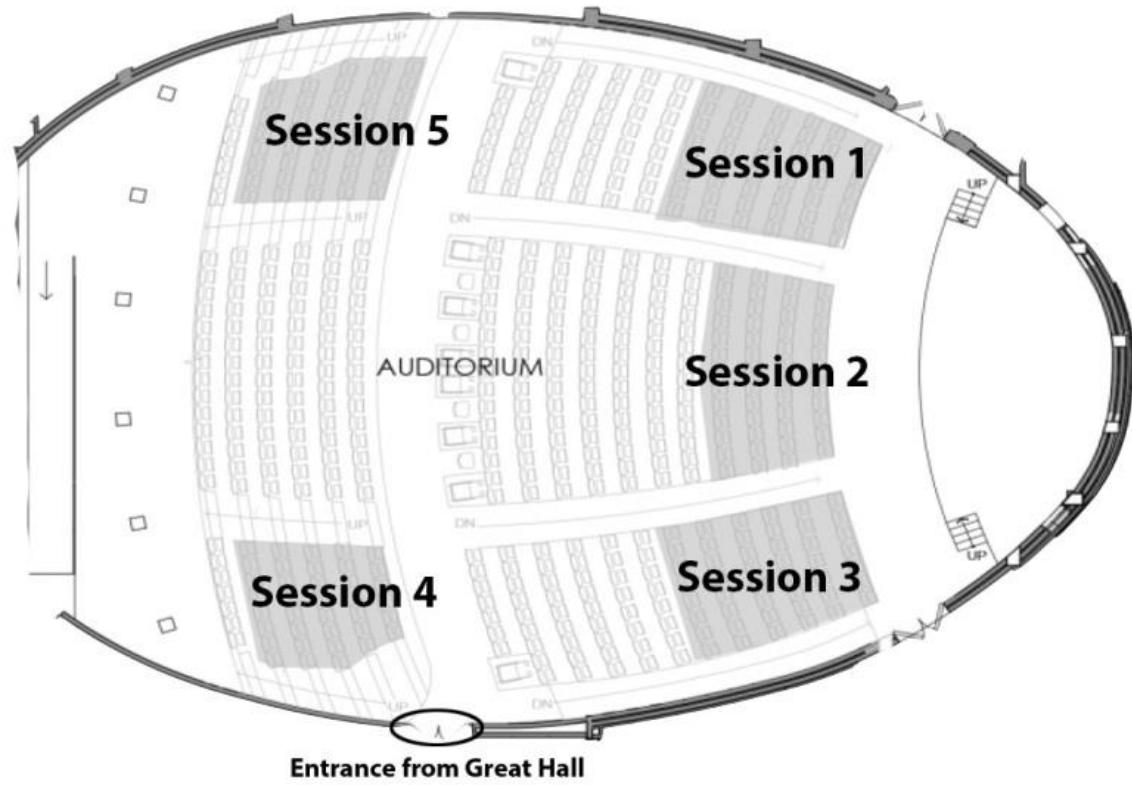
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Breakout 5: Evaluation

- What actions can NASA take to build upon, leverage, and/or expand its current efforts in measuring and assessing its impact in science and engineering education?
- What new opportunities can be explored, and what challenges need to be overcome?

Your Thoughts

Seating For Breakout Session





Additional Notes





Additional Notes



Successful Collaboration

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Question: What are evidence-based examples that a collaboration or partnership is successful?

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POSTER ABSTRACTS

Name:

Nancy Alima Ali, Coordinator of Education Programs, Multiverse, Space Sciences Laboratory, University of California, Berkeley

Title:

THEMIS GEONS Magnetometer Program: Sustaining Teacher Engagement in NASA Science for over a Decade

Abstract:

The Geomagnetic Event Observation Network by Students (GEONS) program was initiated by the THEMIS mission Education/Public Outreach team in 2004. The GEONS program trained science teachers across the United States on how to teach heliophysics using data collected from mission-related magnetometers that were installed in their schools. Teachers who participated in the GEONS program went on to become engaged in other NASA Science Mission Directorate professional development programs such as the Heliophysics Educator Ambassador program and the Heliophysics Community of Practice. This poster discusses the evidence behind the success of the GEONS program in establishing long-term partnerships between NASA scientists, teachers, research labs and informal education organizations. It addresses evaluation-based strategies for overcoming barriers between collaboration across organizations.

Name:

Lindsay Bartolone, Education and Public Outreach Lead, NASA's Interstellar Boundary Explorer (IBEX) Mission

Title:

Space Explorers Club and Heliophysics Educator Ambassadors: Growing District and Teacher Partner Relationships for Sustainable and Significant Impacts

Abstract:

Sustained funding through NASA's Science Mission Directorate for nearly a decade from the Interstellar Boundary Explorer Mission (IBEX) allowed rich partnerships between formal, informal and scientific institutions to develop, strengthen, become more efficient and grow effectively. Initial funding allowed for the collaborative development of the GEMS Space Science Sequence for grades 6-8, a product of partnership between NASA scientists and E/PO professionals with Lawrence Hall of Science, Adler Planetarium and NASA Science Mission Directorate Forums. These curricular units were nationally field-tested with local teacher partners and the curricular model was also tested against a control instructional method and showed greater positive cognitive and affective gains in students. These materials, complemented by additional NASA SMD educational support materials, were used in a variety of collaborative educator professional development programs including the Heliophysics Educator Ambassador program (train-the-trainer and Community of Practice strategies,) and the Space Explorers Afterschool Club program, which additionally utilized partnerships with local school districts, other NASA missions, and partner institutions and teachers. This poster will describe the partnerships, programs, connections and evidence for success of these developing models.

Name:

Dr. Catherine Bowman, Raytheon
Michelle Viotti, Jet Propulsion Laboratory
Sheri Klug Boonstra, Arizona State University

Title:

Mars Education: Providing an Evidence-Based Model for Authentic, STEM-Practice-based Learning

Abstract:

NASA's Mars Exploration Program (MPE) has an evidence-based model for engaging teachers and students in authentic, standards-aligned STEM practices, using NASA data and discipline-based tools. Per recommendations from a large-scale external evaluation (SAMPI, 2011), all are guided by NSF's "Framework for Evaluating Impacts of Informal Science Education Projects" (Friedman, 2008), with logic models and impacts/indicators tables. Reviewed and refined annually, they guide ongoing internal evaluation. Project instruments (questionnaires, interview protocols, rubrics) are developed and tested following evidence-based procedures (e.g. Dillman, Smyth, & Christian, 2009; Lantz, 2004; Maxwell, 2005; Strauss & Corbin, 1998). The latest multi-year evaluation (Bowman, 2014) indicates MPE meets the majority of logic-model-based outcomes, and provides recommendations for the next evaluation phase, contributing to the nation's research base on effective STEM education models.

Name:

Lin Hartung Chambers, Director, CERES S'COOL Project, NASA's Langley Research Center

Title:

Sharing the Adventure: Observation-Based and Data-Based Examples

Abstract:

The NASA Langley Research Center Science Directorate houses two long-running projects aimed at involving students with the excitement of NASA's Earth science research. S'COOL is an observation project with a strong interactive aspect, while MY NASA DATA has a data focus. Both projects are integrally tied to NASA science and missions and involve collaboration across organizations at multiple levels: the project teams themselves involve scientist-educator-technologist collaborations; the projects engage teachers and students with NASA; and the projects also involve collaborations across NASA missions and Centers; and even to outside organizations and other agencies. Both projects have also encountered some barriers to optimal collaboration. This poster will introduce the two projects and explore the benefits and challenges of collaboration.

Name:

Troy Cline, Education and Public Outreach Lead, Magnetospheric Multiscale Mission, NASA's Goddard Space Flight Center

Title:

Building Digital Age Resources Through Sustained Partnerships: MMS and ISTE

Abstract:

This poster session will show how the Magnetospheric Multiscale (MMS) Mission contributes to teacher professional development opportunities in partnership with the International Society for Technology in Education (ISTE). ISTE is the trusted source in educational technology for professional development, knowledge generation, advocacy, and leadership for innovation and represents more than 100,000 professionals worldwide. The MMS team works closely with ISTE to design, develop and disseminate STEM educational materials to K-12 teachers throughout the life of the mission. Featured projects include: The Cyber Café (an online collaborative teacher workspace), a Computational Thinking Student Activity e-book and companion teacher guide iBooks embedded with self-paced professional development tools, information, and resources. ISTE has a proven record of accomplishment and sustainability and is well positioned to help transform education to meet the needs of students in the Digital Age.

Name:

Anita Davis, Lead, Earth to Sky Interagency Partnership, SSAI at NASA Goddard Space Flight Center

Ruth Paglierani, Multiverse, University of CA, Berkeley

Sandy Spakoff, National Conservation Training Center, US Fish and Wildlife Service

John Morris, Alaska Region, National Park Service

Title:

Best Practices from the Earth to Sky Interagency Partnership

Abstract:

The Earth to Sky interagency partnership is a ten-year long effort that has grown from its inception as a week-long NASA workshop for informal educators into a national-scale partnership between NASA, National Park Service, US Fish and Wildlife Service and NOAA. The partnership has designed and executed a variety of professional development events for informal educators, in which NASA scientists have participated as presenters and as science advisors. In turn, scientists have grown in their ability to effectively communicate their work to our audience. Alumni from the partnership together with science presenters form a growing community of practice of about 500 individuals. Independent evaluation determined that 86 alumni from two courses in turn reached over 4 million visitors to parks and refuges with content derived from ETS courses, through a variety of products and programs ranging from news articles to exhibits, peer and teacher-training events, ranger-led interpretive programs, and much more.

We will illustrate the best practices of ETS that have enabled us to build, maintain, deepen and expand a successful and effective collaboration between NASA scientists, and the educational institution that is represented by the training divisions and the professional informal educators of both NPS and USFWS. The complementary skills, resources, facilities and programs of the contributing agencies that

have made possible a fruitful and sustainable relationship will be illustrated, and the characteristics of each agency partner's role in the leadership of ETS will be outlined. We will describe the means by which the ETS model has been shared within NASA and its associated educational communities, and the degree to which the ETS project is being accessed and used by NASA education and outreach. Suggestions for addressing challenges to achieving success in cross and within-agency collaboration will be included.

Name:

Bonnie Eisenhamer, Office of Public Outreach, Space Telescope Science Institute
The Space Telescope Science Institute (STScI) Education Team

Title:

Strategic Partnerships: The Key to Sustainability and Reach for SMD Education

Abstract:

STScI is the home institution for the education and public outreach activities of the Hubble and future James Webb space telescopes. Over time, STScI's Office of Public Outreach has established the infrastructure needed for reaching various audiences at the local, regional, and national levels. Partnerships are a critical element of this infrastructure, and sustainability of our program is ensured through our ongoing partnerships with organizations and institutions with staying power and reach. We have learned from past efforts that strategic partnerships can foster innovation, support diversity initiatives, and increase impact in a cost-effective way while providing target audiences with greater access to NASA SMD science and resources. Partners are selected based upon specific criteria such as potential for reach, the percentage of underrepresented educators and students served, complementary program goals, and willingness to collect and share evaluation data and results with us. This poster will highlight our partnership model as well as examples and benefits of strategic partnerships over time.

Name:

Dorian Janney, Formal Education Specialist, Global Precipitation Measurement Mission, NASA's Goddard Space Flight Center

Title:

Empowering Educators to Engage with NASA Mission science

Abstract:

In February, 2014, NASA launched the Global Precipitation Measurement (GPM) mission. This satellite is now measuring precipitation as it falls all over the globe, and is able to update the data every three hours. This poster will share information about some of the education outreach projects that were developed to share the science and technology behind this mission. The "GPM Master Teacher Program" will be the focus as it is a highly successful model for engaging and collaborating with educators around the world using online tools. GPM's science team members serve as experts as they deliver background science and engineering content to the educators during the monthly webinars. Metrics are collected to determine the effectiveness of using NASA-unique educational resources to bring STEM content and teach NGSS to students in formal education settings

Name:

Andrea Jones, Education Specialist, Planetary Science Institute, NASA's Goddard Space Flight Center
Lora Bleacher, Education and Public Outreach Lead, Solar System Exploration Division, NASA's Goddard Space Flight Center

Sanlyn Buxner, Education Specialist, Planetary Science Institute

Marti Canipe, Graduate Student in Science Education, University of Arizona

Title:

LRO's Lunar Workshops for Educators: A Proven Model for Exceptional Teacher Professional Development

Abstract:

The Lunar Workshops for Educators is an award-winning series of weeklong professional development workshops for grade 6–9 science teachers, sponsored by the Lunar Reconnaissance Orbiter (LRO) and conducted by the LRO Education Team. We will present an overview of the workshop series, a summary of five years of evaluation results, and highlight the strengths of this model for educator professional development, in a program made possible through content and assets unique to NASA's Science Mission Directorate.

Name:

Keliann LaConte, Informal Education/*Explore!* Program Lead, Lunar and Planetary Science Institute

Title:

Explore! Engaging Children in Space Science in Libraries and Other Out-of-school Programming

Abstract:

The Lunar and Planetary Institute's *Explore* program builds the capacity of informal educators — especially librarians — to provide Earth and space science and engineering experiences for children and families utilizing unique NASA Science Mission Directorate assets. Hands-on activities, programming resources, and training are developed in collaboration between scientists, evaluators, librarians, and professional library organizations through an advisory board, formative and summative evaluation and research, and field tests. Evaluation and research data show that training participants gained statistically significantly in Earth and space science content knowledge, experienced an increase in confidence and self-reported ability and intention to use the activities, and are actively using *Explore* materials. Ongoing communication via *Explore* and partner networks and frequent follow-up opportunities are crucial for sustaining librarian and professional library organization involvement.

Name:

Kathy Lestition, Education/Outreach Coordinator, Chandra X-Ray Center, Smithsonian Astrophysical Observatory

Title:

NASA's Chandra X-ray Observatory Education, Public Engagement & Communications Program

Abstract:

NASA's Chandra X-ray Observatory Education, Public Engagement & Communications program utilizes established working relationships with scientists to provide the starting point for all Chandra educational materials. Partnering with organizations such as the National Science Olympiad, the 4-H, the NASA Museum Alliance and the American Library Association, among others, leverages external distribution networks for national impact. Enabling and sustaining a network of "volunpeers" empowered to organize science education events in their communities further strengthens the reach of educational science materials. We summarize a sample of our synthesized suite of programs in informal and formal education that communicate the compelling topics that the high-energy Universe can reveal as well as provide an overview of the guiding research and evaluation results.

Name:

Nancy C. Maryboy, President and Executive Director, Indigenous Education Institute

David Begay, Adjunct Faculty, Department of Physics and Astronomy, Northern Arizona University

Title:

Indigenous Education Institute: Collaboration with Integrity

Abstract:

Indigenous Education Institute: Collaboration with Integrity, will feature images and text focused on our more than 20 year history of working in cross-cultural settings, on collaborative projects funded by NASA and the National Science Foundation. We will show the importance of multicultural science education, offer examples of collaborative success, and strategies for scaling up and sustainability. The poster will showcase lessons learned, as our Indigenous institute has collaborated with science centers, NASA affiliates, universities, tribal colleges, museums, schools and planetariums. We will highlight current NASA projects such as Navajo Sky - Education Modules for Digital Planetariums, and MAVEN - Imagine Mars Through Indigenous Eyes.

Name:

Tony Murphy, Director, Global Learning and Observations to Benefit the Environment (GLOBE) Program

Title:

Connecting GLOBE Students to Satellite Mission Partnerships

Abstract:

Along with the ongoing CloudSat and CALIPSO missions, The GLOBE Program is involving educators and students in activities related to two new NASA satellite missions in 2014/15:

- Global Precipitation Measurement (GPM), launched in February 2014; and
- Soil Moisture Active Passive (SMAP), scheduled for launch in January 2015.

Instruments on the various satellites take measurements of clouds, aerosols, atmospheric chemistry, precipitation, soil moisture and other elements critical to understanding Earth's changing climate.

Satellite partnerships provide students and teachers the opportunity to contribute to the science of the mission by collecting environmental data on Earth to compare to that of the Earth-orbiting satellites. The partnerships also offer a range of opportunities for collaboration: students with other students; students with teachers; students and teachers with scientists; and cooperating agencies with one another in support of the missions.

Name:

Luisa Rebull, Director and Mentor Scientist, NASA/IPAC Teacher Archive and Research Program (NITARP)

G. K. Squires, Assistant Astronomer, Institute for Astronomy, University of Hawaii

V. Gorjian, Research Astronomer, JPL

The NITARP team

Title:

NASA/IPAC Teacher Archive Research Program (NITARP): Evidence of a Successful Partnership Over a Decade

Abstract:

NITARP provides educators with an authentic astronomical research experience by partnering small groups of educators from across the U.S. with a mentor astronomer for a year-long original research project, during which the teams echo the entire research process: writing a proposal, conducting research, writing up and presenting the results at an American Astronomical Society (AAS) conference. Few science teachers have had an authentic research experience. Our goal is to expose teachers to this process, as messy as it can be, but also rewarding, to help them understand what a career in research would entail, and better prepare their students. The most recent formal evaluation looked at both the cognitive and affective impacts of NITARP on teachers, and extent to which NITARP changes teaching styles, or creates a desire to teach science differently.

Name:

Daniella Scalice, Education and Public Outreach Lead, NASA Astrobiology Program

Title:

NASA Astrobiology Institute: Embedding E/PO in the Place of Science to Maximize Collaboration, Partnerships, and Impact

Abstract:

The NASA Astrobiology Institute (NAI) is a nationally distributed, interdisciplinary institute-without-walls that brings together teams of scientists to study life's origins and the possibility of life elsewhere in the Universe. NAI's broad research portfolio is conveyed to learners of all ages in a variety of programs by E/PO leads embedded in each research team. This model maximizes the participation of the astrobiologists themselves—key to achieving participant outcomes—and also allows for long-term partnerships with local institutions such as schools, libraries, and museums—key to designing programs responsive to learners' needs.

NAI E/PO leads are coordinated by a central office, which facilitates communication and collaboration, and administers services such as supplemental funds and evaluation support. As grantees, the NAI E/PO leads are able to deliver their competitively-selected activities with a supportive, centralized presence; as a community of practice, the NAI E/PO leads are able to collaborate, share resources, leverage partners, and replicate successful strategies.

Workshop Speakers, Panelists, and Poster Presenters

Speakers



HILARIE DAVIS: President of TLC Inc.

Dr. Hilarie Davis, President of TLC Inc. focuses on intensive, research-based evaluations of interactive materials, courses and learning environments. She has evaluated long-term projects in the use of technology, online environments, reading interventions, NASA-based materials with high needs students, Earth systems science for post-graduate educators, and environmental health for high school students. Hilarie specializes in collaborative evaluation that establishes feedback loops and examines the effects of interventions over time and in different contexts. She uses video as well as advanced qualitative and quantitative tools to provide insight into the nature and extent of effects. She has designed digital portfolios for after-school programs, literacy development, school change, and online courses. She has conducted professional evaluations for projects funded by NSF, NIEHS, NASA, NOAA, and USDOE, as well as universities and school systems. As a former middle school teacher, department head, and Director of Curriculum, Hilarie brings a strong practical background to understanding the context for educational change. Hilarie has worked with large national projects, such as the Earth System Education Alliance (IGES), the Science Mission Directorate forums (NASA), the Digital Learning Network (NASA K-12), and virtual environments such as INSPIRE (NASA), and PBLU (Buck Institute of Education). Dr. Davis received her Ed.D. from the University of Rochester in 1984 and their distinguished alumni award in 1986. She attended the State University of New York, receiving her B.A. in Philosophy in 1974, MS in Reading Education in 1976, CAS in Educational Administration in 1984. She has published on literacy, educational technology, curriculum design, evaluation, and teacher training methodology.



EDNA DEVORE: Director of Education and Public Outreach at the SETI Institute

Edna DeVore is an astronomy educator and the Director of Education and Public Outreach at the SETI Institute. Her work includes NASA's Kepler Mission, Astrobiology Institute, and Stratospheric Observatory for Infrared Astronomy, NASA & NSF Research Experience for Undergraduates, and Co-I for Voyages Through Time, an integrated high school curriculum. She has served on boards for the ASP, AAS and Foundation for Microbiology. She has published more than 30 papers on science, and astronomy education and presented over 200 invited talks, teacher workshops and short courses. She received her BA from Raymond College at University of the Pacific, her teaching credentials from San Jose State University, her MA in Instructional Technology/Education from SJSU, and her MS in Astronomy at University of Arizona.



KRISTEN J. ERICKSON: Director, Science Engagement and Partnerships, NASA Science Mission Directorate

Recently selected in a new position as NASA's Director for Science Engagement and Partnerships, Ms. Erickson will oversee restructuring of science education and communications for NASA's Science Mission Directorate. Since 2009, Ms. Erickson has led the science engagement efforts for NASA's Planetary Science. Successes include the 2012 Mars Curiosity Landing awareness campaign, comet encounters, recent Moon launches, the 2012 Transit of Venus celestial event, and other Jupiter, Mercury, Saturn and Mars missions. From 2006 to 2009, she led the NASA's Strategic effort including leading NASA's 50th Anniversary and the 40th Anniversary of the Apollo program celebrations. Previously, she held leadership positions in the Space Shuttle Program, Office of Biological and Physical Research, and various staff offices. Starting her career at the Johnson Space Center, Houston, Texas; she has college degrees from Texas A&M University and Harvard.



GORDON KINGSLEY: Associate Professor, School of Public Policy, Georgia Tech

Dr. Kingsley's research explores the development and implementation of effective partnerships across the public, private and non-profit sectors. Current research projects examine the impact of partnerships on 1) organization structure; 2) the development and allocation of scientific and technical human capital; 3) the transfer of knowledge across projects, teams, and partner organizations; and 4) the use of communities of practice to support organization learning and performance. His work focuses upon three policy domains: higher education innovation, STEM education and engineering design of transportation systems. This work is currently supported by the Bill and Melinda Gates Foundation, the National Science Foundation, and the Georgia Department of Transportation. Dr. Kingsley teaches classes in public management, business-government relations, policy implementation, and STEM education policy.



JOHN MATHER: Senior Astrophysicist in the Observational Cosmology Laboratory, NASA Goddard Space Flight Center

Dr. John C. Mather is a Senior Astrophysicist in the Observational Cosmology Laboratory at NASA's Goddard Space Flight Center. His research centers on infrared astronomy and cosmology. As an NRC postdoctoral fellow at the Goddard Institute for Space Studies, he led the proposal efforts for the Cosmic Background Explorer, and came to GSFC to be the Study Scientist, Project Scientist, and also the Principal Investigator for the Far IR Absolute Spectrophotometer (FIRAS) on COBE. He showed that the cosmic microwave background radiation has a blackbody spectrum within 50 ppm. As Senior Project Scientist for the James Webb Space Telescope, he leads the science team, and represents scientific interests within the project management. He has served on advisory and working groups for the National Academy of Sciences, NASA, and the NSF (for the ALMA, the Atacama Large Millimeter Array, and for the CARA, the Center for Astrophysical Research in the Antarctic). He has received many awards including the Nobel Prize in Physics, 2006, for his precise measurements of the cosmic microwave background radiation using the COBE satellite.



WILLIAM PENUEL: Professor of Educational Psychology and Learning Sciences at the University of Colorado Boulder

Bill Penuel is Professor of Educational Psychology and Learning Sciences. He joined the faculty in the School of Education at the University of Colorado Boulder in 2011. He was formerly the Director of Evaluation Research at the Center for Technology in Learning at SRI International, where he developed a broad program of education research in STEM education. His current research focuses on teacher learning and organizational processes that shape the implementation of educational policies, school curricula, and afterschool programs. He examines learning and development from sociocultural, social capital, and complex social systems perspectives. Two of Dr. Penuel's current projects, Synergies and the Longitudinal Study of Connected Learning, are examining how children's interests develop over time and across different kinds of settings. He recently edited two National Society for the Study of Education Yearbooks: Learning Research as a Human Science (2010) and Design-Based Implementation Research (2013). Dr. Penuel serves on the editorial board for Teachers College Record, American Journal of Evaluation, and Cognition and Instruction.



LAURA PETICOLAS: Science Education and Public Outreach Forum Lead for Heliophysics, University of California, Berkeley

Dr. Peticolas is Director of Multiverse, housed at the Space Sciences Laboratory at University of California Berkeley. She has been studying the aurora (on Earth, Mars, and Io) and teaching physics to undergraduates, K-12 teachers, and the public for over 10 years. She has led NASA large-scale and small-scale Education and Public Outreach (E/PO) programs such as the E/PO efforts for FAST, STEREO, Wind, and RHESSI. She currently leads an effort to coordinate and support the Heliophysics E/PO programs and projects of NASA's Science Mission Directorate (SMD) and co-leads NASA's MAVEN to Mars satellite mission E/PO program. She also works with the Indigenous Education Institute (IEI) and 'Imiloa Astronomy Center on an NSF informal science education professional development project, called Native Universe, bringing together multiple world-views to create better access to science and ways of understanding Earth and the Universe in museum settings. This project builds on a previous professional development project with similar goals, called Cosmic Serpent.



STEPHEN PRUITT: Senior Vice President at Achieve

Stephen Pruitt was named Senior Vice President for Content, Research and Development at Achieve in April 2013. He is leading the development of the Next Generation Science Standards. Stephen began his career as a high school Chemistry teacher in Georgia, where he taught for 12 years. In 2003, he joined the Georgia Department of Education (GaDOE) as the Program Manager for Science and later served as the Director of Academic Standards. In 2008, he became the Associate Superintendent of Assessment and Accountability, responsible for directing all state assessments and overseeing the No Child Left Behind accountability process. In April 2009, Stephen became Chief of Staff to State School Superintendent Kathy Cox, coordinating the work of the agency and a variety of projects such as Georgia's third-ranked Race to the Top application. In addition to his state-level work, Stephen also served as President of the Council of State Science Supervisors and a member of the writing team for the College Board's Standards for College Success Science Standards. Most recently, he served on the National Academies of Science's Committee on Conceptual Framework for New Science Education Standards, which has developed the Framework for K-12 Science Education. This document is the basis for the development of the Next Generation Science Standards. Stephen joined Achieve in 2010.



STEVE SCHNEIDER: Senior Program Director at WestEd

Steve Schneider is the Senior Program Director of the Science, Technology, Engineering, & Mathematics program at WestEd. He also serves as the Principal Investigator (PI) of the National Science Foundation's (NSF's) Center for Assessment and Evaluation of Student Learning (CAESL). Steve directs the National Center on Cognition and Mathematics Instruction, and serves as the Principal Investigator and Content Expert for the Science Review Team for the U.S. Department of Education's What Works Clearinghouse. He previously served as the evaluation chairperson for the National Network of Eisenhower Mathematics and Science Consortia and Clearinghouse, and represented the Network on the Department of Education's Mathematics and Science Expert Panels.



THERESA SCHWERIN: Science Education and Public Outreach Forum Lead for Earth Science, The Institute for Global Environmental Strategies

Theresa Schwerin is a founding officer and vice president of Education Programs for the Institute for Global Environmental Strategies (IGES). She has over 20 years of experience in the areas of science applications and education, communication, and information science. She leads IGES education initiatives, particularly the NASA Earth Science Education and Public Outreach Forum, IGES science contests for students, the Earth System Science Education Alliance (ESSEA), a NASA-NOAA-NSF sponsored project providing professional development for K-12 teachers, NASA Earth and Space Science Education Product Review, and a variety of NASA professional development and communication activities. She is also a key leader of nasawavelength.org - a digital library developed by IGES with the University of California, Berkeley. Wavelength provides robust tools for science educators - K-12, higher education and out-of-school - for searching, browsing and creating custom pathways and collections from NASA's Science Mission Directorate portfolio of over 2,000 educational resources, in ways that are most meaningful for educators. Ms. Schwerin has led a wide range of new efforts for organizations such as NASA, NOAA, the United Nations, WGBH Education Foundation, and the former Japanese National Space Development Agency (now part of the Japanese Aerospace Exploration Agency, or JAXA). Her work has led to the planning, development and implementation of international and national education programs, products, workshops, reviews, and conferences. Ms. Schwerin is a member of the American Geophysical Union, the National Science Teachers Association, Astronomical Society of the Pacific, American Association for the Advancement of Science and the American Library Association. Ms. Schwerin's related education experience also includes conducting children's programs in a public library system. Ms. Schwerin holds a M.S. in library and information science from the University of Maryland and a B.S. in sociology from the College of Charleston.



STEPHANIE SHIPP: Science Education and Public Outreach Forum Lead for Planetary Science, Lunar and Planetary Institute

Stephanie's background is in Earth science, specializing in glacial geology for her doctoral degree in Geology and Geophysics from Rice University. While there, she became interested in making a connection between the public and scientific research. She collaborated with the Education Development Center and the American Museum of Natural History to develop an Internet-based middle-school curriculum — Antarctica: The Farthest Place Close to Home — that centered on Antarctica as a theme to engage students in earth science. For eight years, Stephanie also directed the Teachers Experiencing Antarctica and the Arctic Program (TEA), a program in which K-12 teachers work in the field with polar researchers and transfer the experience of research to the classroom. Working closely with educators taught Stephanie the value of collaboration between researchers and teachers in the development of strong science educational materials and programs. Stephanie's management of education programs at the Lunar and Planetary Institute ranges from oversight to design to development and implementation. LPI has an energetic, talented education team that is devoted to building the community and capacity of teachers and informal educators to enable them to offer high quality STEM experiences for their audiences, and to engaging the general public in the excitement of STEM.



DENISE SMITH: Science Education and Public Outreach Forum Lead for Astrophysics, Space Telescope Science Institute

Dr. Denise Smith is an astronomer working in the Space Telescope Science Institute Office of Public Outreach (OPO) as a member of the OPO management team. She currently leads NASA's Astrophysics Science Education and Public Outreach Forum, one of four Forums charged with organizing NASA Science Mission Directorate education and public outreach programs into a coordinated, efficient, and effective nationwide effort. Dr. Smith is also the principal investigator for "Visions of the Universe: Four Centuries of Discovery", a traveling exhibit for public libraries that illustrates how our views and understanding of the universe have changed over the past four hundred years. Over the past fifteen years, she has contributed her expertise in conveying cutting-edge science discoveries from NASA's Astrophysics missions to the development and implementation of a wide range of formal and informal science education materials and professional development experiences. Dr. Smith received her Ph.D. in astronomy from Cornell University, and held postdoctoral research appointments at NASA's Goddard Space Flight Center and the Space Telescope Science Institute prior to assuming a position in education and public outreach. Her scientific research has focused on rapid episodes of star birth in galaxies, as observed across the electromagnetic spectrum.

Panelists

**ANNETTE deCHARON:** Senior Marine Education Scientist, University of Maine

Annette's academic background is in earth sciences (B.S. Geology, M.S. Oceanography). Her early professional experience supported the use of space-borne technology to study Earth and other planets. Overseeing outreach efforts for the Jet Propulsion Laboratory's Earth Science Flight Projects during the 1997-98 El Niño sparked a new focus on multimedia-based science communication. Over the past 15 years, she has focused on piloting and sustaining grant-funded (e.g., NSF Centers for Ocean Sciences Education Excellence, COSEE; NASA Aquarius) educational products, software tools, and models for in-person and online interaction. These endeavors have not only broadly disseminated scientific information but also fostered novel interdisciplinary collaborations.

**BONNIE EISENHAMER:** Deputy Head and Education Program Manager

As the Deputy Director for the Office of Public Outreach at the Space Telescope Science Institute, Bonnie leads the Space Telescope Education Program and the evaluation programs for the Office of Public Outreach and the Astrophysics Science Education and Public Outreach Forum. Bonnie came to the Institute eighteen years ago as the evaluation specialist for the Office of Public Outreach and for the past eight years and has been instrumental in transforming the Amazing Space education Website into a comprehensive education program for K-12 educators. The team that she manages develops curriculum support products for the K-12 education community and offers training for both pre-service and in-service teachers. The focus of the enhanced Space Telescope Education Program is to communicate new and creative ways for classroom teachers to integrate the latest Hubble Space Telescope science discoveries into the classroom. In addition, a new emphasis for her work includes establishing and implementing an E/PO plan and STEM project for the upcoming James Webb Mission. Bonnie's previous professional experience includes serving as an evaluation specialist for the Federal Court Interpreters Project and as an education specialist for the Los Angeles Community College District. In addition, she served as a program evaluation consultant for both state and federal agencies.



KATHRYN FLANAGAN: Deputy Director of the Space Telescope Science Institute

Dr. Kathryn Flanagan is the Deputy Director of the Space Telescope Science Institute (STScI). She is responsible for the Office of Communications and Public Outreach. She is a Senior Scientist and served as head of the Mission Office for the James Webb Space Telescope from 2007 to 2012. In that capacity she was responsible for the development of the Science and Operations Center for this NASA mission. She earned her Bachelor's degree and Ph.D. in Physics at MIT, where she began working in the field of X-ray astronomy, with special interest in supernova remnants and the development of new instruments in space. She became part of the science research staff at the Harvard-Smithsonian Center for Astrophysics and MIT, and has worked on flight instruments for the Einstein Observatory, the Chandra X-ray Observatory, and future X-ray missions. She has been active in education, first as a Peace Corps volunteer teaching math and physics in the Democratic Republic of the Congo, and later as Director for Education and Public Outreach for MIT's Kavli Institute for Astrophysics and Space Research. She has participated in NASA's advisory structure; co-chaired strategic planning documents and served on the Astrophysics Subcommittee. She also participated in the National Academy of Sciences Astronomy and Astrophysics Decadal Survey Astro2010. She was appointed Deputy Director of the STScI in 2012. Photo credit to Rosa Diaz.

MAYA GARCIA: STEM Specialist for the Office of the State Superintendent of Education for D.C.

Maya M. Garcia is the STEM Specialist for the Office of the State Superintendent of Education for the District of Columbia, and was most recently instrumental in the adoption process of the Next Generation Science Standards. She has served nationally on the Committee for Multicultural Equity for National Science Teachers Association, and has recently completed her tenure as the President of the DC Science Teachers Association. She is currently an adjunct professor in the School of Education at American University, in Washington, DC. She is the recipient of numerous awards and fellowships, including a Fulbright Distinguished Teaching Award, in which she studied how South African educators use hands-on, field based learning opportunities to teach STEM science initiatives, and how schools can leverage local resources to support embedded STEM curriculum. In 2010, Ms. Garcia joined the DC STEM Advisory group to help develop a strategic vision for STEM education in DC Public Schools, and participated on the State Science Leadership Team as a teacher leader prior to joining DC' OSSE in 2013. She currently serves on the NRC Science Education Board Committee on Out of School STEM Learning.

**JENNY GUTBEZAHL:** Senior Research Associate at the Center for Youth and Communities at Brandeis University

Jenny Gutbezahl is a Senior Research Associate at the Center for Youth and Communities of the Heller School for Social Policy and Management at Brandeis University, where she oversees and supports research on programs such as the Teen Futures Initiative, AmeriCorps, the FIRST Robotics Challenge, and YouthBuild. Dr. Gutbezahl is a strong proponent of the multi-method approach to research and evaluation: collecting data from multiple sources and using a variety of qualitative and quantitative methods to address research questions. She has worked extensively with NASA's Office of Space Science where she was responsible for evaluating its educational efforts from 1999 to 2008, overseeing the evaluation of a wide range of programs, curricula, museum exhibits, and public outreach efforts. She has also helped to develop or refine education tools and programs for museums, colleges, public school districts, and the Department of Defense.



BETH JOHNSTON: Principal at Endeavour Elementary School

Beth Johnston is the principal at Endeavour Elementary School, an award winning public school which has an emphasis on Science, Space, and Technology. Beth was recently awarded the National Distinguished Principal of the Year award in Washington D.C. representing Utah and she has been honored for her leadership by the Utah Association of Elementary School Principals. Endeavour Elementary is an innovative school serving over 1,100 K – 6 students. The school has used various materials created by the Space Telescope Science Institute to focus on STEM themes, with an emphasis on math and science content. These materials have been shared with other schools and have supported Space Camp, Space Month, "Geek Squad" and Math and Science Olympiads. Endeavour and the Davis School District have continued their partnership with the STScI Education Program.



SHERI KLUG-BOONSTRA: Director of the Arizona State University Mars Education Program

Sheri Klug Boonstra has worked for over a decade as the Director of the ASU Mars Education Program within the Mars Space Flight Facility, School of Earth and Space Exploration at Arizona State University. Ms. Klug Boonstra is the formal education lead for the Mars Public Engagement Team at the Jet Propulsion Laboratory in Pasadena, CA. The ASU Mars Education Program at Arizona State University, in collaboration with JPL, leads the formal education outreach efforts to K-16 teachers and students for NASA's missions to Mars. The ASU Mars Education Program provides hands-on, inquiry-based Mars professional development for K-16 in-service and pre-service educators nationally. Ms. Klug Boonstra serves as the Education and Public Outreach Lead for the ASU NASA Astrobiology Institute Team. She currently serves on the NASA Headquarters Science Mission Directorate - Science Education and Public Outreach Forum Planetary Team advising on K-12 science education efforts. From 2008 to 2010, Sheri Klug Boonstra was the USRA Director and NASA Project Administrator of the NASA Undergraduate Student Research Program (USRP) located at NASA's Johnson Space Center in Houston, TX. Ms. Klug Boonstra previously served as the Education and Public Outreach representative on the Solar System Exploration Subcommittee for NASA Headquarters for 3 years.



FRANCES LAWRENZ: Associate Vice President for Research at the University of Minnesota

Frances Lawrenz is the Associate Vice President for Research at the University of Minnesota and a professor in the Department of Educational Psychology. She has prior administrative experience as Department Chair, Associate Research Dean of the College, and Associate Dean of the Graduate School of the University. Her specialization is science and mathematics program evaluation and she received the international Myrdahl award for outstanding evaluation practice and the international Distinguished Contributions to Science Education award. She has conducted numerous evaluations of NSF projects and programs and has twice served at NSF in a rotator position. She has received College of Education and Human Development recognition as the Wallace Professor of Teaching and Learning and the University wide award for outstanding contributions to graduate education which makes her a member of the University Academy of Distinguished Teachers. She also was selected as a Fulbright scholar to South Africa. She is currently the PI or lead evaluator for 5 federally funded projects and has numerous publications.



JAMES LOCHNER: Universities Space Research Association

Dr. James Lochner has devoted his professional career to astronomy and astronomy education. He has been involved with NASA education programs since 1996. As E/PO Lead for the Astrophysics Science Division at NASA/Goddard, he led the development of both formal and informal education programs, managed the development of a variety of curriculum support materials, and gave numerous educator workshops nationwide. He has also served as the Program Manager for Education and Public Outreach programs within the Science Mission Directorate at NASA. He is currently with USRA as the Director of University Communications and Engagement.

**MORDECAI MAC LOW:** Curator in Astrophysics at the American Museum of Natural History, Adjunct Professor at Columbia

Mordecai Mac Low is a curator and professor in the Dept. of Astrophysics at the American Museum of Natural History, and adjunct professor in the Dept. of Astronomy at Columbia U. He studies the dynamics of circumstellar and interstellar gas in order to understand the formation and evolution of planets, stars and galaxies, primarily using large-scale numerical simulations. He has curated two Space Shows for the Hayden Planetarium (attracting roughly a million visitors a year, including 100K from NYC schools). He helped found and teaches in the Museum's free-standing Master of Arts in Teaching Earth Science program (which includes substantial space science content). Photo courtesy of D. Finnin at AMNH.

**MARIEL MILANO:** Director of Digital Curriculum and Instructional Design for Orange County Public Schools, Florida

Mariel Milano, as Director of Digital Curriculum and Instructional Design for Orange County Public Schools, serves as the program manager for the district's digital curriculum efforts, including the managing of the vertical and horizontal cross-functional governance process and overseeing a team of four innovative instructional design resource teachers. Ms. Milano's team has deployed over 8,000 digital devices to enable anytime, anywhere learning for students at seven local schools. This effort was not only exciting but also garnered promising results with marked improvement to student engagement data including discipline and mobility after one school year. Her team is currently working on plans for expansion of the digital curriculum program using a personalized learning model. Before joining the district's digital curriculum program team, Ms. Milano conducted STEM work in the Curriculum & Instruction department and served as a classroom teacher. Outside of Orange County Public Schools, she has collaborated with Achieve, Inc. to develop the Next Generation Science Standards and has also developed curriculum with local museums and state universities. Ms. Milano received a BS in Early Childhood Education from the University of Central Florida, and is also a part of the Lockheed Martin K-8 Mathematics and Science Academy M.Ed program. She holds endorsements from the Florida Department of Education in Gifted Education, Reading Education, and ESOL Education.



JOHN RISTVEY: Director of the University Corporation for Atmospheric Research (UCAR)

John Ristvey is currently the Director of the UCAR Center for Science Education. In this role, he is responsible for leadership and the day-to-day operation of the Center, including supervision of staff and management of budgets. Large areas of work in the Center include formal education (professional development, instructional materials development), informal education (NCAR Mesa Lab exhibits, school/public programs), Education Technology, and Undergraduate Education (SOARS). Prior to his current position he managed McREL's education and public outreach (E/PO) team. He was responsible for managing the work and resources of multiple contracts including the Planetary Science Education and Public Outreach Forums (SEPOF) led by the Lunar and Planetary Institute, E/PO for NASA's Dawn mission, EPOXI mission and Stardust/NEXT mission. He has also worked on E/PO for NASA's Deep Impact and Genesis missions. John is currently the PI for NanoExperiences a National Science Foundation (NSF)-funded ITEST grant that developed an out-of-school-time (OST) program that combines academic learning in emerging STEM content with additional supports—setting high expectations, building background knowledge, and motivating students—to prepare high school Career and Technical Education (CTE) students for postsecondary learning and credentials leading to participation in the STEM workforce. He was the Co-Principal investigator for Visualizing Science with Adapted Curriculum Enhancements grant with the US Department of Education as well as Co-Principal Investigator for Cosmic Chemistry: Engaging Summer Learning for High School Students sponsored by the US Department of Education. He has co-written two online courses and has co-facilitated an online professional development coursework in Earth Systems Science for middle school teachers in partnership with the Colorado School of Mines and IGES.



HOLLY RYER: Education Specialist at the Space Telescope Science Institute

Holly Ryer is an Education Specialist at the Space Telescope Science Institute (STScI) in Baltimore, Maryland, and has been a member of the Office of Public Outreach's education team since 2006. As an Education Specialist, Holly's responsibilities include assisting with the development of curriculum support tools for the K-14 community and researching national and state-level education standards. She specializes in aligning curriculum support tools to national education standards for STScI and the product analysis team for NASA Wavelength. She also assists with evaluation projects, and is responsible for the maintenance of files, records, and databases for the HST Cycle E/PO Grant Program. Holly is a former elementary level classroom teacher with eight and a half years of experience teaching in Baltimore area schools. During that time, she served on various committees, worked in teams to develop district-level curriculum, and participated in the scoring of the Maryland State Performance Assessment Program.



SAM SHAW: Team Leader - Division of Learning and Instruction, South Dakota Department of Education.

Sam has served as the State Science education specialist for four years and has recently moved to a Team Leader position to oversee professional learning and standards development. He has developed initiatives involving teacher trainings to build instructional capacity. His current operations include advising state and national grants, online learning, Advanced Placement, remediation, and implementing statewide professional development. His role as Team Leader within the Department of Education allows him to stay informed and consult with parties involved in research and initiatives in not only K-20 science education, but also in all other core subject areas. He has regular presentations at both the National and State Science Teacher Associations and has recently presented to the National Research Council committees of "Literacy for Science" and also "Building a Science Teacher Learning Continuum." Sam led South Dakota's NGSS work as a lead state, coordinated a South Dakota workgroup to create science standards based on *A Framework for K-12 Science Education*, and is currently staging long-term plans for professional development for South Dakota teachers. He is also serving as 1st year Director for the Council of State Science Supervisor where he acts as Board Liaison for the Committee on Professional Learning.



CASSANDRA SOEFFING: K-12 Science Education Specialist, Institute for Global Environmental Strategies

Ms. Soeffing has been an IGES employee since 2009, where she leads K12 educational activities related to the NASA Earth Science Education and Public Outreach Forum. Her NASA Earth Forum work includes leading a working group on K-12 education and professional development on the Next Generation Science Standards (NGSS) for NASA science education product developers. She is an accomplished science educator, with 30 years teaching experience as a middle school teacher in Sioux Falls, South Dakota, and a strong background in Earth science, education and leadership. She is proactive in integrating and supporting the use of geoscience technologies in K-12 education and teacher professional development programs. Ms. Soeffing has demonstrated solid abilities in leading, developing, planning, implementing and assessing innovative programs for the middle school through graduate school levels. She is active in several professional associations, and currently on the board of directors for the National Earth Science Teachers Association (NESTA), and has given numerous presentations on GIS, remote sensing, 3D spatial technologies and GPS. Ms. Soeffing has completed numerous professional development programs and institutes, including NSTA institutes related to the NGSS, the American Meteorological Society's Project DataStreme, NOAA Teacher at Sea, and the Center for Image Processing Education. She has accumulated numerous professional accomplishments, including the following awards and recognition: Albert Einstein Distinguished Educator Fellowship Award, Presidential Award for Excellence in Science and Mathematics Teaching, Bush Leadership Fellowship Award, and the NASA Space Grant Fellow.

**MICHELLE THALLER:** Assistant Director of Science at NASA's Goddard Spaceflight Center

Dr. Michelle Thaller is a nationally recognized spokesperson for astronomy and science, and the Assistant Director of Science at NASA's Goddard Spaceflight Center. Michelle has a Bachelor's in astrophysics from Harvard, and a Ph.D. from Georgia State University. After a post-doctoral research fellowship at Caltech, Michelle became particularly interested in public outreach and science communication and served as the public outreach lead for the Spitzer Space Telescope at NASA's Jet Propulsion Laboratory before moving to Goddard. She is currently serving a one-year leadership fellowship in the Science Mission Directorate at NASA Headquarters in D.C. Michelle is one of the regular hosts of "The Universe," series on the History Channel, NatGeo's "the Known Universe" and Discovery Science Channel's "How the Universe Works," and "The Stripped Universe." She also serves as a science advisor for John and Hank Greene's Crash Course series on PBS Home Video, which reaches several million online viewers each month. She has received several high profile awards for on-line science journalism and science leadership. Behind the scenes, Michelle has led efforts to develop high-quality apps for smartphones and tablets, as well as involve NASA missions in social media. In her current role, Michelle represents all of NASA's science themes, from Earth science and climate change, the Sun and space weather, solar system exploration, all the way out to cosmology and the deep universe.

**BELINDA WILKES:** Director, Chandra X-Ray Center

Dr. Wilkes is the Director of the Chandra X-Ray Center. Her primary science interests are X-ray and multi-wavelength studies of quasars along with lower luminosity active galactic nuclei. She has successfully competed for observing time on three of NASA's Great Observatories -- Chandra, the Hubble Space Telescope, and the Spitzer Space Telescope -- as well as many other space- and ground-based facilities. She has served on many committees including the AAS HEAD Executive Committee, the Astrophysics Subcommittee of the NASA Advisory Council, the NRC Review Panel on NASA's SMD Science Plan, and various user, advisory, and review committees for space and ground-based telescopes. She is a Fellow of the Royal Astronomical Society and the Cambridge Philosophical Society, and a member of the American Astronomical Society and the International Astronomical Union. She has received several NASA Achievement awards, the NASA MSFC Director's Commendation, and many Smithsonian Institution awards including the Exceptional Accomplishment Award.

Poster Presenters



NANCY ALIMA ALI: Coordinator of Public Programs at Multiverse at the Space Sciences Lab

Nancy Alima Ali, M.Ed., is a Coordinator of Public Programs at Multiverse at the Space Sciences Lab at the University of California, Berkeley. For over 15 years, Ms. Ali has been active in both formal and informal education as a classroom teacher, college instructor, museum educator, curriculum developer and program manager. She is the Principal Investigator of the NASA-funded "Five Stars Pathway" project, the Education/Public Outreach Lead of the THEMIS-ARTEMIS mission, a content contributor to the "Calendar in the Sky" project and leads the diversity professional development team for NASA's Science Mission Directorate Education/Public Outreach. Prior to joining the Multiverse team, she served as the Science Education Manager at Bishop Museum in Honolulu, Hawaii. Ms. Ali also managed the Imaginarium planetarium and taught archaeoastronomy at Windward Community College in Kaneohe, Hawaii. A graduate of Lesley University in Cambridge, Massachusetts, her Master of Education thesis focused on integrating astronomy and culture in informal education settings. Ms. Ali has a particular interest in projects that explore the ways in which multiple worldviews contribute to our understanding of the cosmos.

**LINDSAY BARTOLONE:** Education and Public Outreach Lead for NASA's Interstellar Boundary Explorer Mission, Southwest Research Institute

Lindsay Bartolone serves as the Education and Public Outreach Lead for NASA's Interstellar Boundary Explorer Mission. She manages a national team of partners to share the exploration and discovery aspects of the mission in ways which make the science relevant to the learner. She leads a number of activities related to this mission including the creation of a nationally field tested integrated space science curriculum guide for grades 6-8 (with GEMS and the Learning Design Group at Lawrence Hall of Science), teacher professional development and after school club program, an internationally distributed digital planetarium show, a kit of educational materials to support the show in museums, the creation of materials for people with visual impairment and a website and social media effort. Lindsay Bartolone is also Co-I on two of NASA's Science Education and Public Outreach Forums: Astrophysics and Heliophysics. These teams of Education and Public Outreach Professionals are formed to increase the awareness, knowledge, and understanding of scientists, researchers, engineers, technologists, educators, product developers, and dissemination agents of best practices, existing NASA resources, and community expertise applicable to E/PO. By coordinating and supporting the NASA E/PO community, the NASA SEPOF partnerships will lead to more effective, sustainable, and efficient utilization of NASA science discoveries and learning experiences. Lindsay Bartolone was a part of Adler Planetarium's Education Dept. for 14 years, and participated in a number of museum project and program teams.

**DAVID BEGAY:** VP of the Indigenous Education Institute

Dr. David Begay is VP of the Indigenous Education Institute located in Friday Harbor, WA and Santa Fe, NM. He is currently working on the NASA project "Imagine Mars Through Indigenous Eyes," connected to MAVEN in coordination with UC Berkeley, Space Sciences Laboratory. He is co-author of "Sharing the Skies: Navajo Astronomy, A Cross Cultural View." He is Co-PI of the NSF funded "Native Universe - Indigenous Voice in Science Museums." He is PI of the NASA funded "Navajo Sky: Education Modules for Digital Planetariums." Dr. Begay is adjunct faculty at Northern Arizona University, Flagstaff, in the Department of Physics and Astronomy and Associate Research Professor in the Department of Pharmacy, University of New Mexico. He is a cultural consultant to many organizations and corporations in the United States and internationally. He is raised with the deep cultural knowledge, tradition, and language of his people as a member of the Navajo Nation.



LIN CHAMBERS: Science Directorate at NASA Langley Research Center

Dr. Lin H. Chambers is a physical scientist in the Science Directorate at the NASA Langley Research Center where she has worked for more than 30 years. She received her Ph.D. in Aerospace Engineering from North Carolina State University in 1991. Dr. Chambers has worked in a variety of radiative transfer applications, including nonequilibrium flows and cloud inhomogeneity effects. She is a member of the Clouds and the Earth's Radiant Energy System (CERES) Science Team. Her research activities have focused on assessing the effect of inhomogenous cloud cover on satellite remote sensing and cloud/radiation parameterizations, as well as on better understanding the radiative properties of Tropical cloud systems. Previously she developed methods to predict nonequilibrium radiative heating of vehicles entering planetary atmospheres. Dr. Chambers is director of the outreach component of the CERES project, the Students' Cloud Observations On-Line (S'COOL) Project, was the Contrail Scientist for the GLOBE program and currently leads a GLOBE partnership at NASA Langley, and leads the MY NASA DATA project to make real NASA Earth-observing data accessible to the K-12 and citizen science communities. From 2009-2013 she served as the Project Scientist for the NASA Innovations in Climate Education project.

**TROY CLINE:** Education and Public Outreach Lead for the Magnetospheric Multiscale Mission

Troy Cline is currently the Education and Public Outreach Mission Lead for the Magnetospheric Multiscale (MMS) mission. He is responsible for mission level public outreach activities and coordination of overall EPO efforts. His responsibilities include planning, coordinating, implementing, and managing the MMS mission's outreach activities to meet NASA's EPO goals and guidelines. He also serves as the Educational Technology Integration Specialist for NASA's Sun-Earth Day, Space Weather Living History program and Space Weather Action Center program. His research based approach lead to the development of a new education products designed to help students learn about NASA's MMS mission, magnetism, solar power and space weather through a variety of inquiry and engineering design methods. Many of these projects are enhanced through model building and digital fabrication: the translation of digital designs into physical objects via 2D and 3D printing. He continues to lead his teams in educational technology applications, social media and podcasting.

**ANITA DAVIS:** Lead of the Earth to Sky Interagency Partnership, Sigma Space

Anita has over 25 years of experience as an education specialist, approximately half with NASA and half with National Park Service. Anita began working with NASA's education and outreach efforts in Earth science, in 2000, serving as a coordinator for informal education across the agency. She later lead the award-winning NASA Landsat satellite mission Education and Public Outreach team in public outreach efforts; classroom and teacher training materials; designing and conducting teacher workshops; and hosting and mentoring Tribal college interns. In 2004 Anita joined with Ruth Paglierani (UC Berkeley) to lead the Earth to Sky NPS-NASA-USFWS interagency partnership, and now devotes 100% of her energy to interagency work on behalf of NASA's Earth Science Education, primarily on Earth to Sky. Prior to her work with NASA, Anita worked in Interpretation and Visitor Services for the National Park Service (NPS). At Grand Canyon National Park she created and produced interpretive programs and products, serving as liaison between the science and interpretive communities, and conducted interpretation training with special emphasis on science content. On a one-year detail as the NPS Liaison to NASA, she initiated and coordinated an Introduction to Remote Sensing pilot course for NPS and US Fish and Wildlife Service, held at the National Conservation Training Center, and provided NASA science content to interpreters across the nation through a variety of venues.



DORIAN JANNEY: Formal Education Specialist for the Global Precipitation Measurement Mission

Dorian Janney is the Formal Education Specialist for the Global Precipitation Measurement (GPM) Mission. She retired from teaching after three decades, and currently works fulltime at the NASA Goddard Space Flight Center, Greenbelt, MD. Her work involves developing educational activities that help to communicate the science and engineering of the GPM mission to the public in both formal and informal settings, and coordinating these efforts with a wide variety of education professionals across the country. Dorian taught for thirty-three years across multiple grade levels and with diverse groups of students. She was selected to head the science department for a new middle school program that focused on astronomy and aerospace technology. Dorian achieved her National Board Certification in Science, was an Einstein Fellow finalist, and served on many educational projects with NSTA, JHU, MD Space Grant, and several other organizations. She has a B.S. in General and Special Education from the University of Maryland, a M.S. in Special Education at the Early Childhood level from the University of Houston, a second M.S. from Johns Hopkins University in Teaching Earth/Space Sciences, and some doctoral level work in Science Curriculum and Instruction from the University of Maryland.



ANDREA JONES: Education Specialist at the Planetary Science Institute

Andrea Jones is an Education Specialist at the Planetary Science Institute, based out of NASA's Goddard Space Flight Center in Greenbelt, Maryland. She conducts education and public outreach (E/PO) activities for NASA Earth and planetary science missions and programs. Jones is the E/PO Lead for the Lunar Reconnaissance Orbiter and E/PO co-Lead for the Sample Analysis at Mars (SAM) instrument team of the Mars Science Laboratory Curiosity rover. She is the Informal Education Lead for the NASA Earth Science E/PO Forum, and represents both the NASA Earth and Planetary Science E/PO Forums on a Diversity Task Force. Jones leads the E/PO program for the NASA Solar System Exploration Research Virtual Institute (SSERVI) teams, Field Investigations to Enable Solar System Science and Exploration (FINESSE) and Remote, In Situ, and Synchrotron Studies for Science and Exploration (RIS4E). She is also a member of the SSERVI Dynamic Response of Environments at Asteroids, the Moon, and moons of Mars (DREAM2) E/PO team. Andrea Jones received her undergraduate degree in Geology from the College of William & Mary, and a Master's degree in Geosciences, with a focus in planetary geology, from the University of Arizona.



KELIANN LaCONTE: Informal Education lead at the Lunar and Planetary Institute

Keliann LaConte leads the Lunar and Planetary Institute's informal education efforts, including developing educational materials for use in out-of-classroom learning experiences and conducting training events. Keliann received her B.S. in chemistry from the University of Denver and her M.S. in environmental science and engineering from Caltech. She began helping others connect to the wonders of the natural world during her previous work as a park naturalist and museum and aquarium docent.



KATHLEEN LESTITION: Education and Outreach program Lead for NASA's Chandra X-Ray Observatory

Kathleen Lestition is the lead of the education and outreach program for NASA's Chandra X-ray Observatory located at the Smithsonian Astrophysical Observatory's Chandra X-ray Center. She joined the Chandra program in 1986 at its Phase A/B stage. In 1996 she drew on her training and prior experience in education to write the development and implementation plan for the comprehensive Chandra education and outreach program which she has managed since.



NANCY C. MARYBOY: Executive Director of the Indigenous Education Institute

Dr. Nancy C. Maryboy is the Executive Director of the Indigenous Education Institute, located in Friday Harbor, WA and Santa Fe, NM. She is the PI of the NSF funded "Native Universe - Indigenous Voice in Science Museums." She is Co-PI of the NASA funded "Navajo Sky: Education Modules for Digital Planetariums." She is also Co-PI of the NSF funded project "Conference Support: Indigenous Views in Informal Science Education (I-WISE): Integration, Synthesis, and Opportunity." She was the PI of the NSF project "Cosmic Serpent: Bridging Native Ways of Knowing and Western Science in Science Museums." She is working on the NASA project "Imagine Mars Through Indigenous Eyes," connected to MAVEN. She is co-Author of "Sharing the Skies: Navajo Astronomy, A Cross Cultural View." Maryboy teaches Indigenous Astronomy for the Dept. of Physics and Astronomy at Northern AZ University. She is Cherokee and Navajo.



TONY MURPHY: Director of the GLOBE Program

Dr. Tony Murphy is the Director of The GLOBE Program Implementation Office in Boulder, Colorado. Murphy has been associated with GLOBE since its inception in 1995, as a National Oceanic and Atmospheric Administration (NOAA) Knauss Policy Fellow, and has served as Director since October 1, 2012. Prior to coming to GLOBE, he served as founding Executive Director of the National Center for STEM Elementary Education at St. Catherine University in St. Paul, Minnesota. Murphy is internationally known for his work in STEM education. Hailing from Ireland, where he earned his undergraduate and MA graduate degrees at the University of Limerick, he moved to the United States to complete his Ph.D. studies in Science and Environmental Education at Ohio State University and, in the process, learned first-hand the value of international experience in shaping a global perspective.



LUISA REBULL: Associate Research Scientist at the Spitzer Science Center

Luisa Rebull received her PhD from the University of Chicago in 2000. After a post-doc at JPL, she took a staff scientist job at the Spitzer Science Center (SSC), at the Infrared Processing and Analysis Center (IPAC), Caltech. Now an associate research scientist, she has most recently been working with the vast archives of data at the Infrared Science Archive (IRSA), also part of IPAC. She has more than 90 refereed astronomy publications. She has been doing education and outreach, formal and informal, paid and unpaid, for nearly 20 years. A unifying thread through many of those efforts has been working with teachers to share the experience of real research. Most recently, she has been running the NASA/IPAC Teacher Archive Research Program (NITARP; 2009-date), which grew out of the Spitzer Teachers Project (2004-2008). This program partners small groups of educators with a research astronomer for a yearlong authentic research project. Her poster will share information about NITARP.



DANIELLA SCALICE: Education, Outreach, and Communication lead for the NASA Astrobiology Institute at NASA Ames Research Center

Since 2000, Daniella Scalice has been the Education, Outreach, and Communication Lead for the NASA Astrobiology Institute at NASA Ames Research Center. As such she manages NAI's extensive portfolio of educational projects, oversees curriculum and website development, provides content to media and educational outlets, and delivers programs to educators and students all over the world. In 2005, Daniella developed the NASA and the Navajo Nation project, an ongoing, NASA-funded initiative wherein cultural and scientific knowledge about our origins are brought together into new classroom materials for Navajo teachers and summer field camps for Navajo students. Daniella believes these two ways of knowing the world have more in common than not, but leaves the making of connections between the two up to the learner. In 2011, Daniella began managing the FameLab initiative for the NASA Astrobiology Program – the first ever in the United States! Akin to American Idol (but for scientists), FameLab builds communication skills for early career scientists within the unique construct of an international competition. In 2012, Daniella began working with an educational evaluation specialist to create a grassroots system to improve the impact of STEM education projects by building capacity in evaluation among STEM education practitioners. After rigorous testing of the system, its efficacy has been validated and it is actively deployed in STEM education projects across NASA and elsewhere.

Committee Members

CO-CHAIR

PHILIP R. CHRISTENSEN is a Regents Professor at Arizona State University. He is also the Ed and Helen Korrick Professor in the School of Earth and Space Exploration. His research interests focus on the composition, processes, and physical properties of Mars, Earth, and other planetary surfaces. Dr. Christensen uses spectroscopy, radiometry, field observations, and numerical modeling to study the geology and history of planets and moons. A major facet of his research is the design and development of spacecraft instruments. He has built five science instruments that have flown on NASA's Mars Observer, Mars Global Surveyor, Mars Odyssey, and the Mars Exploration Rover missions. Over the past decade he has studied urban environments and growth worldwide using satellite data and has developed an extensive K-12 education and outreach program to bring the excitement of science and exploration into the classroom. Dr. Christensen was awarded NASA's Exceptional Scientific Achievement Medal in 2003, NASA's Public Service Medal in 2005, and the G.K. Gilbert Award of the Geological Society of America in 2008. He is a fellow of the American Geophysical Union and the Geological Society of America. He received his Ph.D. in geophysics and space physics from the University of California, Los Angeles. Dr. Christensen currently serves as the chair of the NRC's Committee on Astrobiology and Planetary Science and has previously served as a member of the NRC Committee on Planetary and Lunar Exploration and as chair of the Planetary Science Decadal Survey's Mars Panel.

CO-CHAIR

BRETT D. MOULDING is the director of the Utah Partnership for Effective Science Teaching and Learning. Mr. Moulding was the state science education specialist and coordinator of curriculum and then director of the curriculum and instruction before retiring in 2008. Mr. Moulding taught chemistry for twenty years at Roy High School in the Weber School District and served as the district teacher leader for eight years. Mr. Moulding also served on the Board at the Triangle Coalitional, the NAEP 2009 Framework Committee, and was the President of the Council of State Science Supervisors from 2003–2006. He was a member of the National Research Council's Board on Science Education and a member of the committee who authored A Framework for K–12 Science Education. He subsequently served as a writing team leader for Achieve's Next Generation Science Standards. Mr. Moulding has received the Governor's Teacher Recognition Award, the Presidential Award for Excellence in Mathematics and Science Teaching and the Award of Excellence from the Governor's Science and Technology Commission. He graduated from the University of Utah with a B.S. in chemistry with minors in biology, math and physics. He has a M.S. in curriculum and instruction from Weber State University and an Administrative Supervisory Certificate from Utah State University. Most recently, he has served on the NRC's Committee on Conceptual Framework for New Science Education Standards and the Board on Science Education.

ALBERT BYERS is the associate executive director of Services at the National Science Teachers Association (NSTA). Prior to NSTA, Dr. Byers worked as an aerospace education specialist at NASA Goddard Space Flight Center. At NSTA, Dr. Byers provides strategic oversight and executive management of NSTA services that include the production, delivery, and evaluation of large scale blended learning solutions that include NSTA conferences, competitions, summer academies and institutes, the NSTA Learning Center e-learning portal, SciLinks and government partnerships. The NSTA Learning Center has over 150,000 active users spending hours online each week in self-directed learning experiences in collaboration with 90 school districts and 39 universities across the country. NSTA's five annual conferences reach 18,000-20,000 individuals per year across 16 programming days, and teacher and student competitions reach tens of thousands annually. Dr. Byers serves on the primary technical

working group for the US Department of Education's online communities of practice efforts, and was previously a delegate for the US Department of Education at the Asian Pacific Economic Cooperation Summit, and as an expert panelist for the National Assessment of Education Progress Science Framework Prioritization working group. Dr. Byers earned his Ph.D. in science education from Virginia Polytechnic Institute and State University. He has no prior NRC experience.

HEIDI B. HAMMEL is executive vice president at the Association of Universities for Research in Astronomy (AURA). Previously she served as a senior research scientist with the Space Science Institute, an independent research and education organization based in Boulder, Colorado. Her primary research interests are the outer planets and their satellites, with a specific focus on observational techniques. Dr. Hammel is a leading expert on the planet Neptune and was a member of the Imaging Science Team during the Voyager 2 spacecraft's encounter with that planet in 1989. For the impact of Comet Shoemaker-Levy 9 with Jupiter in July 1994, Dr. Hammel led the Hubble Space Telescope (HST) team that investigated Jupiter's atmospheric response to the collisions. Her latest research has focused on the imaging of Neptune and Uranus with the HST and on ground-based observations of Uranus. Dr. Hammel is the recipient of many awards, including the 1996 Urey Prize from the American Astronomical Society's Division for Planetary Sciences (AAS/DPS) and the San Francisco Exploratorium's 1998 Public Understanding of Science Award. More recently, Dr. Hammel was elected a fellow of the American Association for the Advancement of Science in 2000 and received the AAS/DPS's Sagan Medal for outstanding communication by an active planetary scientist to the general public in 2002. In addition, Asteroid 1981 EC20 has been renamed 3530 Hammel in her honor. She received her Ph.D. in astronomy and astrophysics from the University of Hawaii. She has served on the NRC Committee on Planetary and Lunar Exploration and on the Panel on Solar System Exploration of the Committee on Priorities for Space Science Enabled by Nuclear Power and Propulsion: A Vision for Beyond 2015. In addition to serving on the Space Studies Board, Dr. Hammel served as chair of the Giant Planet Panel of the NRC's Planetary Science Decadal Survey and most recently, as a member of the Space Studies Board.

WESLEY L. HARRIS (NAE) is the Charles Stark Draper Professor of Aeronautics and Astronautics and Associate Provost at Massachusetts Institute of Technology. He is a former NASA associate administrator for aeronautics responsible for all aeronautics programs, facilities, and personnel (1993-1995). Prior to NASA, he was the University of Tennessee Space Institute's vice president and chief administrative officer. His academic research with unsteady aerodynamics, aeroacoustics, rarefied gas dynamics, sustainment of capital asset, and chaos in sickle cell disease have made seminal contributions in these fields. As an elected fellow of the AIAA and of the AHS, Dr. Harris was recognized for personal engineering achievements, engineering education, management, and advancing cultural diversity. He is also an elected member of the National Academy of Engineering, the Cosmos Club, and the Confrérie des Chavaliers du Tastevin. He earned his Ph.D. in aerospace and mechanical sciences from Princeton University. Dr. Harris currently serves on the NRC's Laboratory Assessments Board, the Panel on Mechanical Science and Engineering at the Army Research Laboratory, and is the chair of the Committee on Review of Army Research Laboratory Programs for Historically Black Colleges and Universities and Minority Institutions.

CHARLES F. KENNEL (NAS) is a distinguished professor of atmospheric science emeritus in the Scripps Institution of Oceanography at the University of California, San Diego (UCSD). Dr. Kennel was the founding director of the UCSD Environment and Sustainability Initiative, an all-campus effort embracing teaching, research, campus operations, and public outreach, and is now chair of its international advisory board. His research covers plasma physics, space plasma physics, solar-terrestrial physics, plasma astrophysics, and environmental science and policy. He is a member of the National Academy of

Sciences, the American Academy of Arts and Sciences, the American Philosophical Society, and the International Academy of Astronautics. He was a member of the NASA Advisory Council from 1998 to 2006, its chair from 2001-2005, and is presently chair of the California Council on Science and Technology. He has had visiting appointments to the International Centre for Theoretical Physics (Trieste), the National Center for Atmospheric Research (Boulder), the Ecole Polytechnique (Paris), California Institute of Technology (Pasadena), Space Research Institute (Moscow), and the University of Cambridge (U.K.). He is a recipient of the James Clerk Maxwell Prize (American Physical Society), the Hannes Alfven Prize (European Geophysical Society), the Aurelio Peccei Prize (Accademia Lincei), and the NASA Distinguished Service and Distinguished Public Service Medals. He was the 2007 C.P. Snow Lecturer at Christ's College, Cambridge (U.K.). He earned his Ph.D. in astrophysical sciences from Princeton University. Dr. Kennel has served on numerous NRC committees and boards including the 2010 astronomy and astrophysics decadal survey follow-on—the Panel on Implementing Recommendations from New Worlds, New Horizons Decadal Survey. Dr. Kennel most recently served as chair of the NRC's Space Studies Board.

JAMES MANNING is a consultant. He was the former head of the Office of Public Outreach at the Space Telescope Science Institute and the former executive director of the Astronomical Society of the Pacific. Mr. Manning has spent 39 years working in science education and public outreach, in production, presentation, teaching, and administration. For nearly three decades he worked at planetariums at the University of North Carolina, Parkland College, and Montana State University/Museum of the Rockies, developing and opening the latter two and serving as their director. His work included planetarium production and presentation, exhibit and program development, teacher professional development, and facility management. He also served a term as president of the International Planetarium Society. He has served on the astrophysics subcommittee of the NASA Advisory Council, and he continues to consult on NASA Science Mission Directorate Education and Public Outreach efforts through the Astrophysics Science Education and Public Outreach Forum. He earned his M.A. in physics and astronomy from the University of North Carolina. He has no prior NRC experience.

RICHARD A. MCCRAY (NAS) is a visiting scholar at the University of California, Berkeley. He is also the George Gamow Distinguished Professor of Astrophysics, emeritus, at the University of Colorado, Boulder (UCB). Dr. McCray's research is in the theory and observations of the dynamics of the interstellar gas and cosmic X-ray sources, supernovae, and supernovae remnants. Prior to UCB, he was an assistant professor at the Harvard College Observatory, and he has held visiting positions at the NASA Goddard Space Flight Center, Beijing University and Nanjing University, the Space Telescope Science Institute, Columbia University, and the University of California at Berkeley. In 1983 Dr. McCray was awarded a Guggenheim Foundation Fellowship and in 1990 he received the Dannie S. Heinemann Prize for Astrophysics of the American Physical Society. In 1989 he was elected to National Academy of Sciences, and his citation notes that "he is widely recognized as the world leader in theoretical x-ray astronomy." In 1996 he was appointed concurrent professor of astronomy at Nanjing University. In 2002 he was awarded the National Science Foundation Director's Award for Distinguished Teaching Scholars. Dr. McCray earned his Ph.D. in theoretical physics from the University of California, Los Angeles. He is currently serving on the NRC's International Temporary Nominating Group for Class 1: Physical and Mathematical Sciences. His numerous prior committee service also includes the Board on Science Education, the Chair of Section: 12 Astronomy, and the Space Studies Board.

MITCHELL NATHAN is a professor in the Department of Educational Psychology at the University of Wisconsin–Madison(UW-Madison). At UW-Madison he also served as director of the Center on Education and Work, and as faculty member for the Latin American School for Education, Cognitive, and

Neural Sciences. He holds affiliate appointments in the UW-Madison Department of Curriculum and Instruction, Department of Psychology, and Wisconsin Center for Education Research. In research and development in artificial intelligence, computer vision, and robotic mobility, he has worked on the design and development of autonomous robotic arms and vehicles; the development of expert systems and knowledge engineering interview techniques; and the representation of perceptual and real-world knowledge to support inference making in dynamic environments. He has also worked on computer-based mathematics tutoring that relies heavily on students' comprehension processes for self-evaluation and self-directed learning (so-called unintelligent tutoring systems). Dr. Nathan directed the project Supporting the Transition from Arithmetic to Algebraic Reasoning (STAAR; funded by the Interagency Education Research Initiative, IERI), which studied the transition from arithmetic to algebraic reasoning. He is co-principle investigator for both the AWAKEN Project ("Aligning educational experiences with WAys of Knowing ENgineering"), which documents how people learn and use engineering, and the National Center for Cognition and Mathematics Instruction. He is a member of the steering committee for the Delta Program, which promotes the development of a national faculty in the natural and social sciences, engineering, and mathematics that is committed to implementing and advancing effective teaching practices for diverse student audiences. He received his Ph.D. in experimental (cognitive) psychology and holds a B.S. in electrical and computer engineering, mathematics, and history. He previously served as a member of the NRC committee Toward Integrated STEM Education: Developing a Research Agenda.

PATRICIA H. REIFF is professor in the Department of Space Physics and Astronomy at Rice University. Dr. Reiff has been involved in space plasma physics research for over 40 years, with interests in magnetospheric convection, magnetosphere-ionosphere coupling, plasma particle acceleration mechanisms, and solar wind control of the magnetosphere and ionosphere of the Earth and Mercury. She was a co-investigator on the Dynamics Explorer, Polar and IMAGE Missions, was a co-investigator for both science and public outreach for the PEACE electron spectrometer on Cluster II, is EPO lead for the MMS mission, and was on the EPO team for the Center for Integrated Space Weather Modeling. She provides real-time space weather alerts to about 1,000 subscribers. She has served as director for public education and teacher enhancement projects for over 25 years. Her "Space Update" software has been used by over a million visitors at over 15 museums, and together with "Earth Update" and "Space Weather" has been distributed to over 300,000 educators and learners. Her project "Immersive Earth", in cooperation with the Houston Museum of Natural Science, created a full-dome digital planetarium that shows teaching Earth science, and has created a portable planetarium system "Discovery Dome" to teach Earth and Space Science through immersive digital theater, that is now in over 220 sites in 33 countries and 33 states. These projects have spun off two companies, Space Update, Inc. and MTPE to distribute educational materials and portable planetariums. She has served as editor or associate editor for *EOS*, *Journal of Geophysical Research*, *Reviews of Geophysics* and served on the editorial board of *Space Weather*. She has served on advisory committees for the NSF, NASA, the National Academy of Sciences, the AAU, Goddard Space Flight Center, UCAR, and Los Alamos, and on the NASA E/PO MOWG. She has served as Chair of the Council of Institutions of the Universities Space Research Association and serves on the SPA Public Education Committee for the AGU. She was elected to the Cosmos Club in 1992, was selected as a Fellow of the American Geophysical Union in 1997, and received the AGU "Athelstan Spilhaus Award" for public education in 2009. She received the "Aerospace Educator Award" from Women in Aerospace in 1999 and the Service Award from NARS in 2004. She received NASA "Group Achievement" awards for the IMAGE, GGS and Cluster missions, and was an organizer for the World Space Congress in 2002. In 2013 she received the first-ever "Space Physics and Aeronomy Richard Carrington" (SPARC) award from the AGU. She has led many teacher workshops and scientific tours. In addition to training twelve PhD's, she created a "Master of Science Teaching" degree, with 27 teacher

alumni as of 2014. Dr. Reiff earned her Ph.D. in space physics and astronomy at Rice University. She has previously served as a member on the NRC Committee on Solar-Terrestrial Research and as chair of the Panel on the International Magnetospheric Study.

THERESA SCHWERIN is founding officer and vice president of Education Programs for the Institute for Global Environmental Strategies (IGES). She has over 20 years of experience in the areas of science applications and education, communication, and information science. She leads IGES education initiatives, particularly the NASA Earth Science Education and Public Outreach Forum, IGES science contests for students, the Earth System Science Education Alliance (ESSEA), a NASA-NOAA-NSF sponsored project providing professional development for K-12 teachers, NASA Earth and Space Science Education Product Review, and a variety of NASA professional development and communication activities. She is also a key leader of nasawavelength.org - a digital library developed by IGES with the University of California, Berkeley. Wavelength provides robust tools for science educators - K-12, higher education and out-of-school - for searching, browsing and creating custom pathways and collections from NASA's Science Mission Directorate portfolio of over 2,000 educational resources, in ways that are most meaningful for educators. Ms. Schwerin has led a wide range of new efforts for organizations such as NASA, NOAA, the United Nations, WGBH Education Foundation, and the former Japanese National Space Development Agency (now part of the Japanese Aerospace Exploration Agency, or JAXA). Her work has led to the planning, development and implementation of international and national education programs, products, workshops, reviews, and conferences. Ms. Schwerin is a member of the American Geophysical Union, the National Science Teachers Association, Astronomical Society of the Pacific, American Association for the Advancement of Science and the American Library Association. Ms. Schwerin's related education experience also includes conducting children's programs in a public library system. Ms. Schwerin holds a M.S. in library and information science from the University of Maryland and a B.S. in sociology from the College of Charleston. Ms. Schwerin has had no prior NRC committee service.

Sharing the Adventure with the Student: Exploring the Intersections of NASA Space Science and Education

Statement of Task

An ad hoc committee will plan and conduct a workshop to discuss maximizing the effectiveness of the transfer of knowledge from the scientists supported by NASA's Science Mission Directorate (SMD) to K-12 students directly and to teachers and informal educators. In addition, the connection between these SMD efforts and the implementation of the National Science and Technology Council's Committee on Science, Technology, Engineering, and Mathematics (CoSTEM) STEM Education Strategic Plan will be discussed.

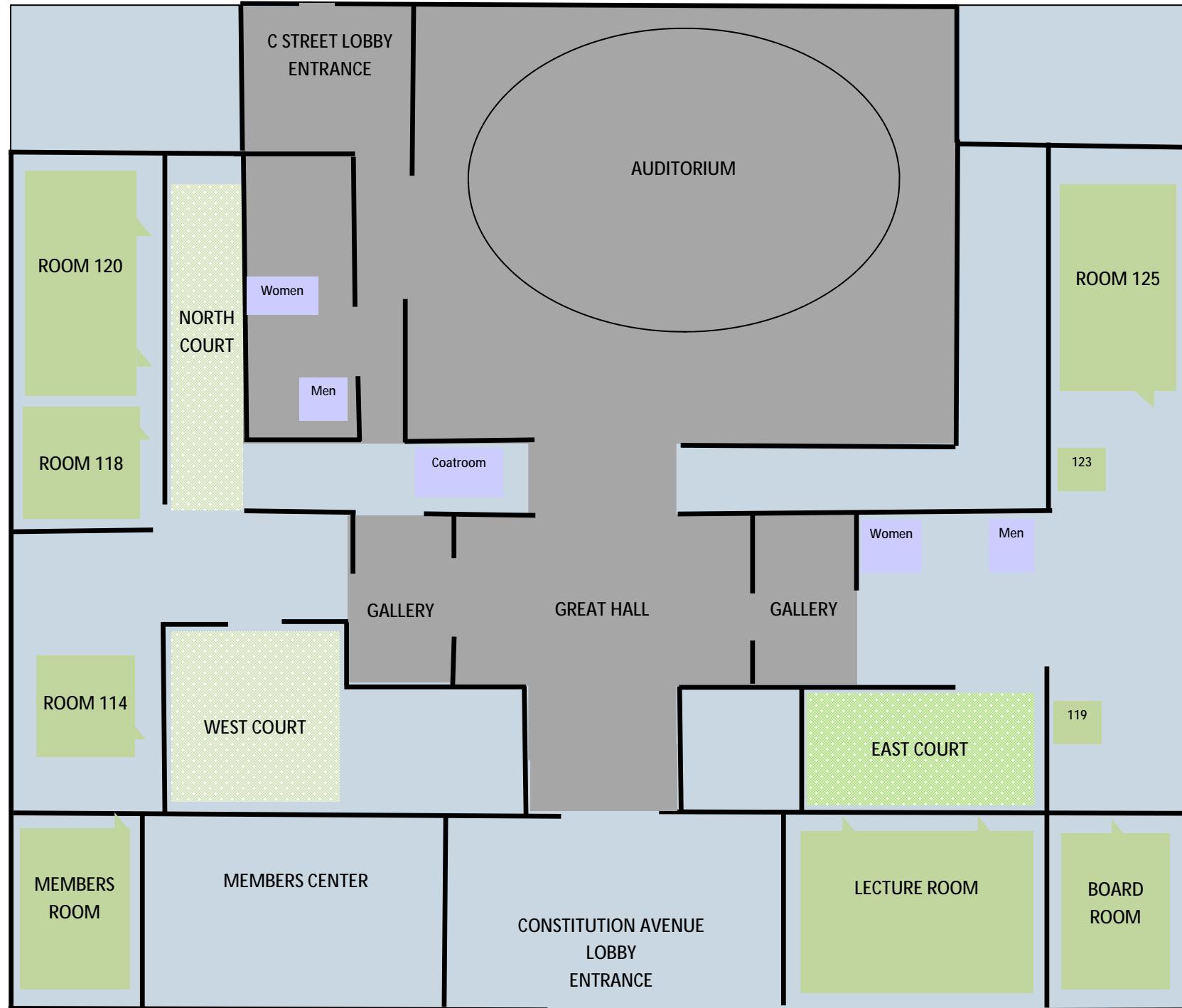
The workshop will focus not only on the effectiveness of recent models for transferring science content and scientific practices to students, but will also serve as a venue for dialogue between education specialists, education staff from NASA and other agencies, space scientists and engineers, and science content generators. Workshop participants will review case studies of scientists or engineers who were able to successfully translate their research results and research experiences into formal and informal student science learning, including measureable improvements to student achievement and other valued outcomes listed below. These may include a variety of outcomes, from awareness to conceptual understanding, from understanding discovery to the nature of the scientific enterprise, and from the joy of learning to authentic involvement with actual scientists. Education specialists (e.g., state science supervisors, teacher education departments, professional development providers, informal science institutions/organizations, such as planetariums, after-school STEM education providers, state STEM education networks, and education researchers) will share how the science can be translated to education materials and directly to students, and teachers will share their experiences of space science in their classrooms.

Amongst the things the committee will consider in assembling the workshop are issues such as:

- Where is the intersection between what NASA space science can provide for education (as part of the CoSTEM STEM Education Strategic Plan) and what education providers want and need from the NASA science community? What can NASA do to better understand educators' and education providers' needs?
- How can scientists, engineers, and education providers work together to improve the science education of school-aged students? What are the common goals? How are the goals of educators and NASA scientists different? How can these differences be bridged?
- How is it determined if a program has been successful? Do scientists and education experts agree on what constitutes success? How well does SMD's process of development, trial, evaluation, and performance measurement support an "evidence-based" approach?
- What are institutional arrangements that provide effective platforms for successful cooperation or collaborations? What are the barriers, if any, to meeting the common goals?
- What are existing examples of successful NASA SMD education efforts?

- How can NASA work with/lead other agencies to have its successful education efforts reach a wider audience? How can this work be targeted towards students who may need it most?
- How should success of NASA education efforts be defined and measured? How can NASA determine whether its education efforts are having a measurable long-term effect on student achievement and involvement in science?

The workshop will feature invited presentations and discussions that encourage broad audience participation. The committee will select and invite speakers and discussants and moderate the discussions. An individually authored summary of the presentations and discussions at the workshop will be prepared by a designated rapporteur in accordance with institutional guidelines.



Restaurants in the Area



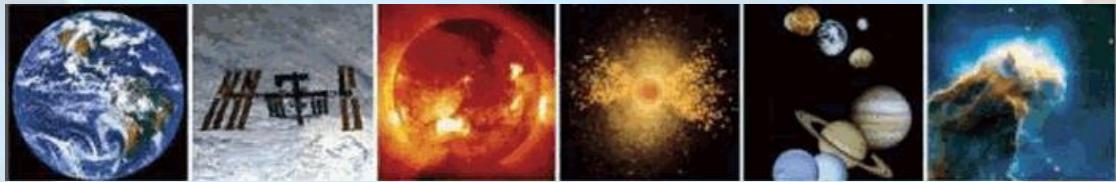
- A. Burger Tap & Shake: 2200 Pennsylvania Avenue NW (202) 587-6258
- B. District Commons: 2200 Pennsylvania Avenue NW (202) 587-8277
- C. Circa: 2221 I Street NW #300 (202) 506-5589
- D. Roti Mediterranean Grill: 2221 I Street NW (202) 499-2095
- E. Whole Foods Market: 2201 I Street NW (202) 296-1660
- F. T.G.I. Friday's: 2100 Pennsylvania Avenue NW #1 (202) 872-4344
- G. El Chalan Peruvian Cuisine: 1924 I Street NW (202) 293-2765
- H. Cafe Asia: 1720 I Street NW (202) 659-2696
- I. Bottom Line: 1716 I Street NW (202) 298-8488
- J. Notti Bianche: 824 New Hampshire Ave NW (202) 298-8085
- K. Bertucci's: 2000 Pennsylvania Ave NW (202) 296-2600
- L. Johnny Rockets: 2000 Pennsylvania Avenue NW (202) 822-1260
- M. Founding Farmers: 1924 Pennsylvania Avenue NW (202) 822-8783
- N. Tonic: 2036 G Street NW (202) 296-0211
- O. State Plaza Hotel (F Street Grill): 2117 E Street NW (202) 861-8200
- P. NAS Building: 2101 Constitution Ave NW

State Plaza Area Restaurants

Café Lombardy	2019 I Street	202.828.2600	American	Business Casual	**Romantic**	SS		
Dish	924 25th Street	202.338.8707	American	Business Casual	Traditional	SS		
TGIF Fridays	2100 Pennsylvania Avenue	202.872.4344	American	Casual	Family	SS		
Prime Rib	2020 K Street	202.466.8811	American/Steak	Formal	*Conservative*	SS		
Charlie Chang's	1912 I Street	202.293.6000	Chinese	Casual	*Conservative*	SSS		
One Fish, Two Fish	2423 Pennsylvania Avenue	202.822.0977	Asian	Casual		SSS		
Oodles of Noodles	1120 19th Street	202.293.3138	Asian	Casual		S		
Thai Kingdom	2021 K Street	202.835.1700	Asian	Casual		SSS		
Thai Place	2134 Pennsylvania Avenue	202.298.8204	Asian	Casual		SS		
Asia Nora	2213 M Street	202.797.4860	Asian/Organic	Casual	*Romantic*	S		
Lindy's Bon Appetite	2040 I Street	202.452.0055	Burgers	Casual	Burgers & Beer	SS		
Magic Gourd	528 23rd Street	202.466.3995	Chinese	Casual		SSS		
Marcel's	2401 Pennsylvania Avenue	202.296.1166	French	Business Casual	*Romantic*	SSS		
Aroma	1919 I Street	202.833.4700	Indian	Casual	Atmosphere	S		
Bombay Palace	2020 K Street	202.331.4200	Indian	Casual	*Atmosphere*	SS		
McFadden's	2401 Pennsylvania Avenue	202.223.2338	Irish Pub	Casual		SS		
Primi Piatti	2030 I Street	202.223.3600	Italian	Business Casual	*Romantic*	SS		
Kaz Sushi Bistro	1915 I Street	202.530.5500	Japanese/Sushi	Casual	Sushi	S		
Agua Ardiente	1250 24th Street	202.833.8500	Latin American	Casual	Atmosphere	S		
El Chalan	1924 I Street	202.293.2765	Peruvian	Casual		SSS		
Bertucci's	2000 Pennsylvania Avenue	202.296.2600	Pizza/Sandwiches	Casual	Family	SSS		
Froggy Bottom Pub	2124 Pennsylvania Avenue	202.338.3000	Sandwiches	Casual	Burgers & Beer	SS		
Kinhead's	2000 Pennsylvania Avenue	202.296.7700	Seafood	Business Casual	*Conservative*	S		
Legal Seafoods	2020 K Street	202.496.1111	Seafood	Business Casual	*Conservative*	S		
Starbucks	20th E Street		Coffee/Pastries		Quick Bite	S		
Subway	20th E Street		Sandwiches		Quick Bite	S		

PIZZA DELIVERIES:

Dominoes Pizza	202.223.1100		
Papa John's Pizza	202.293.7272		
Pizza Hut	202.463.6644		



ABOUT THE SPACE STUDIES BOARD

The Space Studies Board (SSB) was established in 1958 to provide an independent, authoritative forum for information and advice on all aspects of space science and applications. It serves as the focal point within the National Academies for activities on space research. It oversees advisory studies and program assessments and facilitates international research coordination. It promotes communications on space science and science policy between the research community, private sector, the federal government, and the public. The SSB also serves as the U.S. National Committee for the International Council for Science Committee on Space Research (COSPAR). Since 1958, the SSB has released more than 350 reports or letters on a wide range of issues relevant to the space science, engineering, technology, and policy communities.

ABOUT THE BOARD ON SCIENCE EDUCATION

The Board on Science Education was established in 2004. BOSE focuses on science learning and education for all, from early childhood to adulthood, in both schools and informal learning environments, such as science museums, aquariums, nature centers, and social networks. BOSE investigates how science is learned and taught, from individual self-directed learning and the teaching-learning exchange in a classroom or at the dinner table to the effectiveness of schools or entire federal education programs. BOSE reports have influenced federal legislation, provided guidance to federal agencies involved in STEM education, and shaped RFPs from the National Science Foundation and the Department of Education. Through the board's particular attention to broad dissemination and stakeholder engagement, its reports have had considerable influence on professional communities in K-12 formal education and informal science settings.

Find Out More

To learn out more about the Space Studies Board and its work, please visit www.nas.edu/ssb, to download past reports and keep abreast of our ongoing activities. To learn more about the Board on Science Education and its work, please visit www.nas.edu/bose.