

2014 Science On a Sphere®
Users Collaborative Network Workshop

Program

Science Museum of
Minnesota
St. Paul, MN
June 10 – 12, 2014

Welcome to the
Anthropocene



Welcome to the 6th Science On a Sphere® Users Collaborative Network Workshop!

We have quite an offering this year, with 39 presentations led by your fellow Workshop attendees, and a compelling Workshop theme, “*Welcome to the Anthropocene: Exploring the role of SOS in illuminating humanity as the driving agent of global change.*” We hope these Workshop offerings meet your needs and expectations. You’ll have a chance to provide your feedback on the post-Workshop survey.

Also, we hope you’ll take advantage of the less structured parts of the agenda to interact with your fellow attendees. There is a quite a diversity of expertise here with us. There are 94 attendees from 3 different countries representing 54 institutions, including educators, visualizers, scientists, exhibit designers, movie producers, and technologists. We encourage you to eat lunch with a stranger!

NOAA is thrilled to have as our host one of the original sphere pioneers, the Science Museum of Minnesota! You will appreciate their long history with the sphere and the technical innovations and content developments they’ve accomplished. Many of the sphere installations you all have now are due to the early evaluations that were done on sphere exhibits here.

As you participate in the Workshop this week, keep the goals in mind. If you feel we’re not achieving these well, let us know.

Workshop goals:

- Improve effectiveness of each institution’s use of SOS and other spherical platforms
- Evolve best practices for content creation and interpretation
- Expand the breadth of approaches for engaging the public with science through spherical display systems
- Understand the impact spherical display systems have on learning Earth system science in informal science education settings
- Continue to inform the future direction of the SOS Network
- Continue to grow a cohesive and collaborative network that is actively sharing information, expertise, and content

Finally, as with any workshop, there is a team behind the scenes that makes this all happen. This year, we’ve had the pleasure of working with Marissa Jones (NOAA), Britta Culbertson (NOAA), John McLaughlin (NOAA), Sue Landers (SMM), Jennifer Ernst George (SMM), Barry Hans (SMM) and SMM’s Lancer catering. Thanks to all of them for their efforts.

Our sponsor, the National Marine Sanctuary Foundation is also an essential element that allows this Workshop to take place.

We hope you’ll enjoy, be inspired by, and take action as a result of your time here with us this week.

Sincerely,
Your Workshop hosts,

Carrie McDougall, Maria Murray, Pat Hamilton & Beth Russell

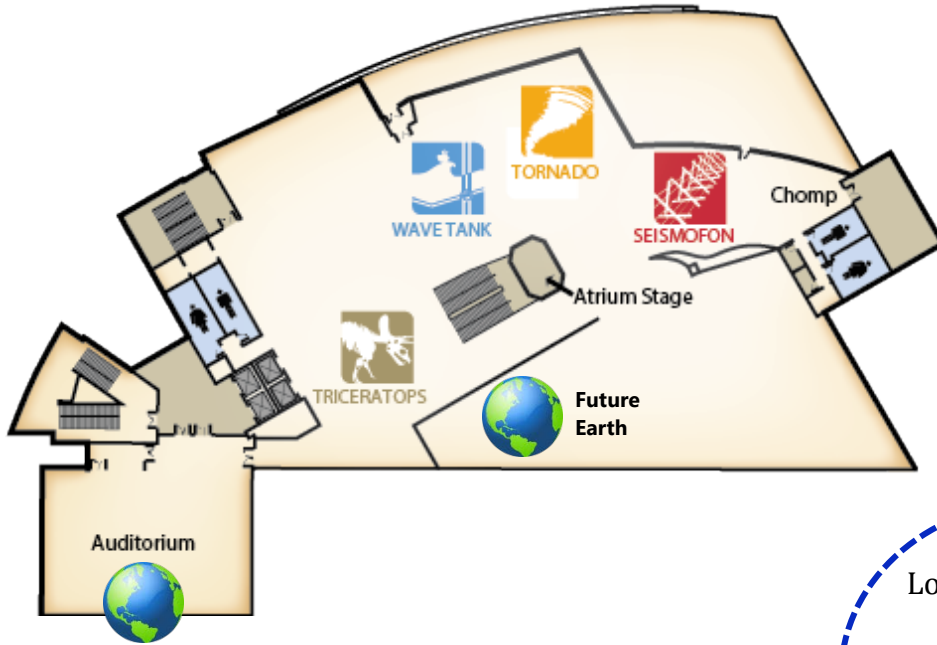
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*Presented in chronological order

Science Museum of Minnesota Floor Plans

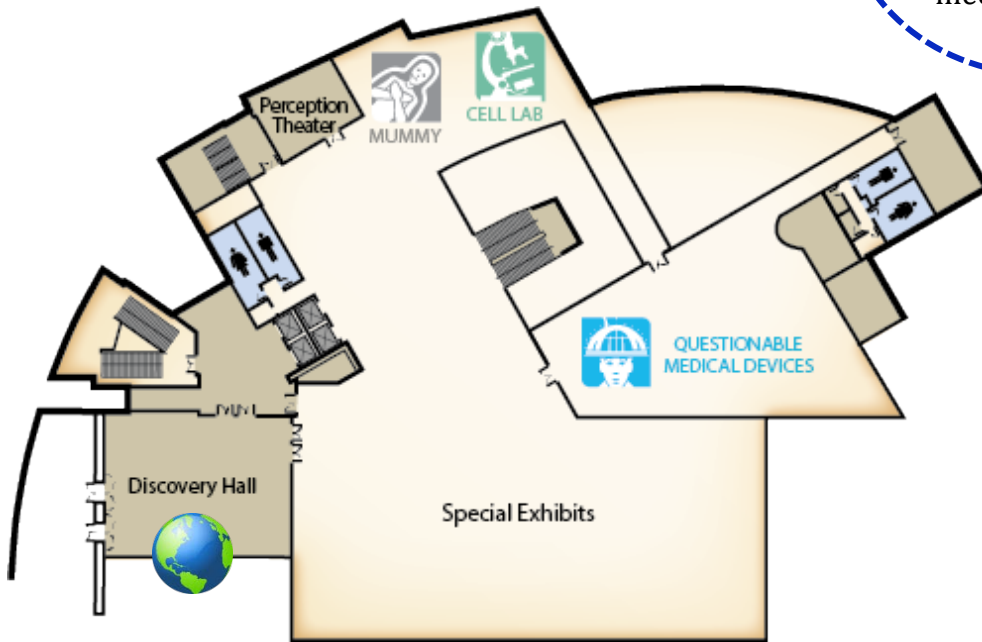
Level 3



Look for the Sphere

to find commonly used meeting spaces!

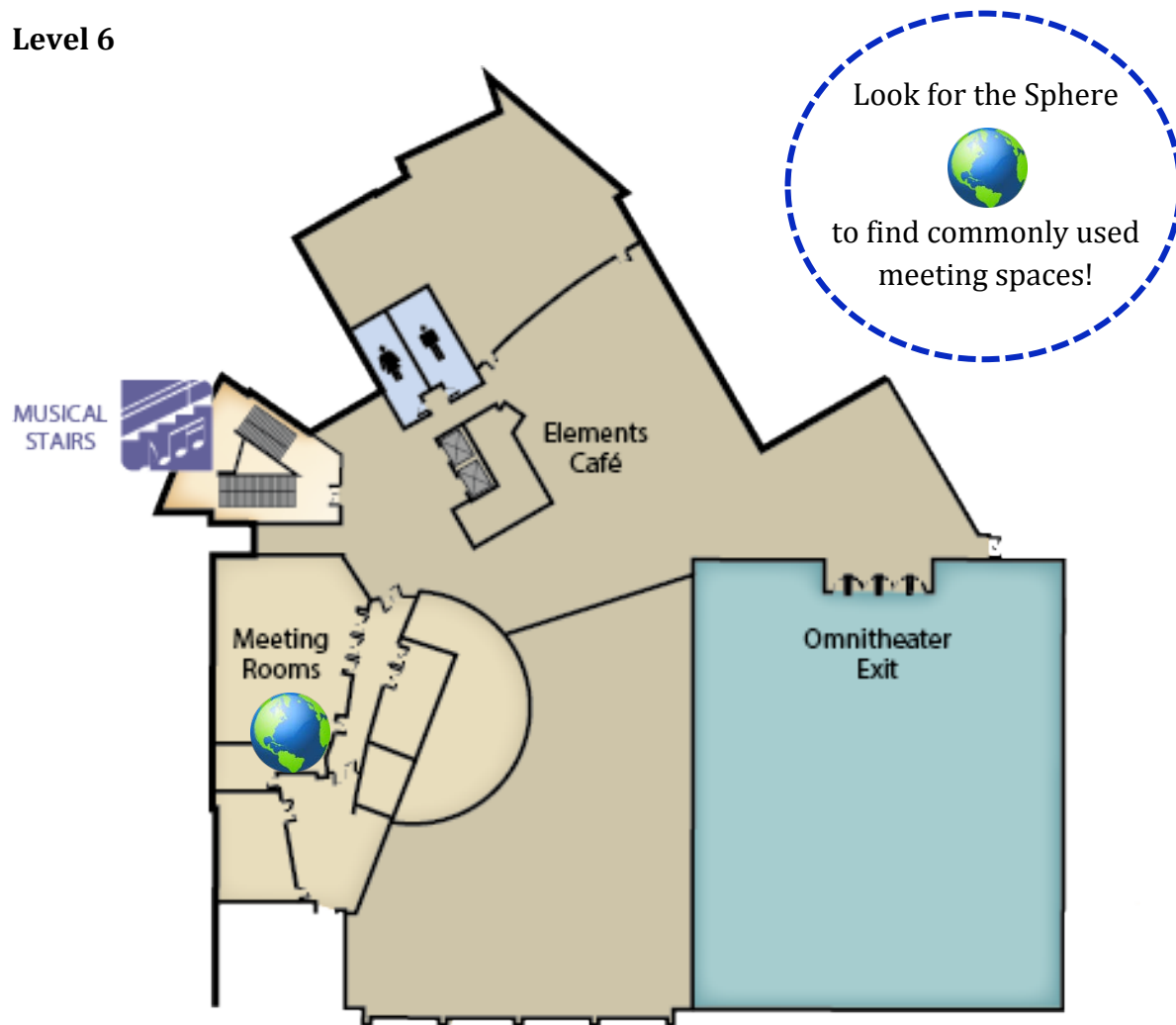
Level 4



Level 5



Level 6



Extra Workshop Opportunities

- Day 1: Reception in the Science Museum's Exhibit Fabrication Shop & Big Back Yard outdoor environmental park
- Day 1: Visit the **iGlobe** table in Discovery Hall at lunch to see a new demo. In the afternoon, drop by the optional demonstration for **teaching SOS content in a dome** in Neon from 3:40 – 5:15 pm.
- Day 2: Join us for a walking energy tour of the Science Museum and District Energy St. Paul, or take some time to explore SMM on your own. The museum is open until 5:00 pm.
- On Day 1 & 2: Get your questions answered during a **Q&A session with an SOS tech** (Discovery Hall).
- Any day during the Workshop, you can see the Science Museum of Minnesota's **Planet Earth Decision Theatre** in Future Earth.

Agenda At-A-Glance – Day 1

H: How to **P:** Plenary/Panel **W:** Working group

Tuesday, June 10, 2014

Time	Auditorium	Discovery Hall (SOS)	Future Earth (SOS)	Neon	Xenon	Argon	
8:00	8:00 AM REGISTRATION/CHECK-IN in Lobby & CONTINENTAL BREAKFAST in Discovery Hall						
8:45							
9:00	Welcome & Introductory Remarks						
9:15							
9:30							
9:45	Future Directions Boulder SOS Team						
10:00							
10:15	BREAK —drinks served in Discovery Hall						
10:30	What's New? SOS 4.2 and Other Updates						
10:45							
11:00							
11:10	KEYNOTE: Dr. Sandy MacDonald						
11:30							
11:45	LUNCH—Options: eat, network with fellow attendees, visit the iGlobe table in Discovery Hall to see a new demo						
12:15							
12:30		Q&A with an SOS Support Tech	Planet Earth Decision Theatre				
12:45							
1:00	SOS Network Developments						
1:10	P: Complex data and science topics on SOS						
1:30							
1:45							
2:00							
2:10		SOS Showcase: Formal Education	H:3 Projector SOS		W: Unscripted Stories: Professional Dev. & Tools for Facilitators		
2:30			Future Earth Theater				
2:45			Planet Earth Decision Theatre				
3:00							
3:15					W: Playlist Editor & Tips for PIPs		
3:30	BREAK —Snacks & drinks served on Level 6 and Discovery Hall						
3:45		SOS Showcase: Formal Education		Demo: SOS Content in a Dome: Teaching from Inside the Sphere		W: Rapid Program Prototyping for the Sphere	
4:00							
4:15		H: Video Production on the Sphere	H: EarthNow "Mini" Training				
4:30							
4:45							
5:00							
5:15	5:15 PM Reception in the Science Museum's Exhibit Fabrication Shop & Big Back Yard outdoor environmental park						
6:30							

Agenda At-A-Glance – Day 2

H: How to **P:** Plenary/Panel **W:** Working group

Wednesday, June 11, 2014

Time	Auditorium	Discovery Hall (SOS)	Future Earth (SOS)	Neon	Xenon	Argon
9:00	Agenda Overview					
9:05	“Storms on Stage” Presentation					
9:25	KEYNOTE: Dr. Jonathan Foley					
9:45						
10:00	BREAK —Snacks and drinks served in Discovery Hall					
10:15						
10:30	KEYNOTE: Dr. Ned Gardiner					
10:45						
11:00						
11:15		KML & WMS with SOS & SphereCasting Showcase				
11:30						
11:45						
12:00	LUNCH in Discovery Hall —Options: eat, network with fellow attendees, relax					
12:15						
12:30		Q&A with an SOS Support Tech	Planet Earth Decision Theatre			
12:45						
1:00		H: NESO Data Access and Measurements Tool	SOS Showcase: Earth’s Humanity			H: Training Docents for Conversation-Based Presentations
1:15						
1:30						
1:45						
2:00		SOS Showcase: Constructing Shows & Content			W: Visualizing Change – Developing Narratives for Global Change	W: SOS Explorer – A Version of SOS for the Classroom
2:15						
2:30						
2:45					W: Teacher Workshops using SOS	
3:00						
3:15						
3:30	BREAK —Snacks & drinks served in Discovery Hall					
3:45	(Walking) Energy tour of Science Museum and District Energy St. Paul or explore SMM on your own (open until 5 pm)					
6:15						

Agenda At-A-Glance – Day 3

H: How to **P:** Plenary/Panel **W:** Working group

Thursday, June 12, 2014

Time	Auditorium	Discovery Hall (SOS)	Future Earth (SOS)	Neon	Xenon	Argon
8:45	Agenda Overview					
8:50	P: Evaluation/ Learning Sciences					
9:15						
9:30						
9:45	BREAK —Snacks & drinks served in Discovery Hall					
10:00	BREAK —Snacks & drinks served in Discovery Hall					
10:10	KEYNOTE: Dr. Julie Sweetland					
10:30						
10:50						
11:00		W: Rethinking the SOS iPad Control Interface			H: The Power of 3: Framing Stories for the SOS	H: Integrating NOAA View Content into SOS Presentations
11:15						
11:30						
11:45						
12:00	LUNCH in Discovery Hall—Options: eat, network with fellow attendees, relax					
12:15	LUNCH in Discovery Hall—Options: eat, network with fellow attendees, relax					
12:30			Planet Earth Decision Theatre			
12:45						
1:00		SOS Showcase: Special Earth Topics		H: Creating Standards- Based Programs	H: Climate Change Communication: Strategic Framing for Informal Science Educators	W: Evaluating the SOS Content Library
1:15						
1:30						
1:45						
2:00						
2:15						
2:30	Transition					
2:45	Closing remarks					
3:00	Adjourn					

Daily Schedule

Day 1 – Tuesday, June 10, 2014

8:00 AM	Registration, check in, continental breakfast	<i>Lobby</i>
9:00 AM	Welcome & Introductory Remarks from the Science Museum of Minnesota and NOAA Pat Hamilton, Eric Jolly, Carrie McDougall & Christos Michalopoulos	<i>Auditorium</i>
9:45 AM	Introductions and Future Directions of the Boulder SOS Team John Schneider & Beth Russell	<i>Auditorium</i>
10:15 AM	BREAK – Drinks served	<i>Discovery Hall</i>
10:30 AM	What's New? SOS 4.2 and Other Updates Shilpi Gupta, Ian McGinnis & Vincent Keller	<i>Auditorium</i>
11:10 AM	KEYNOTE: Low Carbon, Low Cost Wind and Solar Energy Systems are Feasible with Large Geographic Domains Dr. Sandy MacDonald	<i>Auditorium</i>
11:45 AM	LUNCH with optional iGlobe demonstration	<i>Discovery Hall</i>
12:30 PM	Optional: Lunchtime Q&A with an SOS Support Tech (Ian McGinnis)	<i>Discovery Hall</i>
12:30 PM	Optional: SMM's Planet Earth Decision Theatre	<i>Future Earth</i>
1:00 PM	SOS Network Developments Maria Murray	<i>Auditorium</i>
1:10 PM	PANEL: Improving the Use and Understanding of Complex Data and Science Topics on SOS Patrick Rowley, Stephanie Schollaert Uz & Celeste Frazier	<i>Auditorium</i>
2:10 PM	SOS Showcase: Formal Education	<i>Discovery Hall</i>
	Wind, Water & Mountains: Ingredients of Regional Climate Hilary Peddicord	
	Dataset Creation as a Teaching and Learning Tool Darik Velez	
	'How much did it rain?' And Other Hard Questions Bill Mitchell	

Ice in Our Solar System

Sue Wu

Invisible Mars: How MAVEN will Look for Mars' Lost Atmosphere

Brooke Hsu

2:10 PM	How to: And Then There Were Three: Designing and Implementing a Three Projector SOS System Bryan Kennedy	<i>Future Earth</i>
2:10 PM	Working Group: Unscripted Stories: Professional Development and Tools for Data-Nimble Facilitators Emily Yam & Alie LeBeau	<i>Xenon</i>
2:30 PM	Future Earth Theater Bryan Kennedy, Robert Garfinkle	<i>Future Earth</i>
3:00 PM	Planet Earth Decision Theatre Stephanie Long	<i>Future Earth</i>
3:00 PM	Working Group: Review of Playlist Editor Changes and Tips for Using PIPs Beth Russell & Vincent Keller	<i>Argon</i>
3:30 PM	BREAK —Snacks & drinks served	<i>Discovery Hall Level 6</i>
3:45 PM	SOS Showcase: Formal Education	<i>Discovery Hall</i>
	Artistic Exploration: Kepler Exoplanets Inspire Student Art on the SOS Toshi Komatsu	
	Of Kiosks and Content: Bridging Science and Public Understanding Toshi Komatsu	
3:45 PM	How to: EarthNow "Mini" Training Patrick Rowley & Margaret Mooney	<i>Future Earth</i>
3:45 PM	Working Group: Rapid Program Prototyping for the Sphere Stephanie Long	<i>Argon</i>
3:45 PM	Demo: SOS Content in a Dome Joel Halvorson & Sally Brummel	<i>Neon</i>

- 4:15 PM **How to: Film Release - *Our Pale Blue Dot* - plus Tips and Tricks for Production on the Sphere** *Discovery Hall*
Victoria Weeks
- 5:15 PM Reception in the Science Museum's Exhibit Fabrication Shop & Big Back Yard outdoor environmental park

Day 2 – Wednesday, June 11, 2014

9:00 AM	Agenda Overview	<i>Auditorium</i>
9:05 AM	“Storms on Stage” Presentation SMM Science Live Theatre	<i>Auditorium</i>
9:25 AM	KEYNOTE: The Inflection Point: Why This Moment in History Will Determine the Future of our Planet Dr. Jonathan Foley	<i>Auditorium</i>
10:00 AM	BREAK —Snacks & drinks served	<i>Discovery Hall</i>
10:30 AM	KEYNOTE: The Reflection Point: On Building a New Narrative Dr. Ned Gardiner	<i>Auditorium</i>
11:15 AM	Using KML and WMS with SOS and SphereCasting Showcase Shilpi Gupta & Keith Searight	<i>Discovery Hall</i>
12:00 PM	LUNCH	<i>Discovery Hall</i>
12:30 PM	Optional: Lunchtime Q&A with an SOS Support Tech (Vincent Keller)	<i>Discovery Hall</i>
12:30 PM	Optional: SMM’s Planet Earth Decision Theatre	<i>Future Earth</i>
1:00 PM	How to: NESO Data Access and Measurements Tool Maurice Henderson & Stephanie Schollaert Uz	<i>Discovery Hall</i>
1:00 PM	SOS Showcase: Earth’s Humanity	<i>Future Earth</i>
	Film Shorts: A Set of Four Short Films on the Anthropocene and Climate Change Robert Garfinkle	
	SOS: Cognition + Affect = Effect Shilpi Gupta & Marda Kirn	
	See the People Jamie Klein	
1:00 PM	How to: Training Docents for Conversation-Based Presentations Lauren Chaharbakhshi	<i>Argon</i>

2:00 PM	<p>SOS Showcase: Constructing Shows and Content</p> <p>Exploring Earth Systems Science demonstrations, and 'Rapid Response' for Current Events with the Science On a Sphere at Pacific Science Center Zeta Strickland</p> <p>One-Point Modules: An Easy Strategy for Organizing and Presenting Data on the Sphere Eddie Goldstein</p> <p>A Tale of Three Planets Eddie Goldstein</p> <p>WATER FALLS -- An SOS Movie about NASA's Global Precipitation Measurement Mission Michael Starobin</p> <p>Visual Storytelling on Tight Budgets and Timelines Andrew Cohen & Keith Miller</p>	<i>Discovery Hall</i>
2:00 PM	<p>Working Group: Visualizing Change – Developing Narratives for Global Change Sylvia Scharf, Annette Brickley & Emily Yam</p>	<i>Xenon</i>
2:00 PM	<p>Working Group: SOS Explorer – A Version of SOS for the Classroom – In development, looking for feedback Hilary Peddicord & Eric Hackathorn</p>	<i>Argon</i>
2:45 PM	<p>Working Group: Teacher Workshops Using SOS - Examples and Discussion April Chancellor & Hilary Peddicord</p>	<i>Argon</i>
3:30 PM	<p>BREAK—Snacks & drinks served</p>	<i>Discovery Hall</i>
3:45 PM	<p>(Walking) Energy tour of Science Museum and District Energy St. Paul or explore SMM on your own (museum open until 5:00 pm)</p>	<i>Discovery Hall</i>

Day 3 – Thursday, June 12, 2014

8:45 AM	Agenda Overview	<i>Auditorium</i>
8:50 AM	PANEL: Evaluation/Learning Sciences Dr. Katie Stofer, Zeta Strickland, Andrea Giron & Christine Larouche	<i>Auditorium</i>
9:45 AM	BREAK —Snacks & drinks served	<i>Discovery Hall</i>
10:10 AM	KEYNOTE: Climate Change Communication: Toward an Evidence-Based Approach Dr. Julie Sweetland	<i>Auditorium</i>
11:00 AM	Working Group: Rethinking the SOS iPad Control Interface Jamie Klein & Matt Brownell	<i>Future Earth</i>
11:00 AM	How to: The Power of 3: Framing Stories for the SOS Toshi Komatsu	<i>Xenon</i>
11:00 AM	How to: Integrating NOAA View Content into SOS Presentations Dan Pisut	<i>Argon</i>
12:00 PM	LUNCH	<i>Discovery Hall</i>
12:30 PM	Optional: SMM's Planet Earth Decision Theatre	<i>Future Earth</i>
1:00 PM	SOS Showcase: Special Earth Topics	<i>Discovery Hall</i>
	Evolution of the Earth (draft production) Maurice Henderson	
	Climates of the Past and Present at Grand Canyon AJ Lapre	
	"Life Without Sunlight" Live!: bringing the deep sea to the Science On a Sphere Stace Beaulieu	
	"Smoke and Fire Underwater": a new movie with virtual exploration for learning and engagement Stace Beaulieu	

Beyond "Science" on a Sphere: Digital History, Arts, and Humanities in the Round

Tassie Gniady & Patrick Beard

1:00 PM	How to: Creating Standards-based Programs Thomas Quayle	<i>Neon</i>
1:00 PM	How to: Climate Change Communication: Workshop in Strategic Framing for Informal Science Educators Julie Sweetland	<i>Xenon</i>
1:00 PM	Working Group: Evaluating the SOS Content Library Dan Pisut & Beth Russell	<i>Argon</i>
2:40 PM	Closing Remarks	<i>Auditorium</i>
3:00 PM	Adjourn	

Keynote Presentations

Dr. Alexander (Sandy) MacDonald

OAR Chief Science Advisor, Director of Earth System Research Laboratory, NOAA

Low Carbon, Low Cost Wind and Solar Energy Systems are Feasible with Large Geographic Domains

11:10 – 11:45 am, Tuesday, June 10 – Auditorium

Dr. MacDonald will discuss a study conducted over the US contiguous states to determine the geographic characteristics of wind and solar energy systems, augmented by natural gas plants and power transmission. The study shows that wind and solar energy penetration is maximized and total atmospheric carbon release and system costs are minimized by using the largest domain. Using achievable cost estimates for wind and solar energy, the study indicates that the crucial element of the transition is the implementation of a national HVDC power transmission system. Such a transition could be accomplished without an increase of electric costs, and would reduce carbon dioxide emissions by about 90% compared to the 2010 mix.

Bio: Dr. Alexander E. “Sandy” MacDonald serves as Chief Science Advisor, NOAA Office of Oceanic & Atmospheric Research (OAR) and concurrently as Director of NOAA’s largest research facility, the OAR/Earth System Research Laboratory in Boulder, CO. In February of 2014, he was selected as the American Meteorological Society (AMS) President-Elect and will take over as the Society’s president in January of 2015.

He has been an atmospheric scientist modeling weather for nearly 40 years and a long-time AMS member. He played an important role in the inception and growth of two important AMS conferences, IIPS and IOAS-AOLS. In the 1980s, he led a group of researchers that developed systems to integrate data streams and models for operational forecasters; that research group later became NOAA’s Forecast Systems Laboratory. Sandy’s contributions include leading the development of a high performance computing system, a unique mesoscale weather prediction model, and the diagnosis of atmospheric water vapor distributions using global positioning systems. In addition, he worked in the White House with Vice President Al Gore to initiate the GLOBE program. He is the inventor of Science On a Sphere® which is being installed in museums and science centers worldwide, and has recently surpassed its 100th installation. More recently, Sandy is leading efforts within NOAA to improve forecasts to reduce the cost of wind energy, and to use unmanned aircraft systems to improve the accuracy of weather and climate predictions. He is currently the lead investigator researching economically optimal large-scale wind and solar energy systems.

Dr. MacDonald earned a Ph.D. in meteorology from the University of Utah, served in the U.S. Air Force after receiving a B.S. in Math and Physics from Montana State University, and has led a distinguished career with the following awards: Fellow American Meteorological

Society; AMS Councilor, Executive Committee; Fellow Colorado State University Cooperative Institute for Research in the Atmosphere; four Presidential Rank Awards, Federal 100 Award, DOC Gold and Bronze Medals, NOAA Bronze Medal, and Tech Museum Laureate Award.

Dr. Jonathan Foley

Director, Institute on the Environment, University of Minnesota

The Inflection Point: Why This Moment in History Will Determine the Future of our Planet

9:25 – 10:00 am, Wednesday, June 11 – Auditorium

How do we create a future in which sustainable agriculture feeds the world; renewable energy powers the planet; every person has access to food, clean water and shelter; oceans, lakes and rivers are unimpaired; cities have vibrant economies, neighborhoods and cultures; and thriving ecosystems support thriving economies and societies? Dr. Jon Foley, incoming executive director of the California Academy of Sciences, will explore the challenges and opportunities of living on a human-dominated planet.

Bio: Jonathan Foley is the director of the Institute on the Environment at the University of Minnesota. Foley's work focuses on the sustainability of our planet and the natural resources we depend on. He and his students have contributed to our understanding of global food security, worldwide changes in ecosystems, land use and climate, and the sustainability of the world's resources. This work has led him to be a regular advisor to governments, non-governmental organizations, environmental groups, civic groups, foundations and business leaders around the world.

Foley has won numerous awards and honors, including the Presidential Early Career Award for Scientists and Engineers (awarded by President Bill Clinton), the National Science Foundation's Faculty Early Career Development Award; the J.S. McDonnell Foundation's 21st Century Science Award; an Aldo Leopold Leadership Fellowship; and the Sustainability Science Award from the Ecological Society of America. In 2014, he was named the winner of the Heinz Award for the Environment. Originally from Maine, Foley enjoys a wide range of activities, including nature photography, backyard astronomy, gardening, kayaking, hiking and exploring new places – often with his two daughters leading the way. In April 2014, Foley was named as the new executive director of the California Academy of Sciences. He will begin this position in August 2014.

Dr. Ned Gardiner

Executive Producer of Video and Senior Visualizer, NOAA Climate Program Office

The Reflection Point: On Building a New Narrative

10:30 – 11:05 am, Wednesday, June 11 – Auditorium

The world's leading climate scientists continue to assess the state of our home planet. Over the past several decades, the message has been both consistent and consistently more certain about our role in altering the climate system. We are partners in getting the word out about climate change, and global change more broadly. We are getting the word out, but getting the word out is only a partial solution. We need new narratives if we are to engage peoples' hearts and minds. Only then may we bend the trend as a species and devise new strategies for living on Earth.

Bio: Ned Gardiner is a geographer and landscape ecologist who pivoted to science communication immediately following graduate school. Convinced that people need to see in their quest to understand complex problems, he joined the HDTV production group, Science Bulletins, at the American Museum of Natural History immediately after graduate school. He has been an informal educator ever since, moving from geovisualization to managing and producing content for NOAA's award-winning Climate.gov web site, and now focusing on all aspects of video production to help people see and understand the coupled human-Earth system.

Dr. Julie Sweetland

Director of Learning, FrameWorks Institute

Climate Change Communication: Toward an Evidence-Based Approach

10:10 – 10:50 am, Thursday, June 12 – Auditorium

How can science centers make more powerful use of their communications to explain climate change in a way that educates, rather than alienates, the visiting public? Why do some of the most common awareness messages – such as 'it's real and it's happening now' - fail to move public opinion? What do the cognitive and social sciences have to offer science communicators in the way of more effective communication strategies, techniques, and tools? How might informal science educators coalesce around a set of tested, reliable frames for a widespread explanatory campaign that can engage the public in rethinking society's reliance on fossil fuels? Since 1999, the FrameWorks Institute (www.frameworksinstitute.org) has pursued a portfolio of research projects on questions such as these, investigating how public perceptions impede productive thinking about environmental policies, and empirically pursuing more effective ways of framing communications about the climate and the ocean in order to build public understanding and will on these issues. Julie Sweetland, Director of Learning at the Institute, will highlight the findings of this research and unpack its practical implications for science centers,

including recent results from a series of climate change communication studies that FrameWorks conducted on behalf of the National Network for Ocean and Climate Change Interpretation

Bio: Julie Sweetland is a sociolinguist and Director of Learning at FrameWorks Institute, where she leads the translation of research findings into learning tools for nonprofit leaders. As an educator, Julie has been actively involved in improving teaching and learning for over a decade, first as a classroom teacher, and more recently as an educational researcher, curriculum developer, teacher educator, and education reform advocate. Prior to joining the FrameWorks Institute, she served as the Director of Teaching and Learning at Center for Inspired Teaching and launched a graduate teacher preparation program for the University of the District of Columbia. As a linguist, her research has focused on the intersection of language and race; on the role of language variation and language attitudes on student learning; and on effective professional learning for teachers. Julie's work has appeared in publications such as Journal of Sociolinguistics, Educational Researcher, and Education Week. She is a graduate of Georgetown University and lectures regularly at her alma mater. She completed her M.A. and Ph.D. in Linguistics at Stanford University. Dr. Sweetland can be reached at jsweetland@frameworksinstitute.org.

Plenary and Panel Descriptions

Welcome and Introductory Remarks from the Science Museum of Minnesota and NOAA

Pat Hamilton, Dr. Eric Jolly, Dr. Carrie McDougall and Christos Michalopoulos
9:00 – 9:45 am, Tuesday, June 10 – Auditorium

Workshop hosts, Patrick Hamilton, Director, Global Change Initiatives (SMM); Dr. Eric Jolly, President (SMM); Dr. Carrie McDougall, Senior Program Manager (NOAA Education); Christos Michalopoulos, Deputy Director (NOAA Education) will provide welcoming remarks and their perspectives on the field of informal science education and larger science education initiatives happening at the national level.

Introductions and Future Directions of the Boulder SOS Team

John Schneider and Beth Russell, NOAA Science On a Sphere, Boulder, CO
9:45 – 10:15 am, Tuesday, June 10 – Auditorium

John Schneider, the new Chief of the Technology Outreach Branch, will introduce the members of the Science On a Sphere team in Boulder, highlight their recent accomplishments and discuss where the SOS team is taking SOS in the future. In addition, Beth Russell will review some of the results from the recent questionnaire that was conducted by the SOS Boulder team this winter.

Contact: sos.gsd@noaa.gov

What's New? SOS 4.2 and Other Updates

Shilpi Gupta, Ian McGinnis and Vincent Keller, NOAA Science On a Sphere, Boulder, CO
10:30 – 11:00 am, Tuesday, June 10 – Auditorium

The SOS Development team in Boulder will discuss all the new features of the latest SOS release and also highlight improvements in the software and website since the last workshop. Plenty of time will be left for discussion of the new features and requests for future features.

Contact: sos.gsd@noaa.gov

Lunchtime Q&A with a SOS Support Tech

Ian McGinnis (Tuesday), Vincent Keller (Wednesday), NOAA Science On a Sphere, Boulder, CO
12:00 – 1:00 pm, Tuesday and Wednesday, June 10 -11 – Discovery Hall

An SOS support tech will be available during the last half hour of lunch to answer questions on how to better run and maintain user's SOS software and hardware. He will also be offering an alignment refresher for those who need it. Possible topics include Ubuntu system administration, an overview of recommended hardware, alignment, and any questions attendees are able to come up with.

Contact: sos.gsd@noaa.gov

SOS Network Developments

Dr. Maria Murray, NOAA Office of Education
1:00 – 1:10 pm, Tuesday, June 10 – Auditorium

There's a new Sphere in town. NOAA's Office of Education reflects on the growth of the SOS Network over the years, its expertise, new developments, and the Network's representation at the Workshop. We will share how our role as a Network member is enhanced as a new SOS site.

Contact: maria.murray@noaa.gov

Using KML and WMS with SOS and SphereCasting Showcase

Shilpi Gupta and Keith Searight, NOAA Science On a Sphere, Boulder, CO
11:15 – 12:00 am, Wednesday, June 11 – Auditorium

The SOS team will demonstrate the use of WMS (Web Map Service) and KML (Keyhole Markup Language) data formats on SOS. Then they will be showcasing the new features of SphereCasting by tuning into a SphereCast hosted by SOS Tech Lead Keith Searight from Boulder. There will be time at the end for questions and suggestions for further improving SphereCasting.

Contact: sos.gsd@noaa.gov

PANEL: Improving the Use and Understanding of Complex Data and Science Topics on SOS

1:10 – 2:00 pm, Tuesday, June 10 - Auditorium

Advancing Weather & Climate Literacy via EarthNow Trainings and Collaborations

Patrick Rowley, Cooperative Institute for Meteorological Satellite Studies (CIMSS)

In the past year, the EarthNow project out of the Cooperative Institute for Meteorological Satellite Studies (CIMSS) produced and posted monthly Climate Digest products and three climate-related feature stories on the EarthNow Blog (<http://sphere.ssec.wisc.edu/>). CIMSS also conducted 5 on-site trainings for SOS docents during this time period; at the Aldo Leopold Nature Center, the Nauticus Maritime Science and History Museum, the Space Foundation, the Grand Canyon National Park, and the Ocean Explorium. In fact, the storyline for the recent feature story on Extreme Weather and Climate Change was gleaned from discussions at the Space Foundation and Grand Canyon. This panel presentation will share anecdotal perspectives on the EarthNow project, give an overview of the recent trainings and subsequent feedback.

Contact: Patrick.rowley@ssec.wisc.edu

An Overview of Data Analysis in SOS Presentations Using NESO

Dr. Stephanie Schollaert Uz, NASA GSFC/NASA Earth and Space Observations (NESO)

One way to visualize change on Earth is by analyzing evidence: animations, time series, histograms and comparisons between data sets to look for correlations. Traditionally such tools have only been accessible to scientists. Now you can analyze images displayed on your Science On a Sphere using a simplified graphical iPad app. NASA Earth & Space Observations (NESO) is an interactive mapping and analysis tool for Earth and Space data available to anyone on the SOS network. Three levels of NESO use and examples will be discussed: 1) To Infinity and Beyond: become a NESO expert and you will be able to animate, analyze and compare a growing library of Earth and Space data sets dynamically and interactively during your SOS shows 2) The Sky's the Limit: become proficient with using NESO and follow investigations created by the NESO team to demonstrate highlights about Earth's system that have been in the news recently or are otherwise considered hot topics by the climate science community 3) Nuts and Bolts: use PIP's and animations created by the NESO team annotated for ease of use with key messages about data in bullet point format in a docent script, all available through the NOAA SOS catalog.

Contact: ses@essic.umd.edu

Cyber Lab, What We Can Do For You!

Dr. Celeste Frazier, Hatfield Marine Science Center

Hatfield has received a NSF grant to research learning in museums and has funding to host cyber scholars. We are interested in hosting people from within the SOS network that

would like to focus a collaborative research project on learning objectives around the sphere. The lab consists of facial recognition software that can be accessed remotely and there are OSU graduate students that can assist with gathering any data on site as needed once the project is defined. My presentation is explaining cyber lab, having a current cyber scholar and OSU graduate student that collects data for the cyber scholar reflect on the experience. Additionally, as I am the person that the SOS network would be collaborating with at Hatfield on the sphere research and am excited to further learning research around complex visualizations, I am excited to share ideas and hear ideas from the network and maybe gain future cyber scholars.

Contact: celestef.barthel@gmail.com

PANEL: Evaluation/Learning Sciences

8:50 – 9:45 am, Thursday, June 12 - Auditorium

Designing Visualizations and Stories for Broad Audiences Based on Visitor and Public Research

Katie Stofer, University of Florida

How do visitors make sense of the visualizations of data we present? My research investigates both visualization characteristics such as color schemes that draw on visitor background knowledge and experience and what supporting information viewers need to make sense of the data (date, source of data). I will present practical design tips based on what we know so far, and preview upcoming research projects, including incorporating questions from the Users' Network raised at this meeting. Audience: Anyone who creates visualizations and anyone who creates or delivers programs and exhibits using these visualizations for public and school audiences. The work has been primarily done with Earth systems science (ocean) datasets, but the design elements are likely to be broadly applicable.

Contact: stofer@ufl.edu

Evaluation Efforts with External Student Evaluators

Zeta Strickland, Pacific Science Center

Pacific Science Center undertook an evaluation effort to learn how autorun programs could best serve guests when no facilitator is available. We partnered with masters students in the Museology program at the University of Washington for a full-year evaluation effort. Partnering with the students increased the evaluation capacity of our institution, and allowed us to gain valuable information regarding autorun programs. We'll share what we learned about working with external student evaluators and autorun programs.

Contact: zstrickland@pacsci.org

Know Your Audience: How Evaluation Can Improve the Visitor Experience Using Science On a Sphere

Andrea Giron, Denver Museum of Nature and Science

This session will focus on how institutions can use evaluation findings to better inform Science On a Sphere (SOS) programs and facilitation to enhance the visitor experience. First a case study of the volunteer facilitated SOS will be presented in which presenters will share evaluation methods as well as how to train volunteers in SOS facilitation methods. Presenters will focus on the training, technique, and testing of effective volunteer facilitation methods that have been proven most effective for a positive visitor experience. Presenters will also detail how evaluation was used to better understand how our visitors interpret data visualizations on the Sphere. The case studies to be presented are housed at the Denver Museum of Nature & Science, and will provide examples of how programming on the Science On a Sphere can be measured for impact.

Contact: Andrea.Giron@dmns.org

Looking Back and Looking Forward: Evaluating the Value of SOS for Audiences

Christine Larouche, People, Places and Design Research

Looking Back: This session will begin with a review of findings about the value of SOS for museum visitor audiences, distilled from previous SOS evaluations conducted at various sites, focusing on four topics: affective reactions, understanding of visualizations, global knowledge or connections, current data (i.e. Earth Now).

Looking forward: People, Places & Design Research is in the process of planning an evaluation of sites that use Earth Now data sets, and we believe that the study will be enhanced by studying these four topics across SOS Network member sites. In this light, we will invite any SOS Network members at the session to participate. Participants will have input to the questions asked within the four topics and will be rewarded with their data being tabulated and returned to them, analyzed in the context of the whole study. The session will conclude with information about what will be expected of sites that choose to participate. Contact cards will be supplied to members of the audience to signal their interest in participating as well as to suggest additional references to studies on these topics.

Contact: christinelarouche@ppdresearch.com

Working Group and Discussion Descriptions

Displaying SOS Data on Other Spherical Products

John Marciniak and Scott Muller, BWC Visual Technology

Marc Lalley, iGlobe

11:45 am – 1:00 pm, Tuesday, June 10 – Discovery Hall

Drop by during lunch to see demonstration of displaying SOS data on the iGlobe 3D system. iGlobe 3D is a spherical display technology with 3D imagery and innovative user interface software. iGlobe-3D creates highly accurate representations of Earth, celestial bodies, or other interpretive content and has the added advantages of high resolution in any lighting situation.

Contact: john@bwcviz.com

Unscripted Stories: Professional Development and Tools for Data-Nimble Facilitators

Emily Yam and Alie LeBeau, Aquarium of the Pacific

2:10 – 3:30 pm, Tuesday, June 10 – Xenon

Through the IMLS-funded SITI project (Spherical Interpretation and Technology Integration), the Education Department at the Aquarium of the Pacific has embarked on a three year professional development project aimed at improving the staff's ability to use Science On a Sphere (SOS) to bring earth systems science to the public. Institutional investment in professional development has produced a variety of reflective practices, action research projects, and storytelling methods in the SOS space. Storytelling strategies include pairing films with data sets and using the space as a free-choice environment. Based on the collective learning from the project, the Education Department will now develop semi-facilitated programming to be implemented by staff with varying content background and facilitation experience. In this small group discussion, we engage the broader SOS community similarly involved in facilitated interactions in a dialog on the diversity of interpreter-lead programs, sustainable professional learning, and measures of success in our staff and in our audience. Come ready to share how your institution supports learning for informal science professionals and ideas for measures of success in facilitated SOS interpretation. We invite participation from managers and practitioners interested in professional learning, best practices in interpretation, and facilitation of data-driven stories.

Contact: eyam@lbaop.org

Review of Playlist Editor Changes and Tips for Using PIPs

Beth Russell and Vincent Keller, NOAA Science On a Sphere, Boulder, CO

3:00 – 3:30 pm, Tuesday, June 10 – Argon

The December release of the SOS software included some major changes in the Playlist Editor. We will review these changes and also discuss the many functions of PIPs. A Picture in a Picture, or PIP, can be used to add a colorbar or legend to a dataset, but there is

so much more that can be done with a PIP. In this session we will be going over creative uses for PIPs and will be covering how to add them with the Playlist Editor.

Contact: sos.gsd@noaa.gov

Rapid Program Prototyping for the Sphere

Stephanie Long, Science Museum of Minnesota

3:45 – 5:00 pm, Tuesday, June 10 – Argon

In this hands-on session, attendees will create a show using existing data sets. We will ask participants to perform the rapid prototype program they created for the group at the end of the session. The session will be challenging, fun and invigorating.

Contact: slong@smm.org

Optional, Drop-In Demonstration of SOS Content in a Dome: Teaching from Inside the Sphere

Joel Halvorson, Science Communications Consultant

Sally Brummel, Bell Museum of Natural History, University of Minnesota

3:45 – 5:00 pm, Tuesday, June 10 – Neon

How can educators use data and virtual environments to help students infer knowledge that sticks? How do we build learning environments and curriculum that capitalize on this potential? Whether students are touring the universe or understanding the Earth as a system, data visualization and interactivity are powerful tools for discovery and learning. In the Upper Midwest, a K-16 group of educators is tackling this challenge with a variety of immersive environments. Students engage with interactive data visualizations inside dome environments that mimic the natural spherical perspective of human vision, creating immersion for greater retention. This network of sites shares costs, resources and programming opportunities, with a collaborative focus on teaching and learning. This session will illustrate recent examples combing SOS data with data from the NOAA funded WorldViews Network project.

Contact: sbrummel@umn.edu

SOS Explorer - A Version of SOS for the Classroom - In development, looking for feedback

Hilary Peddicord and Eric Hackathorn, NOAA ESRL

2:00 – 2:45 pm, Wednesday, June 11 – Argon

For years, Science On a Sphere has been looking for ways to bring the hundreds of data visualization seen on SOS to personal devices in order to expand our reach into classrooms and allow our docents and visitors to supplement the exhibit experience. We will demonstrate the first unreleased version of "SOS Explorer" that potentially includes viewing, graphing, probing, and putting datasets into playlists. Our expectation is that the tool will be used not only by teachers and eventually by students, but also by SOS docents

who are looking to practice their presentations on their own devices outside of the exhibit hall/theater. Join us for a live demo and brainstorming session on the future of this fantastic new version of your favorite exhibit!

Contact: hilary.peddicord@noaa.gov

Teacher Workshops using SOS - Examples and Discussion

April Chancellor, Museum of Science and Industry, Chicago

Hilary Peddicord, NOAA ESRL

2:45 – 3:30 pm, Wednesday, June 11 – Argon

Targeting educators interested in either doing teacher workshops or sharing the experience they have gained from hosting teacher workshops. For example, teachers from the Museum of Science and Industry's (MSI) Great Lakes Rocks teacher education course were invited to participate in an extension of the course called GLR: Visualizing Climate Change, funded by a NOAA Environmental Literacy Grant. Teachers in GLR:VCC participated in professional development workshops to deepen their understanding of Earth systems science content and climate change in the Great Lakes Region. For the culminating project, teachers worked in pairs to develop and deliver data-driven problem-based lessons using Science On a Sphere during a Student Summit at MSI. After a couple of examples of successful teacher workshops, we will open the floor for a discussion.

Contact: hilary.peddicord@noaa.gov

Visualizing Change – Developing Narratives for Global Change

Sylvia Scharf, New England Aquarium

Annette Brickley, Ocean Explorium

Emily Yam, Aquarium of the Pacific

3:45 – 5:00 pm, Wednesday, June 11 – Xenon

Visualizing Change is a NOAA-funded project to develop 'visual narratives' that will help interpreters tell a clear story about the effects of climate change, linking human actions with global impacts and global solutions. The goal of these narratives is to go beyond sharing information, engaging visitors and audiences in a conversation about stewardship and community-level actions that will reduce fossil fuel consumption. Join members of the team to learn about narratives in development, and to give feedback and ideas to make the narratives useful to as many institutions as possible. Topics include ocean acidification, primary productivity in the oceans, extreme weather, and sea level rise. Participants in this conversation will also get an overview of strategic framing, a field-tested and data-driven way to communicate complex topics, such as climate change, to diverse audiences. Learn successful terminology and communication techniques to bring back to your institution.

Contact: sscharf@neaq.org

Rethinking the SOS iPad Control Interface

Jamie Klein and Matt Bronwell, Denver Museum of Nature and Science
11:00 am – 12:00 pm, Thursday, June 12 – Future Earth

The standard NOAA iPad SOS control app works very well in most circumstances, but what if you want more? Here at the Denver Museum of Nature and Science, working in conjunction with NOAA, we have been toying with a new version of an SOS control app that goes beyond the standard capabilities and address some organizational issues. Our major challenge with the current iPad app is locating datasets and their organization. While still in the developmental stage, this app attempts to give users the ability to customize dataset organization while also providing a search feature to quickly locate datasets, movies and playlists. A few additional features we have incorporated are a robust notes section for facilitators, better sphere control and the ability to make playlists on the fly, all written in HTML 5 to work across all platforms. This is a great opportunity for tech savvy SOS users to get together and discuss the future of this app and get feedback from the community. Contact: jamie.klein@dmns.org

Evaluating the SOS Content Library

Dan Pisut, NOAA Visualization Lab
Beth Russell, NOAA SOS
1:00 – 2:30 pm, Thursday, June 12 – Argon

The SOS dataset catalog has a lot of resources – some widely used, some that need improvement, some that are probably out of date. As a group, we will discuss what makes a good dataset, score the datasets based on use of best practices, frequency of use, and educational value, and then make suggestions to NOAA on what should stay, go, get reworked, and how to better organize the content. Contact: dan.pisut@noaa.gov

How-To Descriptions

And Then There Were Three: Designing and Implementing a Three Projector SOS System

Bryan Kennedy, Science Museum of Minnesota
2:10 – 2:30 pm, Tuesday, June 10 – Future Earth

When we set out to remodel the Science On a Sphere theater space at the Science Museum of Minnesota, we knew we wanted to improve the visitor viewing experience, while using less floor space for the theater. We hit upon the novel idea of eliminating the fourth projector at the “back” of the sphere. Through careful design of the physical space and the development of custom content we were able to build a sphere experience where all of the audience members can focus on the same area of the sphere content, without losing the

powerful illusion of the spherical projection effect. In this presentation we will examine the considerations that lead to this approach, its advantages and challenges, and how others might consider using three projector systems in new setups.

Contact: bkennedy@smm.org

EarthNow "Mini" Training

Patrick Rowley and Margaret Mooney, CIMSS, University of Wisconsin – Madison
3:45 – 5:00 pm, Tuesday, June 10 – Future Earth

Based on feedback from the SOS Network and the 2012 SOS Users Workshop, the EarthNow team solicited applications for onsite EarthNow training sessions. Out of 15 applications, we were able to conduct 5 trainings at Nauticus Maritime Museum, Aldo Leopold Nature Center, Space Foundation, Grand Canyon National Park, and Ocean Explorium. This condensed 90 minute "mini" training at the 2014 SOS Workshop will be based on these trainings and guide participants through the EarthNow Training QuickGuide developed as a result of post-training surveys. Along with learning how to create and edit playlists, participants will be able to ask questions and discuss strategies to include EarthNow products into SOS exhibits.

Contact: patrick.rowley@ssec.wisc.edu

Film Release – *Our Pale Blue Dot* – Plus Tips and Tricks for Production on the Sphere

Victoria Weeks, Verglas Media

4:15 – 5:00 pm, Tuesday, June 10 – Discovery Hall

Humanity's perception of their only home has experienced a radical shift over the last sixty years. *Our Pale Blue Dot* examines this relatively new perspective and how it can reveal climate change. The film starts out with game-changing snapshots from space, and builds to a stirring introduction of global datasets. Further, we will examine how presenting movies on the sphere can be a powerful component of science storytelling. Many aspects of video production apply to spherical films; however there are areas that differ greatly from traditional media. We will show examples on SOS and share some challenges that we have faced as well as their solutions. Q&A is welcomed. The presenter, Victoria Weeks, has been photographing and editing spherical films for over eight years and helped create many of NASA's SOS movies, some of which include *Footprints*, *Frozen*, *Loop* and *Water Falls*. She is currently owner of Verglas Media and involved in a variety of productions, including independent spherical films about our planet.

Contact: victoria@verglasmedia.com

NESO Data Access and Measurements Tool

Maurice Henderson and Stephanie Schollaert Uz, NASA Goddard
1:00 - 2:00 pm, Wednesday, June 11 – Discovery Hall

NASA Earth and Space Observations (NESO) is an interactive map and measurements tool for SOS. The name is derived from the web tool NEO which provided the original functionality, and Earth Science data sets. The tool has been expanded to include Space Science data sets such as planetary, lunar, and all-sky maps, hence the new name. We are targeting K-12 students and educators, citizen scientists, and museum docents. During this presentation we will demonstrate the numerous capabilities of NESO to generate timely and relevant SOS clips, and demonstrate the way that scientists use remote sensing data to reach important conclusions about our planet during the Anthropocene. We are available to discuss ways that we have used NESO in formal and informal settings. We will spend a session only creating animations in NESO and preparing them for use in SOS playlists, or explore a wide range of critical science topics using NESO data sets that are germane to climate change.

Contact: maurice.henderson@nasa.gov

Training Docents for Conversation-Based Presentations

Lauren Chaharbakhshi, Museum of Science and Industry, Chicago
1:00 – 2:00 pm, Wednesday, June 11 – Argon

A conversation based approach to Science On a Sphere allows each presentation to be tailored to meet the needs of different audiences, but also requires a specialized skill set for docents. These skills include the use of inquiry methods and question based facilitation, use of positive reinforcement, high enthusiasm, and humor. With regular training and practice, docents can build these skills and become effective facilitators of conversational presentations. This session will discuss techniques for training docents to have two-way conversations with guests, and will include participation in improvisational activities.

Contact: lauren.chaharbakhshi@msichicago.org

The Power of 3: Framing Stories for the SOS

Toshi Komatsu, Lawrence Hall of Science, University of California – Berkeley
11:00 am – 12:00 pm, Thursday, June 12 – Xenon

The last Network meeting was focused on storytelling. As we move into this new era of more and more publicly available digital data coupled with the anthropocene, compelling science stories—or simply compelling stories—are more important than ever. Without a hook to engage the public, the truth gets lost in the noise, and the public is left confused. I will share lessons recently learned from a book, *Connection: Hollywood Storytelling Meets Critical Thinking* by Randy Olson, on how to craft stories that are both engaging and scientifically accurate. The book details a simple, specific, and flexible set of three templates that can be used to get to the heart of your story. Whether it is about rising sea levels, abnormal climates, or what you ate for lunch yesterday, any story can be made into a

compelling story. These lessons can (and should!) be applied to the SOS—an inherently striking visual medium, perfect for storytelling.

Contact: tkomatsu@berkeley.edu

Integrating NOAA View Content into SOS Presentations

Dan Pisut, NOAA Visualization Lab

11:00 am – 12:00 pm, Thursday, June 12 – Argon

The NOAA View data exploration tool (www.nnvl.noaa.gov/view) provides over 60 datasets, all formatted to work perfectly on the Science On a Sphere. During this session we will discuss how to use the NOAA View interface, download imagery and playlists, and load into the SOS system. More advanced topics such as playlist scripting, layering, editing and recoloring of the imagery will also be discussed.

Contact: dan.pisut@noaa.gov

Climate Change Communication: Workshop in Strategic Framing for Informal Science Educators

Julie Sweetland, FrameWorks Institute

1:00 – 2:30 pm, Thursday, June 12 – Xenon

Please join FrameWorks Institute staff for a theory-to-practice working session exploring tested communication strategies for promoting a more productive, policy-oriented civic conversation on climate and ocean change. Participants will learn to recognize differences between communications strategies that undermine the public's ability to engage with widescale solutions and those that open up a collective action frame, and benefit from guided practice with specific science translation tools such as Climate's Heart, a carefully-tested metaphor for the role of the ocean in regulating the climate system. Participation is limited to 25 participants.

Contact: jsweetland@frameworksinstitute.org

Creating Standards-Based Programs

Thomas Quayle, Clark Planetarium

1:00 – 2:30 pm, Thursday, June 12 - Neon

Participants in this workshop will be lead through a process that will help create compelling lessons for use by educators and educational institutions. We will focus on program and content development, ways to tie content into primary education curriculum such as the Next Generation Science Standards (NGSS), and methods of audience/presenter interaction. The goal of this workshop is to show how existing datasets can be used to produce programs that are standards-based and have a high level of audience interaction. Program and Content Development: • Identifying the audience – who will be seeing what you do • Reviewing State/national standards such as NGSS to ensure alignment • Identifying the most appropriate datasets for your audience • Organizing datasets and

approach into a compelling story •Testing with presenters •Testing with audiences
•Feedback and refinement •Augmenting lessons with pre/post visit activities Methods of Audience/Presenter Interaction •Designing questions that tie topics and datasets together and assess main themes •Use of outside media to enhance understanding of datasets and draw the audience in • Aspects of presenter interaction to encourage engagement •Using iClickers as a method of interaction We will be providing PowerPoints and scripted lessons for participants that they can take home.

Contact: tsquayle@slco.org

SOS Showcase Descriptions

Formal Education

Wind, Water & Mountains: Ingredients of Regional Climate - A Formal Education SOS Presentation

Hilary Peddicord, NOAA ESRL

2:10 – 2:25 pm, Tuesday, June 10 – Discovery Hall

Why does climate change matter? To understand the implications of climate change, we must first understand what climate is and what it is supposed to be like. This script is intended to be used with 6-10th grade students learning about regional climate and biomes. The Science On a Sphere script is written as an interactive lecture to elaborate on "ingredients of regional climate" such as latitude, prevailing wind, elevation, proximity to water, ocean currents that determine a location's climate. Students follow 1 location out of 6 unidentified exotic locations (marked with pushpins) and make notes on a worksheet in order to later write a summary of the climate of that location. The final activity, done in the theater, involves choosing the picture and corresponding biome of their unnamed location.

Contact: hilary.peddicord@noaa.gov

Dataset Creation as a Teaching and Learning Tool

Darik Velez, St. Paul's School

2:25 – 2:40 pm, Tuesday, June 10 – Discovery Hall

At St. Paul's School in Concord, NH, we have an SOS system for our teachers and students to use. In order to encourage this, we have just completed our first run of an elective course titled "Computer Programming: Dataset Creation for the Science On a Sphere". In this course, students paired with teachers in different disciplines to create presentations for use by the teachers in a wide variety of content areas. This presentation will demonstrate some of the results of this class while highlighting some of the challenges and successes of this first attempt at using the SOS system as a teaching and learning tool.

Contact: dvelez@sps.edu

'How Much Did It Rain?' And Other Hard Questions

Bill Mitchell, Lawrence Hall of Science, University of California – Berkeley
2:40 – 2:55 pm, Tuesday, June 10 – Discovery Hall

Using seemingly simple questions, the Sphere can become a springboard for diving into the complexities of Earth science from intuitive concepts. Direct observations, remote observations, and models all help us understand the atmosphere. This program explores these three tools, their strengths, and their application, through precipitation and CO₂ datasets. Although aimed at an informal audience 7th grade and up, many of the science and engineering practices which are used or considered are aligned with the NGSS framework and the presentation could be modified easily to fit formal education.

Contact: wsmitchell3@gmail.com

Ice in Our Solar System

Sue Wu, Oregon Museum of Science & Industry (OMSI)
2:55 – 3:10 pm, Tuesday, June 10 – Discovery Hall

“Calling all space cadets: come join me at the NASA training center in Portland, Oregon to look for evidence of ice in space.” As part of OMSI’s NASA Earth from Space grant, we worked with college interns to develop and test live SOS programs. After running the Ice in Our Solar System demonstration with visitors, over time we added simple hands-on props and a storyline to engage younger children. Come check out the latest version. This presentation is geared toward docents.

Contact: swu@omsi.edu

Invisible Mars: How MAVEN will Look for Mars' Lost Atmosphere

Brooke Hsu, NASA Lunar and Planetary Institute
3:10 – 3:25 pm, Tuesday, June 10 – Discovery Hall

Invisible Mars is a docent-led presentation that discusses how the MAVEN mission will investigate the loss of the Martian atmosphere. Materials included in the package include science background information, the script and playlist, and all data sets needed to run the program. The Invisible Mars script includes a demonstration of how a planetary atmosphere is lost to space, and an audience participation activity. The script is written for a 6th grade comprehension level. Key learning points: The environment on Mars used to support liquid water at the surface Mars is a much drier place now Evidence suggests that Mars had a thicker atmosphere early in its history and that the climate of Mars was warmer and wetter in the past Mars has a thin atmosphere today. MAVEN will study the martian atmosphere, from close to the planet’s surface to high up in the outer reaches, to find out the rate of loss of water and other gases from the atmosphere today and to determine what the loss rate might have been in the past. Data from MAVEN will help scientists as they try to solve the mystery: what happened to the water on Mars?

Contact: Brooke.C.Hsu@nasa.gov

Artistic Exploration: Kepler Exoplanets Inspire Student Art on the SOS

Toshi Komatsu, Lawrence Hall of Science, UC Berkeley
3:45 – 4:00 pm, Tuesday, June 10 – Discovery Hall

The NASA Kepler Mission Education and Public Outreach team, in coordination with the staff at the NASA Ames Exploration Center at Moffett Field, CA, have just launched a pilot test of a new SOS curriculum project. The project consists of 2 parts: a pre-visit, in class curriculum to introduce students to the Kepler Mission and the idea of exoplanets, and a curriculum to visit the SOS at the Exploration Center. A major component of the pre-visit curriculum is for students to work in small groups (2-3 students) to design and create their own visualization of an exoplanet. Upon their visit to the SOS, the class is split into three groups that rotate through three stations-one of which is the SOS. The students then present and describe their exoplanet to their peers while it is displayed on the SOS. These activities were designed for grades 4-6, with Next Generation Science Standards and Common Core standards in mind. I will share our early results from the pilot tests.
Contact: tkomatsu@berkeley.edu

Of Kiosks and Content: Bridging Science and Public Understanding

Toshi Komatsu, Lawrence Hall of Science, UC Berkeley
4:00 – 4:15 pm, Tuesday, June 10 – Discovery Hall

Within the last 15 years or so, the digital revolution has changed how the public accesses real data about our planet. However, much of those data are unintelligible to the public. Science centers and research labs serve an important function as data interpreters. The Lawrence Hall of Science is developing a model and platform for connecting with local scientists and their data to create relevant stories to give the public deeper conceptual explanations and a global context. As part of that model, I will share and discuss a (preliminary) concept for a new, highly flexible and updatable, publicly attractive kiosk. Part of the flexibility of this kiosk is the ability to showcase both full stories on specific topics or themes, and also individual datasets that allow the freedom to explore the wealth of data on the SOS. This work has been funded by an NSF grant under the Geosciences division.
Contact: tkomatsu@berkeley.edu

Science Museum of Minnesota Showcase

Future Earth Theater

Bryan Kennedy and Robert Garfinkle, Science Museum of Minnesota
2:30 – 3:00 pm, Tuesday, June 10 – Future Earth

Come view the Future Earth Theater: an object theater featuring a Minnesota's only Mammoth skull, a crocodile from North Dakota, and the Science On a Sphere. In this showcase we present the SOS program at the center of Future Earth, the museum's exhibit

on the Anthropocene. This SOS presentation features physical objects, directional audio, custom lighting queues, and flat screen media that combine to demonstrate how humans are now the dominant force of change on the planet. We will discuss some of the challenges in developing an engaging and hopeful show on this often dour topic. We will also highlight the advantages of using the SOS in an object theater setting.

Contact: bkennedy@smm.org

Planet Earth Decision Theatre

Stephanie Long, Science Museum of Minnesota

3:00 – 3:30 pm, Tuesday, June 10 – Future Earth and optional lunchtime event!

For three years, Science Live Theatre at the Science Museum of Minnesota has been performing Planet Earth Decision Theatre to thousands of visitors. Come witness our visitor experience and cast your vote about the future health of our planet in this interactive presentation. The show runs every day at 12:30 pm on level three of the museum. Seating is limited.

Contact: slong@smm.org

Earth's Humanity

Film Shorts: A Set of Four Short Films on the Anthropocene and Climate Change

Robert Garfinkle, Science Museum of Minnesota

1:00 – 1:20 pm, Wednesday, June 11 – Future Earth

Informal research conducted at the last SOS Users Group Meeting indicated that short, mini-films would be potentially attractive programming for auto-run Spheres. The Science Museum of Minnesota has created four 3-minute films on the effects of anthropogenic change on Earth. Preview this series of films and share your feedback and thinking about these films in particular and short auto-run programming for Spheres in general.

Contact: rgarfinkle@smm.org

SOS: Cognition + Affect = Effect

Shilpi Gupta, NOAA Science On a Sphere, Boulder, CO

Marda Kirn, EcoArts Connections in Boulder, CO

1:20 – 1:40 pm, Wednesday, June 11 – Future Earth

"SOS: Cognition + Affect = Effect" (CAE) is a year-long project that commissioned two artists, advised by a team of scientists from various disciplines, to create two short films for SOS. CAE is investigating the hypothesis that science and data visualizations conveyed on SOS through artistic images, metaphor, and storytelling can be more effective for inspiring social engagement and behavior change than data described solely from an informational standpoint. In this presentation, you will see each artist's film. In addition, we will discuss

the project's research plan, audience evaluation results, and the importance of exploring such collaborations.

Contact: Shilpi.Gupta@noaa.gov

See the People

Jamie Klein, Denver Museum of Nature and Science
1:40 – 2:00 pm, Wednesday, June 11 – Future Earth

This SOS showcase is comprised of six data sets on the sphere. It tells the story of humanity's distribution around the globe with a positive message about population growth patterns: global color-coded footprint of our species, global population distribution, airplane flight paths, lights at night, Facebook connections world-wide, population growth rate change by nation over time. We have become the human planet. Our species is 7.2 billion strong and we have spread across the face of the earth; and we have modified the face of the earth. Our cities glow at night, our footprints span all lands, our aircraft sweep across the globe. We are the first globally linked species. This unprecedented inter-connectivity has fostered education and technology transfer across the face of the globe. Medical care and education has made global strides. As a direct result we have curbed our population growth and are heading for a future where large population excesses are not our civilization's primary hurdle. We can now focus more on resiliency and sustainable lifestyles to provide a better planet for our children.

Contact: jamie.klein@dmns.org

Constructing Shows and Content

Exploring Earth Systems Science demonstrations, and 'Rapid Response' for current events with the Science On a Sphere at Pacific Science Center

Zeta Strickland, Pacific Science Center
2:00 – 2:20 pm, Wednesday, June 11 – Discovery Hall

Pacific Science Center is just starting work on a two year grant that focuses on earth system science demonstrations on our Sphere. We are developing nine demonstrations using existing datasets that will explore a range of topics from geology, land use, and weather and climate. In this session we'll see one of the newly created demonstrations, share our staff content and presentation training, and share how these pre-scripted demonstrations will form the basis of our 'Rapid Response' programming that will interpret near-real time events to guests.

Contact: zstrickland@pacsci.org

One-Point Modules: An Easy Strategy for Organizing and Presenting Data on the Sphere

Eddie Goldstein, Denver Museum of Nature & Science
2:20 – 2:40 pm, Wednesday, June 11 – Discovery Hall

With the vast, and growing, number of datasets available for the Sphere, one of the challenges is finding good datasets for answering interesting questions. A strategy that we are currently working on is what we call One-Point Modules. These are short playlists of 2 or 3 datasets, often layered, which are designed to make a single point. Our goal is to make these dataset comparisons so compelling that visitors have *Aha!* understandings of the points we are trying to make. We even name these modules as questions so that a list of them looks like a list of FAQs. We will show a couple of our modules on the Sphere. We will also discuss what we have discovered are the necessary components for creating these modules. Finally, we will enlist our fellow SOS users to join the effort in creating and sharing these one point modules.

Contact: Eddie.Goldstein@dmns.org

A Tale of Three Planets

Eddie Goldstein, Denver Museum of Nature & Science
2:40 – 2:50 pm, Wednesday, June 11 – Discovery Hall

A Tale of Three Planets - Climate scientists often reference the climate histories of Venus and Mars as they try to understand the climate history of Earth. After all, there is strong evidence that all three planets started with very similar climates. Understanding what happened on Venus and Mars gives scientists clues as to what might happen on Earth. We wondered if understanding Venus and Mars would also aid VISITORS in understanding climate change on our own planet. To find out we created a show which explores some of the basic principles of climate science. Our feeling is that understanding these basics is a precursor to understanding the subtleties in the ongoing debate on how to best address global climate change on Earth. We will present our show and share resource materials.
Contact: Eddie.Goldstein@dmns.org

WATER FALLS -- An SOS Movie about NASA's Global Precipitation Measurement Mission

Michael Starobin, NASA Goddard
2:50 – 3:10 pm, Wednesday, June 11 – Discovery Hall

WATER FALLS integrates live action footage, animation, and data visualization into a unified story about one of the most ambitious Earth observing missions ever deployed. Designed exclusively for SOS, WATER FALLS challenged the creative team to solve tough production problems without losing sight of essential mission messages. The result takes viewers on a meditative, compelling journey, designed to provide a sensory experience through images, sound, and language as much as it does an informational experience. This

performance and accompanying Q&A will provide a forum for beginning and experienced content producers to consider some of the techniques and philosophies that go into making fully featured productions of this kind. It will introduce the concept of a "seamless" live action production sequence, with opportunities to discuss composition and execution. It will also provide an opportunity to demonstrate the challenges of dealing with "accurate" data visualizations of non-spherical shapes presented on a spherical surface.

Contact: michael.starobin@nasa.gov

Visual Storytelling on Tight Budgets and Timelines

Andrew Cohen and Keith Miller, Aquarium of the Pacific

3:10 – 3:30 pm, Wednesday, June 11 – Discovery Hall

Aquarium of the Pacific presents two new sphere productions on how to create compelling stories with limited time and budgets.

Contact: acohen@lbaop.org

Special Earth Topics

Evolution of the Earth (Draft Production)

Maurice Henderson, NASA Goddard

1:00 – 1:20 pm, Thursday, June 12 – Discovery Hall

NASA Goddard is in the production phase of a new SOS feature highlighting the last 4.569 Billion years in the evolution of the Earth. We stop along the way to examine major bombardments, the formation of the moon and oceans, the great oxygenation, and the explosions of life over the most recent 500 million years. This spiraling journey through Earth's history seeks to explain our place in the solar system, and highlight the feature of our current Habitable World alongside Mars.

Contact: maurice.henderson@nasa.gov

Climates of the Past and Present at Grand Canyon

AJ Lapre, Park Ranger, Grand Canyon National Park

1:20 – 1:40 pm, Thursday, June 12 – Discovery Hall

This presentation is a standard park ranger program that I present at the Grand Canyon National Park Visitor Center. It is our first attempt creating a park ranger program with the Sphere that we have given at the park. The target audience is any of our park visitors for people of all ages.

Contact: aj_lapre@nps.gov

"Life Without Sunlight" Live!: Bringing the Deep Sea to the Science On a Sphere

Stace Beaulieu, Woods Hole Oceanographic Institution
Annette Brickley, Ocean Explorium
1:40 – 1:55 pm, Thursday, June 12 – Discovery Hall

The New Bedford Ocean Explorium, in collaboration with Woods Hole Oceanographic Institution, invites you to explore the deep sea with a new live docent presentation - "Life Without Sunlight." Our unique new content dives beneath the sunlit ocean to the darkness of deep-sea vents, where hot water spews from the seafloor and fuels food webs based on chemosynthesis. We use imagery obtained with deep-sea vehicles to illuminate this otherworld of ecosystems linked to deep Earth and ocean systems. We tour the Earth's plate boundaries to see where deep-sea vents have been discovered over the past four decades. Our educational package will be available to the entire SOS Users Network and contains this and "Smoke and Fire Underwater," a companion scripted presentation with SOS playlist, both matched to auto-run movies. Both storylines address Earth science and ocean literacy principles. Come see how you can incorporate this new content into your existing programs for Earth system science, primary productivity, and biodiversity.
Contact: stace@whoi.edu

"Smoke and Fire Underwater": A New Movie with Virtual Exploration for Learning and Engagement

Stace Beaulieu, Woods Hole Oceanographic Institution
Annette Brickley, Ocean Explorium
1:55 – 2:10 pm, Thursday, June 12 – Discovery Hall

Did you know that there are volcanoes in the deep sea with vents that can spew hot water over 750 degrees F? Did you know that life can survive, even thrive, near such extreme environments? Come watch the debut of "Smoke and Fire Underwater" - one of two new movies created by the Woods Hole Oceanographic Institution and the New Bedford Ocean Explorium. Our unique new content interweaves imagery obtained with deep-sea vehicles with global datasets, including a new dataset locating the world's known deep-sea hydrothermal vents. Our educational package will be available to the entire SOS Users Network and contains two scripted interactive presentations with SOS playlists, matched to this and the companion movie, "Life Without Sunlight." Both storylines address Earth science and ocean literacy principles. After the movie, we will present results of our evaluation of learning and engagement, which includes a comparison of the delivery of each story (movie or docent-led presentation). Initial results indicate that most students who participated in this virtual exploration were "quite a bit" excited about the deep ocean frontier and the exploration and research of deep-sea vents.
Contact: stace@whoi.edu

Beyond "Science" on a Sphere: Digital History, Arts, and Humanities in the Round

Cassandre (Tassie) Gniady and Patrick Beard, Indiana University

2:10 – 2:30 pm, Thursday, June 12 – Discovery Hall

Here at Indiana, we have been experimenting with datasets that fall into the "Extras" category. In February we sent out our first set to the SOS network entitled: "Mapping the Winter Olympics: 1924-2014." Over the course of the month we put together a set of historic participants, historic medal winners and, finally, a movie that combines the historical data with an in-depth look at the Sochi games. In addition, as the graduate assistant for Indiana's Sphere, I have used my background in digital humanities and information science to work with a virtual heritage class, a digital photography class, and a digital humanities class. In the latter I gave a lecture on Spatial Humanities, specifically focusing on using global datasets that could be applied to the Sphere.

Contact: ctgniady@indiana.edu