



**2017 Summer Conference**  
**Helping Every Student Succeed: Strategies**  
**for Engagement, Deepening Understanding,**  
**and Addressing Student Difficulties**

Conference Program

June 25 to June 27, 2017 • University of Maine • Orono, Maine

*Hosted by the Maine Center for Research in STEM Education (RiSE Center)*



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# **Conference Host**

## **Maine Center for Research in STEM Education (RiSE Center)**

The Maine Center for Research in STEM Education (RiSE Center) provides an integrated approach to University-based research and professional development in science and mathematics education. The RiSE Center is an interdisciplinary research center with faculty members from the College of Education and Human Development, the College of Liberal Arts and Sciences, and the College of Natural Sciences, Forestry and Agriculture. RiSE faculty members are involved in partnerships with other STEM and STEM education faculty, K-12 teachers and administrators, and members of nonprofits committed to improving STEM education. Their work includes basic and applied research on learning and teaching in science and mathematics; research-guided modifications to introductory and upper level science, mathematics, and engineering courses to include more student-centered practices, establishing content-rich, research-based teacher preparation and professional development, and building infrastructure for ongoing STEM education improvement with teachers, schools, and administrators throughout the state.

The Master of Science in Teaching Program, offered by the RiSE Center, provides a rigorous research-based route to initial certification for STEM majors interested in teaching secondary science and/or mathematics; an opportunity for veteran teachers to build their knowledge of teaching and learning in their disciplines while earning a Master's degree; and a chance for STEM majors to conduct STEM education research, often in preparation for doctoral work in a related field. All MST graduates must complete a research thesis as part of the degree requirements. The University of Maine has recently established a Ph.D. program in STEM Education, offered by RiSE Center faculty members through the College of Education and Human Development.

Since its formation in 2001, the RiSE Center has hosted conferences annually focused on integrating STEM education research and practice. This integration is a significant part of many of the Center's initiatives, including the Maine STEM Partnership, a K-16+ partnership with 160 Maine schools, 100 school districts, 700 teachers, 29,000 students, and over 30 University of Maine faculty members. The Partnership sustains a state-wide professional community that brings educators and education researchers together to support high-quality, evidence-based instruction for students at all levels. More information about the RiSE Center and its programs can be found at [umaine.edu/risecenter/](http://umaine.edu/risecenter/).

## Schedule-at-a-Glance

### Sunday, June 25

Time	Event	Location
3:00-6:00 PM	Dormitory Check-In	DTAV Community Center
4:30-6:00 PM	Conference Registration	Wells Conference Center Lobby
6:00-8:00PM	Dinner	Wells Conference Center
	Opening Remarks and Welcome: Dr. Susan McKay	
	Keynote: Dr. David Kung, St. Mary's College of Maryland	

### Monday, June 26

Time	Event	Location
7:30-8:30AM	Information Table and Continental Breakfast	Wells 1
8:30-9:15 AM	Keynote: Michael O'Byrne, Bellevue School District, WA	Wells 1
9:20-10:00 AM	Talk Session 1	See Talk Schedule
10:00-10:20 AM	Coffee Break and Transition to Workshop A	Wells 1
10:20-11:50 AM	Workshop A	See Workshop Schedule
11:50-1:15 AM	Lunch	Hilltop Dining Hall
	Set-Up for Poster Session	Estabrooke Ballroom
1:15-1:55 PM	Talk Session 2	See Talk Schedule
2:00-2:40 PM	Talk Session 3	See Talk Schedule
2:40-3:00 PM	Coffee Break and Transition to Workshop B	Wells 1
3:00-4:30 PM	Workshop B	See Workshop Schedule
4:30-6:00 PM	Poster Session	Estabrooke Ballroom

**Tuesday, June 27**

<b>Time</b>	<b>Event</b>	<b>Location</b>
7:30-8:30 AM	Information Table and Continental Breakfast	Estabrooke Ballroom
8:30-9:10 AM	Talk Session 4	See Talk Schedule
9:20-10:50 AM	Workshop C	See Workshop Schedule
10:50-11:50 AM	Lunch	Estabrooke Ballroom
11:50-1:20 PM	Workshop D	See Workshop Schedule
1:30-3:00 PM	Open Conference	Buchanan Alumni House

## Keynote Presentations

**Keynote Speaker: *Dr. David Kung***  
**Professor of Mathematics, St. Mary's College of Maryland**

**Sunday, June 25**  
**7:15-8:00 PM**

### **Keynote: Promoting Mathematically Responsible Citizenship in an Era of Alternative Facts**

Most citizens spend years in our mathematics classes before they ever cast a vote. Are we preparing them to be responsible, informed participants in a thriving democracy? What mathematics is required to understand current events, critically examine issues of social and economic justice, and properly evaluate public policy proposals? What can educators who teach mathematics do to fight back against the rise of alternative facts? We will discuss example problems, student projects, and course curricula that push us in the direction of a more just world.

**Keynote Speaker: *Michael O'Byrne***  
**High School Physics Teacher, Bellevue School District, WA**

**Monday, June 26**  
**8:30-9:15 AM**

### **Keynote: Supporting Student Learning in Physics – the impact of inquiry-based professional development.**

In this talk, I will highlight the role of inquiry-oriented professional development on efforts to better support student learning. As my professional preparation was in the biological sciences, intensive summer institutes focused on the learning and teaching of physics via guided inquiry were critical as I worked to become an effective high school physics teacher. Although I have served as a lead instructor in such professional development efforts for many years now, these experiences (whether as a participant or a facilitator) continue to affect my teaching in substantive ways. In particular, I will describe the role of inquiry-based lessons in advanced physics courses (IB and AP), with a particular emphasis on developing reasoning skills, managing formative assessments, and using questioning strategies while also preparing students for content-heavy standardized assessments.

## Detailed Talk Schedule

**Monday, June 26**

**Talk Session 1 (9:20-10:00 AM)**

**\*Note:** A target student age range has been listed for each talk. This is meant to serve as a resource for teachers in determining which talks may be most relevant. Any person may attend any talk.

Talk Title and Presenter	Location	Grades Targeted
Dr. Alan Buss, Associate Professor of Elementary Science and Mathematics Education, University of Wyoming <i>Using Robotics to Develop Elementary Students' Computational Thinking</i>	Wells 1	K-8
Lindsay Glasner BirdSleuth K-12 Outreach Coordinator, Cornell Lab of Ornithology <i>The Power of Citizen Science</i>	Wells 2	K-12
Dr. Lisa Rice Assistant Professor in Mathematics Education, Arkansas State University <i>Taxi-cab Geometry: Exploring an Alternative Geometry System?</i>	Wells 3	6-12

**Talk Session 2 (1:15-1:55 PM)**

Talk Title and Presenter	Location	Grades Targeted
Dr. Ander Erickson Assistant Professor of Math Education, Western Oregon University <i>Information Literacy in Mathematics Courses</i>	Wells 1	9-12
Dr. Asli Sezen-Barrie Assistant Professor of Science Education Towson University, Physics, Astronomy and Geosciences <i>Engaging All Students into Scientific Practices: Lessons from K-12 Classrooms</i>	Wells 2	6-12

<p style="text-align: center;">Shari Templeton  Science and Technology Content Specialist and York County  Regional Representative, Department of Education  Melissa Vallieres  Early Childhood Education Science Specialist  <i>Science Pathways to Literacy</i></p>	Wells 3	K-5
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<b>Talk Session 3 (2:00-2:40 PM)</b>
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<b>Talk Title and Presenter</b>	<b>Location</b>	<b>Grades Targeted</b>
<p style="text-align: center;">Dr. Brian Gane  Research Assistant Professor  University of Illinois at Chicago  <i>A Design Framework for Developing Science Assessment Tasks for  Formative Use</i></p>	Wells 1	K-12
<p style="text-align: center;">Dr. Justin Dimmel  Assistant Professor of Mathematics Education and Instructional  Technology, UMaine; RiSE Center  Camden Bock  Graduate Research Assistant, College of Education and Human  Development, UMaine  <i>HandWaver: A Gesture-Based Virtual Mathematical Making  Environment</i></p>	Wells 2	K-12
<p style="text-align: center;">Stephen Barry  Physics Teacher, Harper Creek High School, Harper Creek  Community Schools, MI  <i>Using Modeling Practices to Create Optimal Learning Moments in  Project-Based Physical Science Units</i></p>	Wells 3	9-12

**Tuesday, June 27**

**Talk Session 4 (8:30-9:10 AM)**

<b>Talk Title and Presenter</b>	<b>Location</b>	<b>Grades Targeted</b>
Shawn Laatsch Director of the Emera Astronomy Center and Jordan Planetarium at the University of Maine <i>The Great American Eclipse 2017 and Beyond - Sharing Eclipses With Our Students</i>	Buchanan Alumni House, McIntire Room	K-8
Dr. Michael C. Wittmann Professor of Physics, Department of Physics and Astronomy; RiSE Center <i>What We Pay Attention To, and How It Affects Our Teaching</i>	Heritage House, Foyer	6-12

## Detailed Workshop Schedule

**\*NOTE:** Each workshop is offered in two sessions. Please note that space is limited for certain workshops in certain sessions (noted in the schedule). We request that you sign-up for workshop sessions at the registration desk when picking up your registration material, and/or at the information tables at meal times.

### Monday, June 26

#### Workshop Session A (10:20-11:15 AM)

**\*Note:** A target student age range has been listed for each workshop. This is meant to serve as a resource for teachers in determining which workshops may be most relevant. Any person may attend any workshop.

Workshop Title and Presenter	Location	Grades Targeted
Michael P. O’Byrne, High School Physics Teacher, Bellevue School District, WA <i>Inquiry-Oriented Strategies for Teaching Electric Circuits in High School Physics Courses</i> Capped at 15 Participants	Aubert Hall, 428	6-12
Dr. Asli Sezen-Barrie, Assistant Professor of Science Education, Towson University, Physics, Astronomy and Geosciences <i>"Don't Be So Shellfish!": Ocean Acidification and Oysters</i> Capped at 15 Participants	Aubert Hall, 427	6-12
Dr. Ander Erickson, Assistant Professor of Math Education, Western Oregon University <i>Counting on the Knowledge of Others: facilitating information-based problems in the math classroom</i>	Shibles Hall, 201	9-12
Dr. Brian Gane, Research Assistant Professor, University of Illinois at Chicago <i>Using Three-Dimensional Learning Performances to Structure Instruction and Assessment</i>	Neville Hall, 208	K-12
Stephen Barry, Physics Teacher, Harper Creek High School, Harper Creek Community Schools, MI <i>Increasing Engagement in Physics through Project Based Learning</i>	Donald P. Corbett Business Building, 217	9-12

<p>Teri Jergenson, Science Teacher, Bucksport High School, Bucksport, Maine</p> <p>Don Sprangers, Science Teacher, Washington Academy, East Machias, Maine</p> <p>Yvonne Thomas, Education Director, Island Institute, Rockland, ME</p> <p>Bill McWeeny, Science and Math Teacher, Adams School, Castine, ME</p> <p><i>Panel on Place- and Project-Based Teaching and Learning in Maine</i></p> <p>Capped at 20 Participants</p>	<p>Donald P. Corbett Business Building, 218</p>	<p>K-12</p>
<p>Christopher Nadeau, PhD Student, University of Connecticut Hannah Webber, Education and Research Project Manager, Schoodic Institute</p> <p>Bill Zoellick, Education Research Director, Schoodic Institute <i>Connecting Ideas Across K-12 Science Education to Prepare Students to Think About Biodiversity and Climate Change</i></p>	<p>Donald P. Corbett Business Building, 215</p>	<p>K-12</p>
<p>Shari Templeton, Science and Technology Content Specialist and York County Regional Representative, Department of Education Melissa Vallieres, Early Childhood Education Science Specialist <i>Catch the Wave! Engage in phenomena to understand light and sound waves and see the benefits of teaching literacy through science.</i></p> <p>Capped at 20 Participants</p>	<p>Estabrooke Hall, Fireside Room</p>	<p>K-2</p>

**Workshop Session B (3:00-4:30 PM)**

<b>Workshop Title and Presenter</b>	<b>Location</b>	<b>Grades Targeted</b>
<p>Michael P. O’Byrne, High School Physics Teacher, Bellevue School District, WA</p> <p><i>Inquiry-Oriented Strategies for Teaching Electric Circuits in High School Physics Courses</i></p> <p>Capped at 20 Participants</p>	<p>Bryand Global Sciences Center, 203</p>	<p>6-12</p>

<p>Dr. Asli Sezen-Barrie, Assistant Professor of Science Education, Towson University, Physics, Astronomy and Geosciences <i>"Don't Be So Shellfish!": Ocean Acidification and Oysters</i></p>	<p>Bryand Global Sciences Center, 101</p>	<p>6-12</p>
<p>Dr. Ander Erickson, Assistant Professor of Math Education, Western Oregon University <i>Counting on the Knowledge of Others: facilitating information- based problems in the math classroom</i> Capped at 25 Participants</p>	<p>Estabrooke Hall, Fireside Room</p>	<p>9-12</p>
<p>Don Sprangers, Science Teacher, Washington Academy, East Machias, Maine Teri Jergenson, Science Teacher, Bucksport High School, Bucksport, Maine Yvonne Thomas, Education Director, Island Institute, Rockland, ME Bill McWeeny, Science and Math Teacher, Adams School, Castine, ME <i>Panel on Place- and Project-Based Teaching and Learning in Maine</i> Capped at 25 Participants</p>	<p>Merrill Hall, 335</p>	<p>K-12</p>
<p>Christopher Nadeau, PhD Student, University of Connecticut Hannah Webber, Education and Research Project Manager, Schoodic Institute Bill Zoellick, Education Research Director, Schoodic Institute <i>Connecting Ideas Across K-12 Science Education to Prepare Students to Think About Biodiversity and Climate Change</i></p>	<p>Merrill Hall, 330</p>	<p>K-12</p>
<p>Shari Templeton, Science and Technology Content Specialist and York County Regional Representative, Department of Education Melissa Vallieres, Early Childhood Education Science Specialist <i>Catch the Wave! Engage in phenomena to understand light and sound waves and see the benefits of teaching literacy through science.</i></p>	<p>Bryand Global Sciences Center, 102</p>	<p>K-2</p>
<p>Dr. Lisa Rice, Assistant Professor in Mathematics Education, Arkansas State University <i>Taxi-Cab Geometry: Exploring an Alternative Geometry System</i></p>	<p>Bryand Global Sciences Center, 201</p>	<p>6-12</p>

Lindsay Glasner, BirdSleuth K-12 Outreach Coordinator, Cornell Lab of Ornithology <i>Developing Science Process Skills through Citizen Science and Data Interpretation</i> Capped at 20 Participants	Merrill Hall, 228A	K-8
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**Tuesday, June 27**

<b>Workshop Session C (9:20-10:50 AM)</b>
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Workshop Title and Presenter	Location	Grades Targeted
Shawn Laatsch, Director of the Emera Astronomy Center and Jordan Planetarium at the University of Maine <i>Lunar Phases and Eclipses - Understanding Spacial Relationships</i>	Bryand Global Sciences Center, 101	K-8
Dr. Alan Buss, Associate Professor of Elementary Science and Mathematics Education, University of Wyoming <i>Leveraging the Affordances of LEGO Robotics to address STEM Standards</i> Capped at 20 Participants	Merrill Hall, 228	K-5
Dr. Michael C. Wittmann, Professor of Physics, Department of Physics and Astronomy; RiSE Center <i>The Flow of Energy Flow Through the Curriculum</i> Capped at 20 Participants	Bryand Global Sciences Center, 203	K-9
Dr. Justin Dimmel, Assistant Professor of Mathematics Education and Instructional Technology, UMaine; RiSE Center Camden Bock , Graduate Research Assistant, College of Education and Human Development, UMaine <i>Exploring Plane and Solid Geometry in Virtual Reality</i> Capped at 16 Participants	Shibles Hall, 207	K-12
Laura Millay, RiSE Research and Evaluation Coordinator, RiSE Center, UMaine <i>Assessing Student Learning of Science Content: Designing and Interpreting Tests</i>	Bryand Global Science Center, 102	6-12

Travis Hall, STEM Coordinator for the Boys & Girls Club of the Austin Area, TX <i>3D Printing in Education</i>	Estabrooke Hall, 130	K-12
Dr. Brian Gane, Research Assistant Professor, University of Illinois at Chicago <i>Using Three-Dimensional Learning Performances to Structure Instruction and Assessment</i> Capped at 25 Participants	Estabrooke Hall, Fireside Room	K-12
Stephen Barry, Physics Teacher, Harper Creek High School, Harper Creek Community Schools, MI <i>Increasing Engagement in Physics through Project Based Learning</i>	Bryand Global Sciences Center, 201	9-12

<b>Workshop Session D (11:50-1:20 PM)</b>
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Workshop Title and Presenter	Location	Grades Targeted
Shawn Laatsch, Director of the Emera Astronomy Center and Jordan Planetarium at the University of Maine <i>Lunar Phases and Eclipses - Understanding Spacial Relationships</i>	Bryand Global Sciences Center, 101	K-8
Dr. Alan Buss, Associate Professor of Elementary Science and Mathematics Education, University of Wyoming <i>Leveraging the Affordances of LEGO Robotics to address STEM Standards</i> Capped at 20 Participants	Merrill Hall, 228	K-5
Dr. Michael C. Wittmann, Professor of Physics, Department of Physics and Astronomy; RiSE Center <i>The Flow of Energy Flow Through the Curriculum</i> Capped at 20 Participants	Bryand Global Sciences Center, 203	K-9
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<p>Dr. Justin Dimmel, Assistant Professor of Mathematics Education and Instructional Technology, UMaine; RiSE Center  Camden Bock , Graduate Research Assistant, College of Education and Human Development, UMaine  <i>Exploring Plane and Solid Geometry in Virtual Reality</i>  Capped at 16 Participants</p>	<p>Shibles  Hall, 207</p>	<p>K-12</p>
<p>Laura Millay, RiSE Research and Evaluation Coordinator, RiSE Center, UMaine  <i>Assessing Student Learning of Science Content: Designing and Interpreting Tests</i></p>	<p>Bryand  Global  Science  Center, 102</p>	<p>6-12</p>
<p>Travis Hall, STEM Coordinator for the Boys &amp; Girls Club of the Austin Area, TX  <i>3D Printing in Education</i></p>	<p>Estabrooke  Hall,  130</p>	<p>K-12</p>
<p>Dr. Lisa Rice, Assistant Professor in Mathematics Education, Arkansas State University  <i>Taxi-Cab Geometry: Exploring an Alternative Geometry System</i></p>	<p>Bryand  Global  Science  Center, 201</p>	<p>6-12</p>
<p>Lindsay Glasner, BirdSleuth K-12 Outreach Coordinator, Cornell Lab of Ornithology  <i>Developing Science Process Skills through Citizen Science and Data Interpretation</i>  Capped at 25 Participants</p>	<p>Estabrooke  Hall,  Fireside  Room</p>	<p>K-8</p>

# Talk Abstracts

*In Order by Session*

## **Talk Session 1 - Monday, June 26 (9:20-10:00 AM)**

### **Using Robotics to Develop Elementary Students' Computational Thinking**

*Dr. Alan Buss, Associate Professor in Elementary Science and Mathematics Education  
University of Wyoming*

This talk will focus on how the affordances of LEGO robotics can be leveraged to develop computational thinking skills in elementary/middle school students. Connections will be made to the Common Core State Standards in Mathematics, the Next Generation Science Standards, and the computational thinking standards from the International Society for Technology in Education.

### **The Power of Citizen Science**

*Lindsay Glasner, BirdSleuth K-12 Outreach Coordinator, Cornell Lab of Ornithology*

Explore what citizen science is and how it relates to the Next Generation Science Standards by inspiring authentic student investigations.

### **Taxi-cab Geometry: Exploring an Alternative Geometry System?**

*Dr. Lisa Rice, Assistant Professor in Mathematics Education, Arkansas State University*

The content of this talk will focus on an alternative geometry system called Taxi-cab geometry. In particular, comparisons between Euclidean and Taxi-cab geometries with respect to notions of distance, geometric figures, and congruency will be discussed. The Common Core State Standards of Mathematics will also be discussed in relation to Taxi-cab geometry.

## **Talk Session 2 - Monday, June 26 (1:15-1:55 AM)**

### **Information Literacy in Mathematics Courses**

*Dr. Ander Erickson, Assistant Professor of Math Education, Western Oregon University*

I present a cross-case analysis that explores the demands and opportunities that arise when information problem-solving tasks are introduced into mathematics classes. Three teachers collaborated with me to develop statistics-related activities that required students to engage in research outside the classroom. This paper will focus on one aspect of the study: a comparison of how the teachers balanced mathematical content with information-problem solving in the tasks that they created. These tasks incorporated mathematics in a variety of ways, ranging from tasks in which the mathematical component was crucial to others where mathematics served solely as a marker of credibility. This research has the potential to

provide tools for understanding how to productively incorporate information-literacy instruction into the mathematics classroom without losing sight of mathematical goals.

### **Engaging All Students into Scientific Practices: Lessons from K-12 Classrooms**

*Dr. Asli Sezen-Barrie, Assistant Professor of Science Education, Towson University, Physics, Astronomy and Geosciences*

The new Next Generation Science Standards (NGSS) call for a dramatic shift in science teaching and learning, with a focus on students engaging in science practices as they make sense of natural phenomena. In addition, the NGSS have a significant and explicit focus on climate change. The adoption of these new standards in many states across the nation have created a critical need for on-going professional learning as in-service science educators begin to implement three dimensional instruction in their classrooms. This talk describes an innovative professional learning environment on climate change for secondary science teachers, designed by teacher educators and scientists. The goal is to improve teachers' capacity to deliver effective three dimensional climate change instruction in their classrooms. We present the structure and goals of the workshop, describe how theories of effective professional learning drove the design of the workshop, and address the affordances and challenges of implanting this type of professional learning experience.

### **Science Pathways to Literacy**

*Shari Templeton, Science & Technology Specialist, Maine Department of Education & Melissa Vallieres, Early Childhood Education Science Consultant, Maine Sprouts*

What if Science and Literacy were truly in the service of each other? In this session, we will look at the dilemma facing elementary teachers and students around the drive to push out science and social studies to promote reading and writing. We will look at Maine survey results, the Federal and State DOE mandates that got us into this mess, and why "Johnny can't read." Join a strategy session to see what other states are doing to address the lack of science in elementary classrooms and what we need to do to turn things around. To bring the joy back into classrooms across Maine it will require all hands on deck!

## **Talk Session 3 - Monday, June 26 (2:00-2:40 PM)**

### **Using Modeling Practices to Create Optimal Learning Moments in Project-Based Physical Science Units**

*Stephen Barry, Physics Teacher, Harper Creek High School, Harper Creek Community Schools, MI*

Explore teacher-developed project-based units designed as part of a research project through the CREATE for STEM Institute, Michigan State University that provide strategies for supporting students in the practice of modeling using physical science core ideas to explain phenomena.

### **HandWaver: A Gesture-Based Virtual Mathematical Making Environment**

*Dr. Justin Dimmel, Assistant Professor of Mathematics Education and Instructional Technology, UMaine; RiSE Center & Camden Bock, Graduate Research Assistant, College of Education and Human Development, UMaine*

We report on the design and development of HandWaver, a gesture-based mathematical making environment for use with immersive, room-scale virtual reality. A beta version of HandWaver was developed at the IMRE Lab at the University of Maine and released in the spring of 2017. Our goal in developing HandWaver was to harness the modes of representation and interaction available in virtual environments and use them to create experiences where learners use their hands to make and modify mathematical objects.

### **A Design Framework for Developing Science Assessment Tasks for Formative Use**

*Dr. Brian Gane, Research Assistant Professor, University of Illinois at Chicago*

Following the introduction of the Next Generation Science Standards (NGSS) educators are being challenged to modify their instruction to fit the vision of the NGSS, despite a dearth of NGSS-aligned curricula and assessments. The NGSS adopts a multi-dimensional, “knowledge-in-use” perspective: students put their knowledge to use by engaging in processes that allow them to understand phenomena and solve observed problems. For students to be proficient in science, they must use their conceptual knowledge (NGSS DCI dimension + NGSS CC dimension) to engage in science and engineering practices (NGSS SEP dimension). Therefore, assessment tasks must present students with the opportunities to demonstrate and integrate these multiple dimensions of science proficiency. In this talk, I will report on the results of a multi-year research and development project that has been developing and validating three-dimensional, instructionally-supportive assessments. Our design framework is based on the idea of generating learning performances – instructionally tractable and accessible pieces that can be used to guide instruction and assessment.

### **Talk Session 4 - Tuesday, June 27 (8:30-9:10 AM)**

#### **The Great American Eclipse 2017 and Beyond - Sharing Eclipses With Our Students**

*Shawn Laatsch, Director of the Emera Astronomy Center and Jordan Planetarium at the University of Maine*

This presentation will explore the upcoming total solar eclipse on August 21 of this year which passes through the entire continental US. What conditions are needed for an eclipse to happen? When will the next one pass through Maine? How do I safely view the eclipse? This presentation will examine these questions and more.

## **What We Pay Attention to, and How it Affects Our Teaching**

*Dr. Michael C. Wittmann, Professor of Physics, Department of Physics and Astronomy; RiSE Center Faculty*

How teachers respond to students depends, in part, on what they see in their students' thinking. When asked to provide possible incorrect responses and explanations that students might give about a problem involving gravitational potential energy, teachers were aware of the common difficulties that students might have: (1) energy is “used up” because of travel time, travel distance, or the effort exerted during travel (2) students double-count work and energy, and (3) energy is an intrinsic property of the hiker. Several of these difficulties use the metaphor of energy as a substance-like quantity. This idea can also be of great value when thinking about energy, but teachers never made explicit that they were aware of the value of this metaphor in thinking about energy. This talk looks at the multiple grain sizes of student thinking, including the metaphors they use and the different and at times problematic facets of each.

# Workshop Abstracts

*Organized Alphabetically by Presenter by Day*

## **Monday, June 26**

### **Increasing Engagement in Physics through Project Based Learning**

*Mr. Stephen Barry, Physics Teacher, Harper Creek High School, Harper Creek Community Schools, MI*

Experience a teacher-developed Project Based Learning unit designed as part of a research project through the CREATE for STEM Institute, Michigan State University to increase high school student engagement, creativity, and challenge while using the three-dimensional learning practices described in the NGSS.

### **Counting on the Knowledge of Others: facilitating information-based problems in the math classroom**

*Dr. Ander Erickson, Assistant Professor of Math Education, Western Oregon University*

In this workshop, I will begin by defining what is meant by an information-based problem and by reviewing several activities that I have developed with practicing teachers. We will then work together to examine some excerpts from student transcripts that came out of these activities. These transcripts have been chosen to highlight critical teaching problems that arise when students are encouraged to engage in independent research as part of a statistics activity. We will then have an opportunity to collaboratively develop parameters for a similar information-based problem.

### **Using Three-Dimensional Learning Performances to Structure Instruction and Assessment**

*Dr. Brian Gane, Research Assistant Professor, University of Illinois at Chicago*

Workshop participants will learn how to write a three-dimensional learning performance that integrates three dimensions of the NGSS, and to use that learning performance to focus instruction and assessment targets. Participants will try their hand at writing a learning performance and associated evidence rules. Additionally, participants will use learning performances that we have written to evaluate example assessment tasks and student responses to those tasks.

### **Developing Science Process Skills through Citizen Science and Data Interpretation**

*Lindsay Glasner, BirdSleuth K-12 Outreach Coordinator, Cornell Lab of Ornithology*

Participating in citizen science provides a unique and accessible way to facilitate STEM learning. Students engaged in the Cornell Lab of Ornithology's citizen-science projects have been asking and answering their own questions about birds for more than a decade, conducting original experiments and analyzing and interpreting their original data. By engaging in citizen science, students become scientists and meet NGSS Standards. During this workshop, we'll provide access to free resources that help you have students participate

in citizen science and explore how students can analyze and contribute to such a rich, global databases.

### **Panel on Place- and Project-Based Teaching and Learning in Maine**

*Teri Jergenson, Science Teacher, Bucksport High School, Bucksport, Maine*

*Bill McWeeny, Science and Math Teacher, Adams School, Castine, ME*

*Don Sprangers, Science Teacher, Washington Academy, East Machias, Maine*

*Yvonne Thomas, Education Director, Island Institute, Rockland, ME*

Come learn about place-based education and how to incorporate it into your classroom. During this session we will hear from several panelists who have successfully implemented place-based education and have the opportunity to ask them questions. The end of the session will provide an opportunity for you to identify community issues that are locally relevant to your students along with resources that are available to help you integrate these issues into the topics that you already teach.

### **Connecting Ideas Across K-12 Science Education to Prepare Students to Think About Biodiversity and Climate Change**

*Christopher Nadeau, PhD Student, University of Connecticut*

*Hannah Webber, Education and Research Project Manager, Schoodic Institute*

*Bill Zoellick, Education Research Director, Schoodic Institute*

Climate change is already affecting biodiversity, which is impacting economies and human well being. In response, governments are developing policy to mitigate negative impacts and an increasing number of jobs in biology, environmental science, and agriculture focus on climate change. Students that are well informed on the interaction between climate, biodiversity, and human well being will be better able to understand these societal changes and more prepared for future career paths.

In this workshop teachers from across the K-12 grade span will work together to identify key ideas and crosscutting concepts at each grade level that, when encountered in sequence, will provide students with the foundation they need to understand these interdisciplinary ideas. The workshop will be informed by research in progress by Chris Nadeau at the University of Connecticut. Chris's research looks at how variation in climate affects the vulnerability of different species to climate change. His work is at the cutting edge of climate science, and yet is concerned with scientific ideas that are discussed in most high school science classes. Chris is not just looking at one idea at a time (for example, biodiversity), but is looking at how different parts of a system—unusual weather events, biodiversity, spatial variation in climate, and genetic variation - are connected and interact. Hannah Webber and Bill Zoellick of the Schoodic Institute at Acadia National Park will assist Chris in helping teachers connect their planning and scaffolding to the Next Generation Science Standards (NGSS).

Sometimes it seems that teachers at different grade levels are expected to help students with key parts of a learning sequence without ever having the chance to see how the parts fit

together. Teachers will leave this workshop with a better idea of how the teaching that they do sets things up for future learning. Ideas from the workshop instructors and fellow participants will also help sharpen the focus of science units and science lessons.

### **Inquiry-Oriented Strategies for Teaching Electric Circuits in High School Physics Courses**

*Michael P. O'Byrne, High School Physics Teacher, Bellevue School District, WA*

In this workshop, participants will have the opportunity to work through inquiry-based materials in electric circuits in which students build and extend a model for how current flows through a circuit. Specifically, participants will develop a unique method for determining equivalent resistance. In addition, we will discuss practical aspects of implementation, formative assessment questions, differentiation, and how the activities meet NGSS science and engineering practices.

### **Taxi-Cab Geometry: Exploring an Alternative Geometry System**

*Dr. Lisa Rice, Assistant Professor in Mathematics Education, Arkansas State University*

In the workshop we will work on problems and activities related to Taxi-Cab geometry, including real world problems that may not be best modeled in Euclidean geometry. We will also talk about how students' prior understandings of geometry can support their understanding of Taxi-Cab geometry. Connections to standards will also be discussed.

### **"Don't Be So Shellfish!": Ocean Acidification and Oysters**

*Dr. Asli Sezen-Barrie, Assistant Professor of Science Education, Towson University, Physics, Astronomy and Geosciences*

The Ocean Acidification (OA) activity is designed to provide students an opportunity to consider the driving question How might increasing levels of CO<sub>2</sub> affect oysters? Students will build an explanatory model to answer this question using information they learn from engaging in a variety of investigations and activities. Learning Goals: Identify the relationship between increasing CO<sub>2</sub> in the atmosphere (due to burning of fossil fuels by humans) and amount of CO<sub>2</sub> dissolved in Earth's oceans. Determine pH is a measure of one important water quality characteristic and that changes in ocean pH affect marine ecosystems. Plan and carry out an investigation to explore relationship between CO<sub>2</sub> and pH in salt water. Explain the relationship between increasing amounts of CO<sub>2</sub> in oceans and pH levels of the ocean based on evidence. Obtain information that oyster shells are composed of calcium carbonate (CaCO<sub>3</sub>) and the oysters living inside these shells must obtain these minerals from the ocean environment in order to build the shells. Use a model to predict the effects of decreasing pH on carbonate availability. Build an explanatory model to answer the driving question How might increasing levels of CO<sub>2</sub> affect Oysters?

**Catch the Wave! Engage in phenomena to understand light and sound waves and see the benefits of teaching literacy through science.**

*Shari Templeton, Science and Technology Content Specialist and York County Regional Representative, Department of Education & Melissa Vallieres, Early Childhood Education Science Specialist*

Engage in phenomena to understand light and sound waves and see the benefits of teaching literacy through science. Tap the “born investigator” in children. Join us in this make-and-take workshop as we explore the benefits of an integrated unit of study suitable for K-2.

**Tuesday, June 27**

\*Note: Workshops taking place on Monday and Tuesday are listed below with title and presenter name only. See Monday workshops for abstracts.

**Increasing Engagement in Physics through Project Based Learning**

*Stephen Barry, Physics Teacher, Harper Creek High School, Harper Creek Community Schools, MI*

**Leveraging the Affordances of LEGO Robotics to address STEM Standards**

*Dr. Alan Buss, Associate Professor of Elementary Science and Mathematics Education, University of Wyoming*

The combination of LEGO building bricks, motors, sensors and a compact, mobile computer brain can be a powerful tool for engaging students in meaningful STEM learning. As with all tools, however, any associated potential can only be met through careful, skillful application of the tools’ inherent affordances. In the case of LEGO robotics, affordances include the ability to connect scientific sensors to gather a range of data types, robust hardware and software that meet the needs of novices and experts alike, creative flexibility to engineer just about anything, and mathematically-grounded materials. This workshop will engage participants in two LEGO robot activities to examine such affordances, one for primary grades and the other for intermediate, requiring measurement, algorithmic thinking, and problem solving.

**Exploring Plane and Solid Geometry in Virtual Reality**

*Dr. Justin Dimmel, Assistant Professor of Mathematics Education and Instructional Technology, UMaine; RiSE Center Faculty & Camden Bock, Graduate Research Assistant, College of Education and Human Development, UMaine*

Come explore new ways to make and modify mathematical figures in virtual, three dimensional space. Participants will explore plane and solid geometric figures in HandWaver, a gesture-based virtual mathematical making environment. The session will also include a discussion of the near future of virtual reality technologies in schools.

### **Using Three-Dimensional Learning Performances to Structure Instruction and Assessment**

*Dr. Brian Gane, Research Assistant Professor, University of Illinois at Chicago*

### **Developing Science Process Skills through Citizen Science and Data Interpretation**

*Lindsay Glasner, BirdSleuth K-12 Outreach Coordinator, Cornell Lab of Ornithology*

### **3D Printing in Education**

*Travis Hall, STEM Coordinator for the Boys & Girls Club of the Austin Area, TX*

This workshop will focus on how to integrate 3D printers into the classroom and after-school settings. We'll start from how to set things up, with discussions on which printers make the most sense for what grade levels, how to setup them up, and what accommodations make them run smoothly in the educational environment. We'll then work together to answer the question "How do we make a 3D printer a tool, rather than just a toy?" Together we'll work to brainstorm units, lesson plans, and projects for our students that can utilize the best parts of 3D printing and engineering. We'll even take a stab at designing our own objects using 3D modeling software, so bring your computers! Time and resources allowing we'll even print out some designs using 3D printers from the Maine STEM Partnership.

### **Lunar Phases and Eclipses - Understanding Spatial Relationships**

*Shawn Laatsch, Director of the Emera Astronomy Center and Jordan Planetarium at the University of Maine*

In this hands-on session come explore how and why the Moon goes through its phases along with how we observe the Moon during its monthly cycle. We will investigate the alignments needed for eclipses and why they are rare phenomena.

### **Assessing Student Learning of Science Content: Designing and Interpreting Tests**

*Laura Millay, RiSE Research and Evaluation Coordinator, RiSE Center, UMaine*

In this workshop we will discuss strategies for designing NGSS-aligned tests to assess middle and high school students' learning of physical sciences content, and for interpreting survey results. Examples of tests that were designed collaboratively through the Maine Physical Sciences Partnership will be shared and discussed, along with student data.

### **Taxi-Cab Geometry: Exploring an Alternative Geometry System**

*Dr. Lisa Rice, Assistant Professor in Mathematics Education, Arkansas State University*

## **The Flow of Energy Flow Through the Curriculum**

*Dr. Michael C. Wittmann, Professor of Physics, Department of Physics and Astronomy; RiSE Center*

One of the biggest challenges of working with the Next Generation Science Standards is seeing the progression of ideas across grade levels. In this workshop, we will look at the NGSS standards for energy flow, both as a core idea in the disciplines and as a cross-cutting concept. We will do a set of activities in which we represent energy flow, and consider how students at different ages might have different target ideas within the same activity. There might be a little bit of talk about research on student learning at different ages, depending on how long the activities take. The goal of the workshop is a deeper understanding of what is to be taught and how students think about energy flow.

## Poster Titles

### Poster Session, Monday, June 26, 4:30-6:00 PM

*Organized Alphabetically by Presenter*

**P1: Using 3D Models to Teach Science Concepts, Processes and Systems**

*Carrie Boudreau*, Middle School Science Teacher, Falmouth Middle School, Falmouth, ME

**P2: Real Scientists**

*Carrie Boudreau*, Middle School Science Teacher, Falmouth Middle School, Falmouth, ME

**P3: Calculus Students' Performance on Implicit Differentiation Problems**

*Connor Chu*, Graduate Student, Maine Center for Research in STEM Education, University of Maine

**P4: What Secondary Mathematics Teachers Believe about the Usefulness of Mathematics and What Kind of Real-World Problems They Are Able to Produce to Teach It**

*Jennifer Dunham*, Graduate Student, Maine Center for Research in STEM Education, University of Maine

**P5: Tapping Our Environment**

*Phyllis Frkuska-Heeren*, 3rd Grade Teacher, Drinkwater School, Northport, Maine

**P6: Flipped Classroom**

*Andrea Harvey*, High School Chemistry Teacher, Gray New Gloucester High School, Gray, ME

**P7: How to Get Started with Makerspaces**

*Ruth Lyons*, Gifted and Talented Coordinator, Hampden, Winterport, Newburgh, and Frankfort, Maine

**P8: Stars and Stairs: A Grade 2 Guided Math Model**

*Holly Patenaude*, 3rd/4th Grade Math Teacher, Songo Locks School, Naples, Maine

**P9: Using Data to Revise Content Surveys in the Maine STEM Partnership**

*Adam Rogers and Laura Millay*, Maine Center for Research in STEM Education, University of Maine

**P10: Self-Efficacy of Middle School Teachers Regarding Understanding of Energy Concepts**

*Paul H. Wilson*, Graduate Student, Maine Center for Research in STEM Education, University of Maine

**P11: The Mossy Shoe**

*Jennifer Wright Gregg*, 3rd Grade Teacher, Great Salt Bay Community School, Damariscotta, Maine

## **Speakers and Workshop Facilitators**

*Alphabetically Ordered by Last Name*

### **Stephen Barry**

**High School Physics/Chemistry/Mathematics/Robotics Teacher**

**Harper Creek High School, Harper Creek Community Schools, MI**

Stephen Barry is a high school physical science, mathematics, and robotics teacher at Harper Creek Community Schools, located in Battle Creek, Michigan. He also works with Michigan State University with the CREATE for STEM, assisting researchers in the Crafting Engagement in Science Environments project. The purpose of the MSU project is to increase student engagement and interest in the fields of science, technology, engineering, and mathematics (STEM). Stephen has also been instrumental in bringing other technologies such as 3D printing, robotics and ArcGIS into the science and mathematics classroom at his high school.

Prior to working as a teacher Stephen worked as a Process Engineer for the ExxonMobil Company. Stephen is married and has three grown children all who work in STEM related fields. In his spare time Stephen enjoys landscaping, gardening, and travelling. He is a graduate of the University of Notre Dame where he received a BS in Chemical Engineering. He received his MS in Education from Widener University.

### **Camden Bock**

**Research Assistant, College of Education and Human Development**

**University of Maine**

Camden Bock is a research assistant in the College of Education and Human Development and the Maine Center for Research in STEM Education, pursuing a MST and PhD in STEM Education with concentrations in mathematics education. Camden works in the IMRE Lab, under the supervision of Professor Justin Dimmel to develop HandWaver, a room-scale gesture-based virtual environment for geometric manipulation. Prior to joining the IMRE Lab, Camden completed a B.S. in mathematics and certification in secondary mathematics education at Bates College in Lewiston

**Dr. Alan Buss****Associate Professor in Elementary Science and Mathematics Education  
University of Wyoming**

Dr. Alan Buss, Associate Professor in Elementary and Early Childhood Education at the University of Wyoming, teaches science and mathematics methods courses for pre-service elementary teachers, and graduate courses in learning theory, history of mathematics and science education, and integrating technology in the classroom. Having prior experience teaching grades 2 and 6, he also enjoys supervising elementary education student teachers. The focus of Dr. Buss' research is on meaningful integration of educational technologies to enhance students' understanding of science and mathematics. These technologies include Geographic Information Systems (GIS), Global Positioning System (GPS), dynamic geometry software, Vernier Probeware (data collection equipment), LEGO robotics, computer gaming, and most recently, 3D visualization in immersive virtual reality environments. Dr. Buss recently completed a sabbatical leave, during which he developed curricular materials and a 3D simulation for use in large-scale 3D visualization facilities to better help middle school students and pre-service elementary school teachers understand the concept of density.

**Dr. Justin Dimmel****Assistant Professor of Mathematics Education and Instructional Technology  
University of Maine**

Justin Dimmel is an assistant professor of mathematics education and instructional technology. He is the principal investigator for the University of Maine Immersive Mathematics in Rendered Environments (IMRE) research lab. The goal of his work is to investigate how multimodal interactions with virtual objects affect mathematical thinking and learning.

**Dr. Ander Erickson**  
**Assistant Professor of Math Education**  
**Western Oregon University**

Ander Erickson will be Assistant Professor of Mathematics Education at University of Washington Tacoma in the Fall of 2017. He is currently faculty at Western Oregon University after earning his Ph.D. in Educational Studies (Mathematics Education) from the University of Michigan in 2015. He studies the introduction of information-literacy instruction into mathematics classrooms. This includes analyzing the features of classroom tasks that help students engage productively with expert communities, the role of mathematics in these tasks, and how teachers facilitate the development of a critical stance towards quantitative claims.

**Dr. Brian Gane**  
**Research Assistant Professor**  
**University of Illinois at Chicago**

Dr. Brian Gane is a Visiting Research Assistant Professor at the Learning Sciences Research Institute at the University of Illinois at Chicago. His primary research interests center around the research and development of learning environments, including the design of assessments, instruction, and curriculum within those learning environments.

He is actively involved in developing NGSS-aligned assessments for the Next Generation Science Assessments (NGSA) (<https://ngss-assessment.portal.concord.org>). Dr. Gane is also working on the Mi-STAR project, an integrated science curriculum for grades 6-8. He has previously developed curriculum and assessments for a middle school course that integrates robotics/engineering with physical science (SLIDER). Dr. Gane continues to be involved in on-going teacher education, especially around assessment and instruction with the Next Generation Science Standards.

**Lindsay Glasner**  
**BirdSleuth K-12 Outreach Coordinator**  
**Cornell Lab of Ornithology**

Lindsay Glasner is currently the Outreach Coordinator for the BirdSleuth K-12 program at the Cornell Lab of Ornithology. She has a Bachelor's degree from Cornell University in Natural Resources and Marine Biology with a focus in Environmental Education. She is also currently pursuing her Master's in Environmental Education and Interpretation at the University of Wisconsin Steven's Point. Her past experience includes leading youth and adults through stream ecology and water conservation, and research in freshwater microbiology. She has been working with the BirdSleuth K-12 program since 2012 managing the BirdSleuth Ambassador Program. Though her background is in the marine sciences, she has caught the birding bug while working at the Cornell Lab and has grown to love and appreciate birds and citizen science as an educational tool!

**Travis Hall**  
**STEM Coordinator**  
**Boys & Girls Club of the Austin Area, TX**

Travis is a native Mainer who grew up right here in Orono, ME. He graduated from the University of Maine with a degree in Elementary Education with a concentration in mathematics. After teaching 6th grade math and science at Holbrook School for three years, Travis was recruited to work at the Maine Center for Research in STEM Education (RiSE Center) as the Maine Elementary Sciences Partnership Coordinator. Through his work with K-5 educators to help support elementary science and STEM inquiry, Travis's position evolved into the Maine STEM Partnership Coordinator. With amazing staff and outstanding educators in the partnership, it was time for Travis, his wife Mary, and their cat's Harvey and Marley to pack up and explore the world. Now as residents of Austin, TX, Travis and Mary can often be found biking around the city, enjoying Zilker Park, or dancing to some live music. Travis is now the STEM Coordinator for the Boys & Girls Club of the Austin Area, where he develops curriculum and works with over 20 clubs across the city as an after-school educator with students in grades K-12.

**Teri Jergenson**  
**High School Earth Science Teacher**  
**Bucksport High School, ME**

Teri Jergenson is a science teacher at Bucksport High School (RSU 25), primarily teaching freshmen earth science and forensics. She holds a BS in Ocean Science from MMA, and a M. Environmental Ed degree from UMAINE. She has worked with the RiSE Center/PSP for 6 years. She has worked on designing place-based activities for EarthComm curriculum, has BARR training, Mentor Training, and is a SHSC nonprofit co-founder and volunteer.

**Dr. David Kung**  
**Professor of Mathematics**  
**St. Mary's College of Maryland**

Dave fell in love with both mathematics and music at a very early age. After flirting with (and the rejecting) a music major, he completed three degrees from the University of Wisconsin – Madison, all in mathematics, before joining the faculty at St. Mary's College of Maryland. His 12-lecture DVD course "How Music and Mathematics Relate" was recently released by the Teaching Company. Teaming with other mathematicians, he has worked to improve mathematics literacy and responsible citizenship by developing curriculum materials for a Math For Social Justice course. He has authored many articles on topics in harmonic analysis and mathematics education, is the recipient of numerous awards including the 2004 Homer Dodge Award for teaching excellence by a junior faculty member at SMCM, and the 2006 John M. Smith teaching award from the local section of the MAA. His has lectured widely on Math & Music, including giving the 2010 Undergraduate Lecture in Mathematics at the Joint Math Meetings, and is the incoming Director of the MAA's Project NExT.

**Shawn Laatsch**  
**Planetarium Director, Emera Astronomy Center**  
**University of Maine**

Mr. Shawn Laatsch currently is the director of the Emera Astronomy Center and Jordan Planetarium at the University of Maine. He is recognized as a pioneer in the use of digital dome technology and innovations in the field. Shawn installed the world's first 3D stereoscopic planetarium at the 'Imiloa Astronomy Center of Hawaii. He has consulted on the planning and building of numerous planetarium projects worldwide and recently evaluated the Iziko Planetarium in Cape Town, South Africa for its planned upgrade to digital in late 2015. Shawn serves as President of the International Planetarium Society, Inc. the world's largest

organization of planetarium professionals. In 1998 he was inducted as an International Planetarium Society Fellow, for his work in promoting astronomy education. He currently writes a weekly blog for Bangor Daily News called Eye on Maine Skies (<http://laatsch.bangordailynews.com/>) sharing information on the night sky.

Shawn has extensive planetarium experience in public, school, and university facilities. He served as planetarium director for the Arthur Storer Planetarium in Maryland, the Gheens Science Hall & Rauch Planetarium in Kentucky, and the Imiloa Astronomy Center of Hawaii. In 2004, Shawn was selected as a NASA JPL Solar System Ambassador. In 2006 he was asked by NASA SEARCH to be a special presenter on cultural astronomy education at COSPAR (Committee on Space Research) in Beijing, China. In 2008 he received the International Planetarium Society's highest honor, the Service Award for dedication to the planetarium field. In 2010 he was elected to the Board of Directors for the Astronomical Society of the Pacific and received the Tanaguchi Award for Excellence and Innovation in Teaching from the University of Hawaii at Hilo.

**Dr. Susan McKay**

**Founding Director of the Maine Center for Research in STEM Education, Professor of Physics  
University of Maine**

Susan McKay worked with a group of STEM and STEM Education faculty fifteen years ago to establish the RiSE Center and the Master of Science in Teaching (MST) Program. Since then, she has served as the center's Director and the Graduate Coordinator of the MST Program. She is the Principal Investigator of the Maine Physical Sciences Partnership, the Maine Elementary Sciences Partnership and two grants funded by the Robert Noyce Scholarship Program at the National Science Foundation. One of these grants established an NSF Teaching Fellowship Program for MST students, with extensive support and coaching provided to these new teachers by leading Maine teachers. She serves on the Governor's STEM Council and the Maine STEM Collaborative, and has been a member of the Champions Board for the Maine Girls Collaborative Project. She received her Bachelor's (Princeton University), her Master's (University of Maine), and her Ph.D. (Massachusetts Institute of Technology) in physics and began her career as a physics faculty member at UMaine in 1986. She conducts research with graduate and undergraduate students in theoretical physics and was chair of the Department of Physics and Astronomy for six years. Her research interests in teaching and learning support the goal of providing a rigorous and exciting education in the STEM disciplines for all Maine students, including those from groups currently underrepresented.

**Bill McWeeny****5-8 Grade Science and Mathematics****Adams School, ME**

Bill McWeeny teaches 5-8th grade science at Adams School in Castine, Maine. In the 1970's Bill taught place-based units in the streams, marshes and seashore accessible to Central Middle School in Quincy, Massachusetts. In the 80's and 90's he was a charter member of the Global Laboratory Project. Global Laboratory connected about 100 schools worldwide on the fledgling Internet. The schools all had a local study site and then shared data on similar projects with all the schools. One project was measuring ozone with a rubber band attached to a crude, but accurate gauge. It was fun to look at the data charts on the schools' study site predators list (lions, eagles, raccoons, polar bears, etc.) and then guess where the school was on earth. In 1999 Bill moved to Maine and began teaching at the Adams School. Bill is a scientist volunteer on the New England Aquarium's Right Whale Research Team. He has offered a science club since 2004 to his students who want to study right whales through informal education. Every year they visit the Bay of Fundy to see whales close up and attend the Right Whale Consortium Annual Meeting in New Bedford, Massachusetts to experience scientists talking about their work. His students also co-host the Annual New England Right Whale Festival at the New England Aquarium the first Sunday each May. Bill continues to do place and project based work with his regular classes including Stream Team work, kayak ecology adventures and vernal pool studies.

**Laura Millay****Research and Evaluation Coordinator, RiSE Center****University of Maine**

Before joining the RiSE Center as a Master of Science in Teaching student, Laura grew up in rural Maine, travelled and studied abroad, ran an organic farm business, founded two non-profit organizations and graduated with a B.A. in Development Studies from Brown University. Currently, Laura coordinates education research and evaluation projects. Her personal research interests include knowledge for assessment (K4A); specifically, the knowledge teachers use when planning and implementing classroom formative assessment. This topic is the subject of her in-progress MST thesis.

Laura is also interested in using clustered misconceptions-based questions to probe student thinking and learning about various topics in science, developing methods for analyzing and using data to inform classroom instruction in real-time, building professional communities with a capacity to gather and use data as meaningful evidence, methods for measuring learning among students and teachers, and the nature of evidence when making claims about changes (or not) in attitudes, achievement, thinking, and learning.

**Christopher Nadeau**  
**PhD Student**  
**University of Connecticut**

Christopher Nadeau is a PhD student in the Ecology and Evolutionary Biology Department at the University of Connecticut and a Second Century Stewardship Fellow at Acadia National Park. His research evaluates where biodiversity will be most affected by climate change. He evaluates the ways that species might adapt to climate change and how natural resource management agencies can plan for the future. He previously completed an MS degree at Cornell University and worked for 15 years as a Wildlife Biologist studying a range of topics from rare bird management to rabies.

**Michael O’Byrne**  
**High School Physics Teacher**  
**Bellevue School District, WA**

Michael (Mick) O’Byrne teaches physics at Interlake High School, where he has integrated inquiry-oriented instruction into AP and IB physics courses. Since 2007, he has been a staff member in the Physics Education Group at the University of Washington in Seattle, serving as a lead instructor in intensive, multi-week summer workshops and in academic-year professional development courses for K-12 teachers of physics and physical science. Before teaching, Mick worked in pharmaceutical research and medical device development. He is a graduate of Seattle University, where he received a BA in Humanities, a BS in Biology, and a minor in Chemistry in 1995. Mick earned a Masters in Teaching from the University of Washington in 2002. Mick has also taught biology, chemistry, and Theory of Knowledge over his 15-year teaching career.

**Dr. Lisa Rice**  
**Assistant Professor, Mathematics Education**  
**Arkansas State University**

Lisa Rice is an assistant professor in the Department of Mathematics and Statistics at Arkansas State University. Her research interests include proof and argumentation in mathematics, pre-service teacher preparation, and identity and mathematics learning. Dr. Rice earned her Ph.D. from the University of Wyoming.

**Dr. Asli Sezen-Barrie**  
**Assistant Professor of Science Education**  
**Towson University**

Dr. Sezen-Barrie is an Assistant Professor of Science Education and contact faculty for the Middle School Science Major at Towson University. Currently, her research interests have an overarching goal of improving science teacher education towards ambitious equitable classroom practices. The research program she developed during her early career years has two lines. The first line involves using the discourse analysis method to look at sociocultural dynamics of learning and teaching practice. Drawn from the fields of sociolinguistics, epistemology and climate change education research, Dr. Sezen-Barrie examines students' and teachers' construction of and learning from evidence-based explanations on climate change topics. The second line of research lies at the intersection of anthropology and learning progression studies. She uses the concept of "professional vision" while developing a sustainable support system to improve preservice and novice teachers' teaching of climate science and effectively assess students' learning in a meaningful progression.

**Don Sprangers**  
**High School Chemistry & Ecology Teacher**  
**Washington Academy, ME**

Don Sprangers was born in Green Bay, Wisconsin and moved to Maine in 1990. He is a secondary science educator with 32 years of teaching experience; the past 25 years serving students at Washington Academy in East Machias, Maine. He received his BS in Secondary Science Education in 1982 from the University of Wisconsin-River Falls, and his MS in Education in 2003 from Lesley University in Cambridge, Massachusetts. Sprangers teaches chemistry, honors chemistry, AP chemistry, research methods, and ecology at Washington Academy. Sprangers also serves as adjunct faculty in the Ecological Teaching and Learning (ETL) masters program at Lesley College, and has served as adjunct faculty at UMaine Machias teaching science methods.

Sprangers is the recipient of the 2002 Presidential Award for Excellence in Mathematics and Science Teaching sponsored by the National Science Foundation. He was also honored in 2007 by The Conservation Fund with the Environmental Educator of the Year Award for his creation and implementation of the Washington Academy Sustainable LIFE Curriculum. Sprangers and his colleagues were recognized the 2011 by the Maine Association of Environmental Educators

Association with the Environmental Curriculum Award for their diversified Environmental Science offerings and course integration. Currently, Sprangers and his students are collaborating with 10 high schools in 8 different countries across the North Atlantic, all focusing their studies on Atlantic salmon.

Sprangers is vice-president of the Downeast Salmon Federation and is a director with the Maine Council of the Atlantic Salmon Federation. In his leisure, Sprangers enjoys hunting, fishing, camping, gardening, and woodworking.

**Shari Templeton**  
**Science & Technology Specialist**  
**Maine Department of Education**

Shari Templeton joined the Maine Department of Education as Science & Technology Specialist in early 2014. Her responsibilities include review in all phases of the MEA science assessment, science standards implementation, oversight of the Presidential Awards for science teachers, National Youth Science Camp award, teacher professional development and regional responsibilities with superintendents and curriculum coordinators. On the national stage she served as co-chair of the Council of State Science Supervisors (CSSS) Professional Learning Committee that developed the Science Professional Learning Standards, serves as board liaison for the CSSS Assessment Committee and serves as CSSS secretary. In Maine, she is a board member of Maine Science Teachers Association, steering committee member of Project Learning Tree of Maine, RiSE center advisory board for PSP/ESP and advisory board for Finding the E in STEM. Prior to joining the Department, Shari was a secondary classroom teacher for 31 years primarily teaching physics, forensics and biology. Prior to leaving the classroom, she served as district level Science Specialist working chiefly with early elementary educators.

**Yvonne Thomas**  
**Education Director**  
**Island Institute, ME**

Yvonne Thomas is a K-12 educator with 25 years of experience working on Maine islands, as the K-12 school counselor, health teacher and leadership/admin team member in both the largest and smallest of Maine's unbridged island schools. In 2015, she joined the Island Institute as the Education Director, working closely with Maine's 13 island schools, remote coastal schools, partner organizations and higher education institutions. She helps develop networks and implement education programs through collaborations that support the unique challenges and opportunities that these schools have. The Island Institute's Education Program

takes a place-based and experiential education approach, often with a focus on the marine environment, and increasingly, emphasizing adaptation to climate change. Yvonne received a BA in Fine Arts and Psychology from Connecticut College in 1987 and an MA in Expressive Therapy from Lesley University in 1993. She holds Maine Department of Education school counselor and assistant principal certifications. She lives on the island of Vinalhaven with her family.

**Melissa Vallieres**

**Early Childhood Education Science Consultant**

**Maine Sprouts**

Melissa Vallieres is a freelance early childhood education science specialist with strengths in guiding the integration of literacy and writing into science, classroom management and classroom spaces design. Melissa has 18 years of experience in pre-K, K and 1st grade instruction and a Master's in Education. She is co-founder of Maine Sprouts, a partnership that strives to bring outstanding professional development and learning opportunities to Maine's educators and other professionals.

**Hannah Webber**

**Research and Education Projects Manager**

**Schoodic Institute, ME**

As the Education Research Manager for Schoodic Institute's Acadia Learning Scientist-Teacher-Student Partnerships, Hannah works with research scientists and teachers to provide authentic research opportunities for high school students. Hannah's professional experience includes teaching, work in Arthur D. Little's Marine Science Division and Environmental Sciences Division, and participation on research teams investigating behavioral effects of methylmercury; genetic bases of wound healing; and the effects of PCBs on stream macroinvertebrate communities. She holds a B.A. in Biological Science, an M.S. in Zoology and is a candidate for an M.S. in Teaching.

**Dr. Michael Wittmann**  
**Professor of Physics**  
**University of Maine**

Michael C. Wittmann joined the University of Maine in 2001, and is now a Professor of Physics. He is a founding member of the Maine Center for Research in STEM Education, serves as the editor of the Physics Education Research Section of the American Journal of Physics, and is co-organizer of the biennial conference on the Foundations and Frontiers of Physics Education Research. Michael's research focuses on student conceptual knowledge and teacher knowledge of concepts and of their students' ideas. For his efforts in physics education research, he was named a Fellow of the American Physical Society in 2015.

**Bill Zoellick**  
**Education Research Director**  
**Schoodic Institute, ME**

Bill's work is focused on helping teachers help students discover that science and math are interesting, useful, and something they can do. His current research includes studies of how science and math teachers develop their craft during their first years of teaching and of how teachers develop influence beyond their classrooms. He has also had a long-term interest in how teachers, students, and scientists can work together in ways that support both science and learning. He leads a study to understand the difference that such authentic science learning makes for students. He has served as principal investigator on three successive MSP projects funded by the State of Maine as well as on a NOAA B-WET project titled "Acadia B-WET: a partnership to help teachers engage students in sustained, project-oriented investigations of eel population and distribution in coastal watershed systems." Bill was educated at the University of Illinois and returned to education research following a 30-year career in computer science, software development, and management consulting.