

# Partners In Science National Conference

Research Partnerships for High School Teachers

January 13-14, 2017

Hilton San Diego Resort Hotel

San Diego, California



partners  
in science

*a program of the*



M.J. Murdock  
CHARITABLE TRUST

in association with our partner programs:





## Friday, January 13, 2017

- 6:45 - 7:30 a.m.** Registration, Conference Center Foyer  
Breakfast, International Ballroom  
Oral presentation setup
- 7:30 - 7:45 a.m.** Plenary Session  
Welcome and Opening Remarks  
Jill Tatum, Program Director,  
M.J. Murdock Charitable Trust
- 8:00 a.m.** Buses leave for off-site tours for Partners, Veterans, and Mentors
- 8:30 - 11:00 a.m.** Off-site tours for Partners, Veterans, and Mentors
- 11:45 a.m. - 12:30 p.m.** Lunch, International Ballroom  
(First-year PNW Partners & Implementation Coaches will have lunch in Terrazza)
- 1:00 - 4:00 p.m.** Oral Presentations
- 5:00 - 6:00 p.m.** Poster Presentations, Pavillion (*Even-numbered posters*)  
Reception/Hosted Bar
- 6:30 p.m.** Banquet and Evening Address, International Ballroom  
**Evening Address: "Build a Cell from the Bottom Up"**  
**Dr. Jennifer Ross, Associate Professor, Department of Physics**  
**University of Massachusetts, Amherst**
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## Saturday, January 14, 2017

7:00 - 8:00 a.m.	Breakfast
8:00 - 8:45 a.m.	Morning Welcome and Panel <i>Partners in Science: A Glance Back, a Current Celebration, and a Glimpse at Where We're Heading</i> <ul style="list-style-type: none"><li>• Jay Dubner (moderator) – Columbia University, Summer Research Program for Science Teachers, Program Coordinator emeritus</li><li>• Lyn Swanson – M.J. Murdock Charitable Trust, Trustee emeritus</li><li>• Kaye Storm – Stanford University, Summer Research Program for Teachers, Director of Office of Science Outreach</li><li>• Joel Goodman – UT Southwestern Dallas, STARS Program, Director</li><li>• Jan Huff – Van Andel Education Institute, Science Education Specialist</li><li>• John Keller – Cal Poly San Luis Obispo, STAR Teacher and Researcher Program, Executive Director</li><li>• Nathaniel Schacht – 100Kin10 Collaborative, Funding Collaborative Coordinator</li></ul>
9:00 a.m.	Buses leave for off-site workshops – <i>bring smartphone (for wifi access) and laptop/tablet</i>
9:30 a.m. - 2:30 p.m.	Off-site workshops for Partners and Veterans – Point Loma University Lunch provided at Point Loma for participants
12:00 - 1:00 p.m.	Lunch provided at hotel for those not attending off-site workshops
12:00 - 1:30 p.m.	Mentor lunch, Marbella
5:00 - 6:00 p.m.	Poster Presentations, Pavilion ( <i>Odd-numbered posters</i> ) Reception/Hosted Bar
6:30 - 9:00 p.m.	Banquet and Evening Address, International Ballroom Closing remarks and special recognitions  <b>Evening Address: “Gravitational Waves: Measuring Ripples in Spacetime” Dr. Jocelyn Read, Assistant Professor, Department of Physics California State University, Fullerton</b>

**Thank you for participating in this Partners in Science January 2017 Conference.**

**We would greatly appreciate your participation in the evaluation of this conference. Please be sure to complete the online conference evaluation (it will be emailed to you after the conference.) Thanks again.**



Oral Presentations – Friday, January 13th

1:00 - 2:20 p.m.

Oral Presentations (*numbering refers to Abstract listing*) - Sessions A, B and C: 1 – 4

	St. Tropez Room	Las Palmas/Marbella Room	Portofino/Marseilles Room
	Session A: 1 - 4	Session B: 1 - 4	Session C: 1 - 4
	<p><i>Session Chairs:</i> Dr. Mary Zelinski and Jason Econome</p>	<p><i>Session Chairs:</i> Dr. Gretchen Rollwagen-Bollens and Michelle Whittaker</p>	<p><i>Session Chairs:</i> Dr. John Finke and Valerie Monticue</p>
1:00	<p>A1. “Inducing strokes and exciting brain tumor cells: investigations to study how brain cells communicate”</p> <p><b>Jennifer Long</b>, W.T. White High School, Dallas, Texas</p> <p>Dr. Woo-Ping Ge, University of Texas Southwestern Medical Center, Dallas, Texas</p>	<p>B1. “The distribution of the Pacific Fisher and other carnivores in Southern and Central Oregon”</p> <p><b>Megan Miller</b>, Silverton High School, Silverton, Oregon</p> <p>Dr. Taal Levi, Oregon State University, Corvallis, Oregon</p>	<p>C1. “Quantitation of cyanide in blood via indirect silver detection”</p> <p><b>Matt Alexander</b>, Pocatello High School, Pocatello, Idaho</p> <p>Dr. Jeffery Rosentreter, Idaho State University, Pocatello, Idaho</p>
1:20	<p>A2. “Investigating the life cycle of the salmonid parasite <i>Ceratonova shasta</i> in a polychaete host”</p> <p><b>Deidra Spencer</b>, Corvallis High School, Corvallis, Oregon</p> <p>Dr. Julie Alexander, Oregon State University, Corvallis, Oregon</p>	<p>B2. “Ghosts of competition past? The effect of dying high marsh vegetation from increased inundation on the establishment of lower marsh biota”</p> <p><b>Erin Cole</b>, Valley Catholic High School, Portland, Oregon</p> <p>Dr. Catherine de Rivera, Portland State University, Portland, Oregon</p>	<p>C2. “The effect of glyphosate (Roundup®) on tolypothrix for potential fertilizer use in agriculture”</p> <p><b>Suzanne Poole</b>, Science Park High School, Newark, New Jersey</p> <p>Dr. Kirsten Heimann, James Cook University, Townsville, New Jersey</p>
1:40	<p>A3. “The synucleins: fibrillation studies and Parkinson’s disease”</p> <p><b>Joyce Zimmer</b>, Greenville High School, Greenville, Michigan</p> <p>Ms. Katelyn Becker, Van Andel Institute, Grand Rapids, Michigan</p>	<p>B3. “‘Fearscales and foodscapes’: Learning how structural and chemical diversity of sagebrush (<i>Artemisia</i> spp.) influence the functional quality of landscapes”</p> <p><b>Gina Lockwood</b>, Borah High School, Boise, Idaho</p> <p>Dr. Jennifer Forbey, Boise State University, Boise, Idaho</p>	<p>C3. “Using micropatterning to control cell morphogenesis and function”</p> <p><b>Brandon Fremd</b>, Columbia Secondary Schools, New York, New York</p> <p>Dr. James Hone, Columbia University, New York, New York</p>



<b>2:00</b>	<p>A4. “Genetic screen to identify upstream temporal regulator of lin-4 micro RNA”</p> <p><b>Eleanor Williamson</b>, Urban Assembly School of Design and Construction, New York, New York</p> <p>Dr. HaoSheng Sun, Columbia University, New York, New York</p>	<p>B4. “Yeast cell survival and adaptive mutagenesis when exposed to UV-A”</p> <p><b>Nancy Mouat-Rich</b>, Washington High School, Graham, Washington</p> <p>Dr. Tina Saxowsky, Pacific Lutheran University, Tacoma, Washington</p>	<p>C4. “Food poisoning and vaccines – A connection conundrum”</p> <p><b>Sarah Westcott</b>, The Ambrose School, Meridian, Idaho</p> <p>Dr. Juliette Tinker, Boise State University, Boise, Idaho</p>
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2:20 – 2:30 p.m. Break

**Oral Presentations – Friday, January 15th**

**2:30 - 3:50 p.m.** Oral Presentations (*numbering refers to Abstract listing*) - Sessions A, B and C: 5 – 8

	<b>St. Tropez Room</b>	<b>Las Palmas/Marbella Room</b>	<b>Portofino/Marseilles Room</b>
	<b>Session A: 4 - 6</b>	<b>Session B: 4 - 6</b>	<b>Session C: 4 - 6</b>
	<i>Session Chairs:</i> Dr. Cheryl Jorcyk and Scott Chan	<i>Session Chairs:</i> Dr. Jennifer Forbey and Bernie Carlsen	<i>Session Chairs:</i> Dr. Tina Saxowsky and Jeff Wuebber
<b>2:30</b>	<p>A5. “Self-directed Students (no more lectures!)”</p> <p><b>Heather DeJonge</b>, Van Andel Institute, Lowell, Michigan</p> <p>Dr. Jeremy VanRaamsdonk, Van Andel Institute, Grand Rapids, Michigan</p>	<p>B5. “How to prepare for the next ‘Sandy’ in NYC?”</p> <p><b>Aoife Walsh</b>, High School of American Studies at Lehman College, Bronx, New York</p> <p>Dr. Kartik Chandran, Columbia University, New York, New York</p>	<p>C5. “An evaluation of the rates, methods and implications of inorganic carbon accumulation in semi-arid soils”</p> <p><b>DJ Eberlin</b>, Borah High School, Boise, Idaho</p> <p>Dr. Jen Pierce, Boise State University, Boise, Idaho</p>
<b>2:50</b>	<p>A6. “Exploring pain-sensing pathways in the fruit fly nervous system”</p> <p><b>Adam Lewis</b>, City College Academy of the Arts, New York, New York</p> <p>Dr. Wesley Grueber, Columbia University, New York, New York</p>	<p>B6. “Where is the most food for Yellow Warblers”</p> <p><b>Steve DeMers</b>, Rocky Mountain High School, Meridian, Idaho</p> <p>Ms. Heidi Ware, Boise State University, Boise, Idaho</p>	<p>C6. “Analysis and detection of HFO-1234ze?”</p> <p><b>Albani Ruiz</b>, California State University, Poway, California</p> <p>Dr. Ben Miller, National Oceanic and Atmospheric Administration, Boulder, Colorado</p>



3:10	<p>A7. "The role of phosphorylation in the activity of ResD response regulator in <i>Bacillus subtilis</i>"</p> <p><b>Tai Quirke</b>, Sam Barlow High School, Gresham, Oregon</p> <p>Dr. Michiko Nakano, Oregon Health Science University, Portland, Oregon</p>	<p>B7. "Assessing disease risk in a population of <i>Lithobates vibicarius</i>, a species of conservation concern"</p> <p><b>Alicia Cordell</b>, Northwest Nazarene University, Charleston, South Carolina</p> <p>Dr. John Cossel, Northwest Nazarene University, Nampa, Idaho</p>	<p>C7. "Absorption and effect of contaminants associated with micro-plastic marine debris in seabirds"</p> <p><b>Ghodsie Sabri</b>, West High School, Anchorage, Alaska</p> <p>Dr. Douglas Causey, University of Alaska, Anchorage, Alaska</p>
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3:30	<p>A8. "A molecular approach to finding candidate genes associated with nicotine addiction in <i>Drosophila melanogaster</i>"</p> <p><b>David Valenzuela</b>, Madison High School, Portland, Oregon</p> <p>Dr. Norma Velazquez-Ulloa, Lewis and Clark College, Portland, Oregon</p>	<p>B8. "The spread and potential impact of aquatic invasive bivalves in the Columbia River Basin: What is the feeding rate of the invasive clam <i>Corbicula fluminea</i>?"</p> <p><b>Carol Sandison</b>, Columbia River High School, Vancouver, Washington</p> <p>Dr. Gretchen Rollwagen-Bollens, Washington State University, Vancouver, Washington</p>	<p>C8. "Surface charge and size comparison of purified buckminsterfullerene oxide (C<sub>60</sub>O) in aqueous suspension to purified buckminsterfullerene (C<sub>60</sub>) and a commercially available sample"</p> <p><b>Sharon Cates</b>, Capital High School, Boise, Idaho</p> <p>Dr. Kevin Ausman, Boise State University, Boise, Idaho</p>
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## Off-Site Tours

**Friday, January 13, 2017 – 8:30 – 11:00 a.m.**

*(Buses leave at 8:00 a.m.)*

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### **Off-Site 1: UCSD Center for Energy Research, La Jolla, California**

The UCSD Center for Energy Research creates solutions to the growing challenges of energy supply and utilization in our society. Tour participants will receive an overview of the center's research areas- fusion, renewables, energy storage, fuel cells- as well as tours of two of our laboratories studying solar forecasting and energy storage. We will also include information on cutting-edge research of our sister organization, Food and Fuel for the 21st Century (FF21).

FF21 supports the development of innovative, sustainable and commercially viable solutions for the renewable production of food, energy, green chemistry and bio-products using photosynthetic organisms. They recently used algae to make a surfboard, cool stuff!

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### **Off-Site 2: Scripps Community Outreach Program for Education (SCOPE), La Jolla, California**

The Scripps Community Outreach Program for Education is a volunteer organization based at Scripps Institution of Oceanography composed of graduate students and researchers. We connect educators, students, and interested community groups directly with the incredible science conducted here at Scripps by giving tours and facilitating educational outreach activities.

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### **Off-Site 3: Scripps Research Institute, La Jolla, California**

The Scripps Research Institute is a nonprofit American medical research facility that focuses on research and education in the biochemical sciences and is especially strong in the areas of immunology and infectious disease, biochemistry, structural biology, chemical biology, and organic chemistry. The visit to this research site will include an overview of the components and the work of the institute, presentations by researchers and a tour of the facility.

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### **Off-Site 4: Salk Institute for Biological Studies, La Jolla, California**

The Salk Institute for Biological Studies is an internally renowned, nonprofit, scientific research institute founded in 1960 by Jonas Salk, the developer of the polio vaccine. The institute focuses its research in three areas: Molecular Biology and Genetics; Neurosciences; and Plant Biology. Research topics include cancer, aging, Alzheimer's, diabetes and infectious diseases. The visit to this research site will include an overview of the work of the institute, presentations by researchers and a tour of the facility including an opportunity to view the unique architecture of the institute.

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#### **Off-Site 5: General Atomics - Fusion Education Program, San Diego, California**

The General Atomics Fusion Education Program (<http://fusioned.gat.com>) helps to promote an increased understanding of gaseous plasma and high temperature fusion sciences at the elementary through college level by providing exciting workshops and tours for teachers. We offer you a fascinating workshop and tour using the nation's largest magnetic confinement fusion device as the centerpiece. Materials will be provided to each participant for use in their classroom.

**NOTE:** *Participants have been contacted by Trust staff prior to the conference regarding some additional identification information needed by the facility. All participants will need to bring a government-issued photo ID (and VISA or green card, if applicable). Cameras are welcome, shorts are okay, but **closed toed shoes are a must** (tennis shoes are okay).*

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#### **Off-Site 6: United States Naval Health Research Center, San Diego, California**

Naval Health Research Center (NHRC) serves as a leading research and development laboratory for the Department of Defense. Research focus includes medial modeling, warfighter performance, behavioral sciences & epidemiology, deployment health research, operational infectious diseases and HIV/AIDS prevention program. The visit to this research site will include an overview of the components and the work of the center, presentations by researchers and a tour of the facility.

**NOTE:** *Participants have been contacted by Trust staff prior to the conference regarding some additional identification information needed by the facility. All participants will need to bring a government-issued photo ID.*







## Workshops

**Saturday, January 14, 2017 – 9:30 a.m. – 2:30 p.m.**  
**Point Loma University** (*Buses leave at 9:00 a.m.*)

*\*Participants please bring smartphones to be able to connect to wifi and laptops/tablets to assist in your workshop\**

### Session 1: (2.5 hours)

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**Workshop 1: Reproductive Biomedicine**  
**Room: Sator Lab 105**

#### Presenters

Lynda Jones, Oregon National Primate Research Center / Oregon Health & Science University  
Mary Zelinskie, Oregon National Primate Research Center / Oregon Health & Science University  
Diana Gordon, Oregon National Primate Research Center / Oregon Health & Science University

#### Abstract

Using a specific biomedical research area as an overarching organizational theme for teaching biology provides a context for student learning and answers that question, "Why do I need to know this? Oncofertility, a new field of medicine, encompasses comprehensive approaches to preserving fertility in patients before their cancer treatment begins. Biological, bioengineering, and ethical concepts, including cell division, genetics, reproduction, cryobiology, and biomaterials, can be explored under the umbrella concept of oncofertility: How do cancer and normal cells differ? How do chemotherapy and radiation affect patient fertility? How can fertility be preserved? Who legally owns the cryopreserved eggs and sperm if the patient does not survive? When students have a context for learning, they grasp the science concepts much more quickly and are inspired to continue learning more about them and to possibly pursue a career in biomedical research.

In oncofertility research, scientists are freezing ovarian tissue for transplantation or growing follicles containing oocytes (eggs) outside of the body. Hands-on activities in this workshop will include determining which cryopreservation solution is least damaging to tissue, and exploring the use of alginate as a biomaterial for 3-dimensional follicle growth as the oocyte matures in vitro.

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**Workshop 2: Teaching Evolution using *C. elegans* and Technology**  
**Room: Sator Lab 120**

#### Presenters

Lara (Hollingsworth) Dean, Eastlake High School, Seattle, WA  
Stephanie Namciu, Fred Hutchinson Cancer Research Center



**Abstract**

Bring teaching evolution alive in your classroom by having your students join in the hunt for the Sister Species of *C.elegans*. In this hands-on workshop, teachers will learn how to incorporate this model organism into their classroom using inquiry and molecular biology laboratories.

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**Workshop 3: Upping Your Data Collection Game with Vernier**

**Room: Sator Lab 221**

**Presenters**

Tom Smith, Vernier Software & Technology  
Mike Collins, Vernier Software & Technology

**Abstract**

Looking to bring some new life to that old chemistry, biology, or physics lab? Participants will have the opportunity to use some of the recently released sensors, interfaces, and software. You will gain expertise using technology to help your students engage more effectively with your content, cross cutting concepts, and science and engineering practices. We will have plenty of tools for all disciplines with time to dive into activities from our Chemistry, Biology, and Physics lab books - something you rarely have time for at your schools.

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**Workshop 4: Energy Theater!**

**Room: Latter Classroom 101**

**Presenters**

Ben Van Dusen, Assistant Professor, Physics, California State University, Chico  
Abigail Daane, Adjunct Professor, Physics, Seattle Pacific University

**Abstract**

Energy Theater is an extraordinary new representation of energy that is kinesthetic; scientifically rigorous; creative; and brings out student thinking like nothing we've ever seen! Students choreograph and perform real-life energy processes. Energy Theater can be adapted to applications of energy concepts across disciplines - and encourages the participation of all students.

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**Workshop 5: Outbreak! Using Biotech to Introduce Forensic Epidemiology**

**Room: Sator Lab 108**

**Presenters**

Dawn Tessandore, Highline High School, Burien, WA  
Callen Hyland, The MiniOne Electrophoresis  
Keith Lampel, University of Maryland, Adelphi, MD

**Abstract**

The Foodborne Outbreak Forensic Investigation MiniLab is a new strain of AP Biology lab that combines the best features of research driven inquiries and out-of-the box lab exercises. This lab engages students with a real world, relatable scenario as they investigate which food caused a group of partygoers to become ill. Students construct a hypothesis and design an electrophoresis experiment to test it, at the same time learning about how scientists investigate an outbreak in real life. Multiple right and wrong answers are possible, results are always clear and interpretable, and lively discussion is guaranteed.

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**Workshop 6: Materials Science: The Amazing Chemistry of Ordinary Materials**  
**Room: Sator Lab 209**

**Presenters**

Brian Wright, Olympia High School, Olympia, WA  
Andy Nydam, CORE+, Seattle, WA

**Abstract**

This hands-on workshop will have the participants doing labs and activities that connect theoretical Chemistry with Materials Science and real world applications. Participants will leave this workshop with fun and engaging activities that are inexpensive and will engage students and enhance their learning. Topics to be included are: electrochemistry, crystal structure, metals, polymers, and many more. This workshop will be presented by the awarded winning team of Nydam and Wright.

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**Workshop 7: Teaching Electronics and Programming with Arduino Microcontrollers**  
**Room: Latter Classroom 1**

**Presenter**

Scott Chan, Cupertino High School, Cupertino, CA

**Abstract**

Powerful, adaptable, yet inexpensive and easy to learn, Arduino microcontrollers have become popular tools to teach basic electronics and programming to novices and to create customized instruments and controllers. In this workshop, you will learn to build and program simple circuits with digital and analog sensors. Participants will use actual Arduino kits and will have the option to purchase the kit to take home with them. The cost is \$35 per kit, payable at the workshop. Participants must bring their own Windows or Mac computers, as Arduino is not supported on Chrome or mobile devices.

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**Workshop 8: Data Analysis in the Science Classroom: Stepping Up Our Game**  
**Room: Latter Classroom 2**

**Presenter**

I-Heng McComb, Fremont High School, Sunnyvale, CA

**Abstract**

As inquiry moves front and center in science classes, do you want to empower students to analyze data in more sophisticated ways? Did you know that Common Core math now demands students learn data skills throughout grades K–12? Let's explore how investigations in science class can tap into this new emphasis on statistics in math.

**12:00 – 1:00 p.m. Lunch provided at PLNU**



## Session 2: (1.5 hours)

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### **Workshop 1: Performing an ELISA: Anything but a do-little assay**

**Room: Sator Lab 108**

#### **Presenter**

Jason Econome, Stuyvesant High School, New York, NY

#### **Abstract**

Teachers are given background references, worksheets and a protocol associated with performing an enzyme-linked immunosorbent assay. They will setup positive references, via serial dilutions, to determine the concentration of an unknown sample, and through a case study, diagnose their “patient” if they actually have been infected, poisoned or impregnated in this workshop.

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### **Workshop 2: Birding in the 21st Century: New Electronic Tools that are Revolutionizing the Study of Birds**

**Room: Latter Classroom 1**

#### **Presenters**

Craig Kuchel, Florence-Carlton High School, Florence, OR

#### **Abstract**

Learn powerful new ways to make scientific research available to your classes. Explore The Cornell Lab of Ornithology’s eBird program, including how students can participate in this exciting citizen science project. Also learn how you can record and share data on nocturnal avian migration using inexpensive autonomous recording units.

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### **Workshop 3: Tools & Techniques for Teaching Science Literacy in the 21st Century**

**Room: Latter Classroom 2**

#### **Presenters**

Jennifer Dean, Camas High School, Camas, WA

Kim Newman, Camas High School, Camas, WA

#### **Abstract**

Come learn how to teach your students to be critical consumers of media, from those Facebook posts to interpreting a primary research article. All students need to know how to separate fact from fiction, develop and share their opinions and participate in scientific dialogue. Join our session to learn some strategies to facilitate the development of your students’ abilities to find relevant and scholarly information in a world overwhelmed with spam and misinformation. What is causation and correlation, and why does it matter? What is the difference in quantitative and qualitative data? Get some specific classroom activities you can use tomorrow to involve your students in the identification of claims, evidence and developing a classroom that promotes science as one way of knowing our world.

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#### **Workshop 4: Bring Real Life to the Classroom Through Discovery**

**Room: Latter Classroom 1**

##### **Presenters**

Debra Dimas, Santa Teresa High School, San Jose, CA

##### **Abstract**

Inquiry is a large part of the new NGSS curriculum. Students, however, need scaffolding in order to be able to successfully navigate through an inquiry lab. For 3 years I have been incorporating more inquiry into my science classes ranging from introductory conceptual Physics to second year AP Physics 2. With proper guidance all students can feel successful. This workshop will demonstrate how to create more authentic lab experiences for students by the use of Inquiry. Inquiry lessons will be presented that range from discovery, to structured, to open. These methods can be applied in any science content, but the examples will be from a Physics classroom.

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#### **Workshop 5: Art as Data**

**Room: Latter Classroom 102**

##### **Presenter**

Maria Laws, Gooru, San Francisco, CA

##### **Abstract**

Have you ever envisioned weather data as a sculpture or a musical score? Use analog and digital methods to analyze, transform, and communicate data using a variety of arts integration strategies that emphasize creativity, design thinking principles, and engage students as hands on makers, analytical thinkers, scientists, and creative artists.

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#### **Workshop 6: Community of Practice for Project-Based Physics**

**Room: Sator Lab 105**

##### **Presenter**

Matiah Shaman, Foster High School, Tukwila, WA

Tim Renz, Foster High School, Tukwila, WA

##### **Abstract**

We will experience rigorous Project Based Learning in physics through a transformed Community of Practice (QPOE2 and P2OSE) lesson that uses the design and testing of vehicle airbags and crumple zones to motivate the concept of impulse. We will also investigate the relationships between different models of research-based physics education.

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#### **Workshop 7: Creating a Podcast to Communicate Your Research**

**Room: Sator Lab 209**

##### **Presenter**

Eric Muhs, Roosevelt High School, Seattle, WA

##### **Abstract**

In this workshop, you'll make an "elevator pitch" mini-podcast that tells the story of your research. We'll work on honing your personal 3 pieces: the big idea, the work as narrative, and the convincing to care. We'll explore how you might incorporate the same work into your science classroom as a way to get students to see not just the trees, but the forest. We'll look at projects you do in your classroom which could incorporate audio recording. And we'll explore some venues for presenting your work.







## NOTES

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