

Realizing Vision & Change

Preparing for Next Generation Biology

2nd LIFE DISCOVERY—DOING SCIENCE
Biology Education Conference
October 3-4, 2014



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San José State University
San José, California

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Ecological Society of America
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2nd LIFE DISCOVERY — DOING SCIENCE
Biology Education Conference
Realizing Vision & Change: Preparing for Next Generation Biology
October 3-4, 2014
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In an effort to conserve resources, we have not printed session descriptions as part of the program.

You can view full session descriptions at the registration desk or view them online

www.esa.org/ldc

Conference Planning Committee

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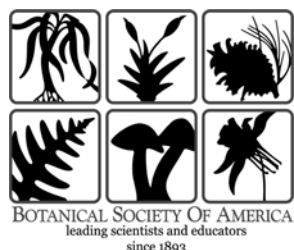
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Conference Partners



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The Ecological Society of America is proud to be a lead organizer of the

Life Discovery—Doing Science Biology Education Conference



Advancing Quality Ecology Education & Broadening Participation in Ecology



www.esa.org/education_diversity

Acknowledgements

Many biology education professionals and experts have contributed to the planning and content of this conference. We would like to thank all of the presenters, speakers and attendees for their support of this education conference.

We offer a special thanks to the faculty of **San José State University** for their enthusiastic support in coordinating the use of the conference venue, Academic Credit, field trip and promoting the conference to many educators in the region.



Many thanks to our Conference Collaborators who promoted the conference to their professional networks:

Animal Behavior Society
American Institute of Biological Sciences (AIBS)
Center for Excellence in Education (CEE)
Community College Undergraduate Research
Initiative (CCURI)
Disciplinary Associations Network for Sustainability
(DANS)
Ecological Research as Education Network (EREN)

The GLOBE program
National Association of Biology Teachers (NABT)
National Education Association (NEA)
The Nature Conservancy's LEAF program
Project Kaleidoscope at AAC&U
US Partnership for Education for Sustainable
Development (USPESD)

Keynote Panel

Keynote Panel:

Friday 8:30 AM, Ballroom 2

Where is science and biology education reform headed?

In what ways are the Next Generation Science Standards (NGSS) and the Vision and Change for Undergraduate Biology Education (V&C) Call to Action aligned?

What implications do the alignments of NGSS and V&C have for professional and resource development so we continue to build biological literacy over a student's career?



Dr. Janet Carlson is currently the Executive Director of the Center to Support Excellence in Teaching (CSET) in the Graduate School of Education at Stanford University. This recent move follows a 23-year history at the Biological Sciences Curriculum Study (BSCS), including serving as the first female executive director. Dr. Carlson's research interests include studying the impact of educative curriculum materials and transformative professional development on science teaching and learning. She began her career as a middle and high school science teacher and has spent the last 20 years working in science education developing curriculum, leading professional development, and conducting research. Dr. Carlson received a BA in Environmental Biology from Carleton College, an MS in Curriculum and Instruction from Kansas State University, and a PhD in Instruction and Curriculum (science education) from the University of Colorado.



Dr. Susan Rundell Singer is Division Director of the Division of Undergraduate Education at the National Science Foundation and Laurence McKinley Gould Professor at Carleton College. A developmental biologist who also does research on learning in genomics, Dr. Singer is an AAAS fellow and received both the American Society of Plant Biology teaching award and Botanical Society of America Charles Bessey teaching award. Dr. Singer also has a deep commitment to the advancement of education. Dr. Singer served on many boards including: NSF EHR advisory committee, Biological Sciences Curriculum Study Board, and the Botanical Society board of directors; is a member-at-large for the AAAS Education Section; participated in the Minnesota Next Generation Science Standards team; and was a member of the National Academies' Board on Science Education. She earned her PhD in biology from Rensselaer.



Dr. Rodolfo Dirzo studied Biology at the University of Morelos, Mexico. He completed his Masters (M.Sc.) and Doctorate (Ph.D) in Ecology at the University of Wales, Great Britain. He has been a Professor at the National University of Mexico (UNAM), where he was researcher at the Evolutionary Ecology Department, and Director of the Los Tuxtlas Research Station. Currently he is a Professor at Stanford University in the Biology Department, and Director of Stanford's Center for Latin American Studies. He teaches Ecology, Field Biology, and Conservation Science. His research centers on the study of the ecological relationships between plants and animals and on the impact of human activities on natural ecosystems. Most of his work is carried out in tropical ecosystems of Latin America, the Central Pacific, and Kenya. He is involved in teaching at undergraduate and postgraduate levels both in the USA and Latin America and he is committed to science education among children and the general public.

Friday Short Presentations

9:45AM – 10:15AM

BioCore Guide: A Tool for Interpreting the Core Concepts of Vision and Change Ballroom 1

Sara Brownell, Arizona State University

Audience: Undergraduate: Lower & Upper Division

The *BioCore Guide* can be used as a tool or resource to guide curricular design centered on three major sub-disciplines of biology: molecular/cellular biology, physiology, and ecology/evolution. The guide presents a set of general principles and specific statements that elaborate on each of the five concepts and indicate what a general biology major ought to know upon graduating in alignment with Vision and Change.

Designing Curricula that Align with NGSS: A High School Unit on Evolution Ballroom 2

Candice Guy, UC Davis; Chris Griesemer, UC Davis, Cynthia Passmore, UC Davis; Julia Gouvea, UC Davis; Jennifer Horton, Lincoln High School; Elizabeth Coleman, C.K. McClatchy High School; Ari Jamshidi, UC Davis; Audience: Grades 9-12

Our team of education researchers and high school teachers presents an early iteration of a research-based curriculum unit on evolution that is part of a yearlong high school biology curriculum that is fully aligned to the Next Generation Science Standards.

Student Initiated Experiments on the Earth's Ecological O₂ and CO₂ Cycles: Closed Ecological Systems Ballroom 3

Frieda Taub, University of Washington; Anna K. McLaskey, University of Washington; Christina H. Tran, University of Washington.

Audience: Undergraduate: Lower Division

A hands on, active experiment with green algae and grazers (*Daphnia*), with half the treatments in common with the class (controls), and half the treatments of the student team's selection of an hypothesis to be tested, e.g., pollution.

Web-Based Authentic Scientific Inquiries in Lower-Division Biology Courses Using BearCam ENG 301

X. Ben Wu, Texas A&M University; Stephanie Knight, Pennsylvania State University; Janie Schielack, Texas A&M University; Aubree Webb, Pennsylvania State University; Melisa Ziegler, Pennsylvania State University.

Audience: Undergraduate: Lower & Upper Divisions

Implement web-based authentic scientific inquiries for students in lower-division biology/ecology courses using photo archives of *BearCam*, remote controlled cameras for studying grizzly bear behavior at McNeil River Falls in Alaska, with collaborative learning, guiding rubric, and Calibrated Peer Review.

10:20AM – 10:50AM

Developing a Research Intensive Curriculum: Challenges and Solutions Ballroom 1

Alan Griffith, University of Mary Washington

Audience: Undergraduate: Lower & Upper Divisions

Curricula introducing students to authentic research have practical and social challenges. Participants will understand these challenges, strategies for change, and the social context for change. Participants will take home a faculty development program, course syllabi, and colleagues' perspectives on change.

Anoles Virtual Evolution Lab Ballroom 2

Laura Bonetta, Howard Hughes Medical Institute

Audience: Grades 9-12; Undergraduate: Lower Division

In this free online lab from HHMI, students explore first-hand the evolution of the anole lizards of the Caribbean islands. Using photos of actual research specimens, they take measurements from x-rays, count toe pad lamellae, and compare dewlap colors. They then use DNA sequence data to construct phylogenetic trees.

Mutualism in Action – A Guided Inquiry Activity Using Plant-Rhizobia Symbiosis in the Classroom Ballroom 3

Tomomi Suwa, Michigan State University

Audience: Grades 9-12; Undergraduate: Lower & Upper Divisions

We present a guided-inquiry biology lesson for high school and undergraduate students, using the plant-rhizobia symbiosis as a model system. We provide an example of a classroom experiment that can be easily modified to test a variety of interesting hypotheses.

Effecting Change Through Applied Conservation Biology ENG 301

Sue Margulis, Canisius College

Audience: Undergraduate: Lower & Upper Divisions

Conservation biology is often in the news. By engaging students using the newspaper as a learning tool, and developing a campus-wide poster session on key topics, students are empowered to see that their actions can and do make a difference.

2:35 PM – 3:05 PM

Writing to Learn Science: Short, In-Class Exercises that Promote Metacognition and Improve Scientific Reasoning Ballroom 1

Julie Reynolds, Duke University

Audience: Undergraduate: Lower & Upper Divisions

Writing can promote deep learning but science instructors often lack time and expertise for writing instruction. This writing workshop is an efficient and effective way to teach students to critically analyze their classmates' writing and, ultimately, their own.

Immersing Students in Systems Biology Research Ballroom 2

Sue McClatchy, The Jackson Laboratory

Audience: Grades 9-12; Undergraduate: Lower & Upper Divisions
Authentic research experiences engage students directly in the scientific process and elevate student understanding of science. Independent Studies in Computational Biology immerses students in computational investigations of their own design. This experience is a powerful influence on student academic paths.

Effectively Teaching About Climate Change Through the Life Sciences Ballroom 3

Mark McCaffrey, National Center for Science Education

Audience: Grades 9-12

This session will provide an overview of where climate, energy, and related global change topics fit within NGSS; highlight supplemental educational materials developed for the National Climate Assessment, and showcase relevant high quality, vetted materials available from the Climate Literacy and Energy Awareness Network (CLEAN; cleanet.org).

3:10 PM – 3:30 PM

Partnership for Undergraduate Life Sciences Education (PULSE): Transforming Life Sciences Education Ballroom 1

Betsy Desy, Southwest Minnesota State University

Audience: Undergraduate: Lower & Upper Divisions

This presentation will highlight efforts by PULSE Fellows to

increase awareness of AAAS/NSF's 2011 report, *Vision and Change in Undergraduate Biology Education: A Call to Action*, which makes a compelling argument for fundamental changes in life sciences education.

The Origin of Species: The Beak of the Finch Ballroom 2

Sandra Blumenrath, Howard Hughes Medical Institute

Audience: Grades 9-12; Undergraduate: Lower Division

The short film *The Origin of Species: The Beak of the Finch* and its accompanying resources introduce students to the pioneering studies of the Galápagos finches by Princeton University evolutionary biologists Peter and Rosemary Grant. This session will highlight activities tailored to train students to draw conclusions about the effect of natural selection on morphological traits based on measurements of living populations and the statistical analysis of those measurements. The workshop will also highlight an engaging interactive focused on reproductive isolation.

Long-term Ecological Monitoring Projects Develop Science Process, Analysis and Writing Skills in all Students Ballroom 3

Suzanne Worcester, California State University Monterey Bay

Audience: Undergraduate: Lower & Upper Divisions

Students engage when they collect and analyze relevant ecological monitoring data. Open-ended opportunities for ecological questioning and analysis allow for differentiated learning. I'll present the infrastructure I use to implement this high impact practice at lower and upper division levels.

Lunch Date with HHMI's BioInteractive: *Lizards in an Evolutionary Tree*



hhmi | **BioInteractive** 

Join us on **Friday, October 3 at 12:30pm** to view one of our latest short documentary films on evolution. Watch this exciting story and learn about the free educational resources that support using the film in your courses. **Lunch will be provided.**

Saturday Short Presentations

9:45AM – 10:15AM

What is a “Large” Lecture? Ballroom 1

Sarah Firestone, University of Maryland

Audience: Undergraduate: Lower Division

Studies have tested ways to improve large lectures; however, these studies define a “large lecture” as a course ranging in size from 72 students to 525 students. We will discuss the scalability of active learning strategies in large lectures.

Curriculum Interplay: What Putting Genetics Courses First Can Show Us About How Students Understand Evolution Ballroom 2

Emily Weigel, Michigan State University/BEACON Center for the Study of Evolution in Action

Audience: Grades 9-12; Undergraduate: Lower & Upper Divisions

Genetics courses often precede Evolution and serve as an introduction to evolutionary mechanisms. This study provides evidence that how students first (mistakenly) conceptualize the genetic mechanisms that underlie evolution is relatively fixed, but that certain critical concepts are still malleable.

Research as Teaching: Implementation of Undergraduate Research at Community Colleges Ballroom 3

Heather Bock, Finger Lakes Community College

Audience: Undergraduate: Lower Division

The Community College Undergraduate Research Initiative (CCURI) network consists of 31 partner colleges in 20 states. This presentation will focus on ways the implementation of UR projects in courses and how UR experiences at community colleges impact student success.

Teaching Science-Based Inquiry Through a Long-term Plant and Animal Phenology Observation Program ENG 301

Erin Posthumus, USA National Phenology Network; LoriAnne Barnett, USA National Phenology Network.

Audience: Grades 9-12; Undergraduate: Lower and Upper Divisions

We will introduce USA-NPN’s long-term plant and animal observation program, Nature’s Notebook. We will provide curriculum, hands-on learning, and demonstrate how Nature’s Notebook can be used to identify and answer local scientific research questions while contributing to national research.

10:20AM – 10:50AM

Facilitating Student/Scientist Partnerships in Secondary Education Ballroom 1

Catrina Adams, Botanical Society of America; Susan Flowers, Washington University in St. Louis

Audience: Grades 9-12

This presentation will focus on best practices in student/scientist partnerships. Catrina Adams (<http://www.plantingscience.org>) and Susan Flowers (<http://tyson.wustl.edu/teaching-hs.php>) share ideas for establishing student/scientist connections, facilitating engagement in meaningful science practices, and encouraging students as full participants in the scientific community.

From Research to Action – Improving Undergraduate STEM Education Ballroom 2

Susan Rundell Singer, National Science Foundation

Audience: Undergraduate

Strategies to move the needle on undergraduate education will be explored in the context of efforts and investments at the NSF and the federal government more broadly. Preparing a globally competitive workforce, including future teachers, and a scientifically literate populace, depends on our collective success in furthering a robust research and implementation infrastructure.

Evolving Better Cars: Teaching Evolution by Natural Selection using BoxCar2D Ballroom 3

Elizabeth Schultheis, Michigan State University; Anne Royer, Michigan State University.

Audience: Grades 9-12; Undergraduate: Lower Division

Evolutionary experiments can be difficult to perform in the classroom; computer applications allow students to observe evolution in action and perform inquiry experimentation. This lesson uses the online program, BoxCar2D, to demonstrate evolution by natural selection in virtual car populations.

Modeling a Teacher Training Placemat for NGSS ENG 301

Kevin Kalman, San Jose State University

Audience: Grades 9-12; Undergraduate: Lower Divisions

This presentation will model the NGSS Performance Expectation Analysis Placemat (created by Mechelle Lalanne from North Central ESD) that has been used in several NGSS professional development workshops. The activity is designed to help institutions and educators breakdown the different components of the Next Generation Science Standards in the form of a placemat activity.

11:00 AM– 11:30AM

From Sun to Cell: Storyboarding the Journey of Photons to Teach Concept of Energy Flow Ballroom 1
Jeffrey Corney, The Wilderness Center

Audience: Grades 9-12

The flow and transfer of energy through earth's systems, a fundamental NGSS core idea, will be used to demonstrate the use of visual storyboarding as an easy to construct yet powerful tool for teaching complex scientific concepts.

Do You See What They See? Ballroom 2

Jim Clark, Arroyo High School; Samantha Johnson, Arroyo High School

Audience: Grades 9-12

This session will focus on the NGSS related skills of making student thinking visible through modeling, discourse strategies and persuasive and argumentative writing. When student thinking becomes visible teachers can adjust lessons, create activities and labs designed around student transfer.

Developing a Research Based Class for Second Year Students Ballroom 3

Ingo Schlupp, University of Oklahoma

Audience: Undergraduate: Lower Division

Learn about a newly developed course, the Cornerstone. It provides an inquiry based learning experience to sophomore students. The focus is on involving students actively into research that is ongoing in the instructor's laboratory.

Witnessing Phenotypic & Molecular Evolution First-hand: A Middle School-College Laboratory Exercise ENG 301

Juliet Noor, Duke University

Audience: Grades 9-12; Undergraduate: Lower Division

This exercise, which contains levels appropriate to middle school through college, leverages student interest in genetics to observe and understand evolution by natural selection. Students watch the spread of an allele demonstrating natural selection, while they also learn genetic principles.

11:35 AM– 12:05 PM

Science Forward Video Series: A Resource to Stimulate Discussion and Promote Scientific Literacy Ballroom 1

Kelly O'Donnell, Macaulay Honors College

Audience: Undergraduate: Lower Division

Science Forward is an interdisciplinary science course that uses an online video series to stimulate discussion and support a flipped classroom. The course and videos focus on the nature of science and important skills that scientific thinkers possess.

Introducing Digital Microscopy and e-Notebooks into an Introductory Biology Course: A Case Study Ballroom 2

Sandra Davis, University of Indianapolis

Audience: Grades 9-12; Undergraduate: Lower Division

A project requiring students to complete an electronic lab notebook utilizing photomicroscopy to enhance the study of biodiversity is described. Lab practical scores among classes incorporating the assignment or not were assessed, along with and instructor observations and student responses.

Project WISE: A Field-Based High School Environmental Science Class Anticipates Trends in Education Ballroom 3

Francis Taroc, Golden Gate National Parks Conservancy

Audience: Grades 9-12

As science education places greater emphasis on the practice of science, new approaches are being sought to adapt to the changing landscape. Project WISE, a program based in San Francisco, provides a dynamic model of what science education can be.

Assessing Student Understanding of Matter and Energy Transformation: Lexical Analysis of Student Writing ENG 301

Luanna Prevost, University of South Florida

Audience: Undergraduate: Lower Division

Computerized lexical analysis can facilitate the use of writing in large enrollment courses and provide feedback to instructors. An analysis of writing on matter and energy in ecosystems revealed students' heterogeneous ideas that may be masked with multiple choice assessments.

2:35 PM—3:05 PM

Sharing and Publishing Your Teaching Ideas Ballroom 2

Teresa Mourad, Ecological Society of America; Ken Klemow, Wilkes University; Catrina Adams, Botanical Society of America, Sunshine Brosi, Frostburg State University.

Audience: Grades 9-12; Undergraduate: Lower & Upper Divisions

It's easy to submit teaching ideas to the Life DiscoveryEd Digital Library (LDDL). This session shows you how to develop descriptive metadata and highlights LDDL's interactive features as we seek to forge an active community of practice.

Friday At-a-Glance

7:30 AM Registration Open - Second Level of Student Union

**8:15 AM Welcome by Conference Chair - Ballroom 2
Keynote Panel**

9:30 AM Break

ROOM	Ballroom 1	Ballroom 2	Ballroom 3	ENG 301
Short Presentations				
9:45 AM	BioCore Guide: A Tool for Interpreting the Core Concepts of Vision and Change <i>Brownell</i>	Designing Curricula that Align with NGSS: A High School Unit on Evolution <i>Guy</i>	Student Initiated Experiments on the Earth's Ecological O2 and CO2 Cycles: Closed Ecological Systems <i>Taub</i>	Web-Based Authentic Scientific Inquiries in Lower-Division Biology Courses Using BearCam <i>Wu</i>
10:20 AM	Developing a Research Intensive Curriculum: Challenges and Solutions <i>Griffith</i>	Anoles Virtual Evolution Lab <i>Bonetta</i>	Mutualism in Action – A Guided Inquiry Activity Using Plant-Rhizobia Symbiosis in the Classroom <i>Suwa</i>	Effecting Change Through Applied Conservation Biology <i>Margulis</i>
11:00 AM	Education Share Fair Roundtable Ballroom 2			
12:30 PM	Lunch Date with BioInteractive's Short Films Ballroom 2 Sponsored by HHMI Biointeractives			
Workshops				
1:30 PM	Using Google Geo Tools For Education (1 hour) <i>Bailey</i>		Evolution in Action in the Classroom with Avida-ED Digital Evolution Software (1 hour) <i>Johnson</i>	Connecting Scientists and K-12 Students with The GLOBE Program (2 hours) <i>Foletta</i>
Short Presentations				
2:35 PM	Writing to Learn Science: Short, In-Class Exercises that Promote Metacognition and Improve Scientific Reasoning <i>Reynolds</i>	Immersing Students in Systems Biology Research <i>McClatchy</i>	Effectively Teaching About Climate Change Through the Life Sciences <i>McCaffrey</i>	<i>GLOBE Workshop continued</i>
3:10 PM	Partnership for Undergraduate Life Sciences Education (PULSE): Transforming Life Sciences Education <i>Desy</i>	The Origin of Species: The Beak of the Finch <i>Blumenrath</i>	Long-term Ecological Monitoring Projects Develop Science Process Analysis and Writing Skills in all Students <i>Worcester</i>	<i>GLOBE workshop continued</i>
3:40 PM	Break			
3:50 PM	Networking Session I - Ballroom 2			
4 :30 PM	Fieldtrip: Tour of SJSU Collection (registration required) Meet at Registration Desk			

Saturday At-a-Glance

7:30 AM Registration Open

8:15 AM Facilitated Networking with Keynote Panelists - Ballroom 2

9:30 AM Break

ROOM	Ballroom 1	Ballroom 2	Ballroom 3	ENG 301
Short Presentations				
9:45 AM	What is a “Large” Lecture? <i>Firestone</i>	Curriculum Interplay: What Putting Genetics Courses First Can Show Us About How Students Understand Evolution <i>Weigel</i>	Research as Teaching: Implementation of Undergraduate Research at Community College <i>Bock</i>	Teaching Science-Based Inquiry Through a Long-Term Plant and Animal Phenology Observation Program <i>Posthumus</i>
10:20 AM	Facilitating Student/Scientist Partnerships in Secondary Education <i>Adams</i>	From Research to Action – Improving Undergraduate STEM Education <i>Singer</i>	Evolving Better Cars: Teaching Evolution by Natural Selection Using BoxCar2D <i>Schultheis</i>	Modeling a Teacher Training Placemat for NGSS <i>Kalman</i>
11:00 AM	From Sun to Cell: Storyboarding the Journey of Photons to Teach the Concept of Energy Flow <i>Corney</i>	Do You See What They See? <i>Clark</i>	Developing a Research Based Class for Second Year Students <i>Schlupp</i>	Witnessing Phenotypic & Molecular Evolution First-hand: A Middle School-College Laboratory Exercise
11:35 AM	Science Forward Video Series <i>O'Donnell</i>	Introducing Digital Microscopy and e-Notebooks into an Introductory Biology Course: A Case Study <i>Davis</i>	Project WISE: A Field-Based High School Environmental Science Class Anticipates Trends in Education <i>Taroc</i>	Assessing Student Understanding of Matter and Energy Transformation: Lexical Analysis of Student Writing <i>Prevost</i>
12:10 PM	Lunch with Scientific Storytelling and the Green Ninja Project Be entertained by Green Ninja videos and discover how storytelling can promote engagement around science and environmentally friendly actions. <i>Sponsored by Google</i>			

Workshops

1:30 PM	Natural History Collections as Resources for Vision and Change in Undergraduate Education (2 hours) <i>Lacey</i>	Dyeing to Learn Objectives: Developing Learning Objectives for a Lab on Making Natural Dyes from Plants (1 hour) <i>Brosi</i>	Teaching Statistics in the High School and College Life Science Courses <i>Strode</i> (2 hours)	Teaching Biology Using Team-Based Learning <i>Grise</i> (1 hour)
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	Workshop	Short Presentation	Workshop
2:35 PM	<i>Natural History continued</i>	Sharing and Publishing Your Teaching Ideas <i>Mourad</i>	<i>Teaching Statistics continued</i>
3:10 PM	Networking Session II - Ballroom 2		
3:30 PM	Break		
3:40 PM	Closing Plenary - Synthesis: What's in store for the future of Biology Education?		
4:30 PM	Farewells		

Education Share Fair

This session is designed for educators to share or gather feedback on teaching ideas and activities with a peer working group. Ideas or activities may be at any stage of development. Authors describe their teaching idea for about 15 minutes and then facilitate feedback regarding the core concepts addressed, methodology, misconceptions, assessment, educational extensions or implementation in various institutional settings and audiences. There will be two rounds of 45 minutes each..

Friday, 11:00 AM, Ballroom 2

Table #A1

Popular Literature and Biology: What's the Connection?

Chung Khong, Yerba Buena High School

Audience: Grades 9-12

This presentation will explore the use of popular literature, specifically novels, in the teaching of biology. The use of popular literature will enhance the students' connections with other curricular areas such as English. This will further enhance the connections sought by the Common Core Reading and Writing Standards and the Next Generation Science Standards.

Table #A2

Thumbs Up! for Evolution: A Differentiated Lesson for Experiential Learning

Allison Walker, High Point University

Audience: Grades 9-12, Undergraduate: Lower & Upper Division

Want to prove to your students how much we depend on the biological and cultural adaptations of our shared evolutionary history? No need to lecture, just watch as your students experience evolution firsthand. This differentiated lesson plan includes hands-on evolutionary research, guided self-discovery, and culminates with a STEAM-driven artistic rendering of an evolutionary epiphany. Could you survive without an essential human adaptation? In this lesson you'll find out!

Table #A3

Modeling Populations: Emphasizing the Importance of Mathematical Modeling in Undergraduate Ecology

Kristin McCully, University of California, Santa Cruz

Audience: Undergraduate: Upper Division

Undergraduate biology programs seldom provide adequate mathematical skills to understand biological phenomena and contribute to scientific inquiry. We present a computer inquiry module that uses research literature to introduce structured population models and their conservation applications to upper-division ecology courses.

Table #A4

Authentic Undergraduate Research Experiences in Introductory STEM courses

James Hewlett, Community College Undergraduate Research Initiative

Audience: Undergraduate: Lower Division

This discussion will focus on curriculum models used to integrate an authentic undergraduate research experience into traditional introductory STEM courses.

Table #A5

Promoting University Attendance by Underrepresented Groups with Multi-year Mentoring: the CiM-Bio model

Zachary Culumber, Centro de Investigaciones Cientificas de las Huastecas Aguazarca

Audience: Grades 9-12

Structured scientific experiences and mentoring in scientific disciplines from middle school to the university level by trained scientists could provide a mechanism to support university attendance and achievement by underrepresented groups in developing and developed nations alike.

Table #A6

Engaging the Mon-major through Collaborative Science

Annissa Furr, Kaplan University

Audience: Undergraduate: Lower & Upper Division

Using a typical day, students track their carbon usage and calculate their environmental footprint. Students reflect on personal global impacts and evaluate modifying future behaviors. A collaborative science approach allows students to visualize themselves as part of a global community.

Table #A7

Thinking Like a Neuroscientist: Using Scaffolded Grant Proposals in a Freshman Neuroscience Course

Stacey Taylor, Stanford University; Hania Koeber, Stanford University; Melinda Owens, Stanford University; Andrew Dosmann, Stanford

Audience: Undergraduate: Lower Division

The roundtable discussion of "Thinking Like a Neuroscientist" will first describe a set of activities designed to develop students' scientific reasoning and communication skills. Second, we will discuss strategies for assessing how well the activities achieve the learning goals.

Table #A8

Modeling Activities in Support of NGSS Strategies

Jim Clark, Arroyo High School

Audience: Grades 9-12

We are developing lessons around modeling requirements in the NGSS framework. We are interested in sharing the lessons and receiving feedback from the round table group.

Table #A9

Creating Relevance in Botany through Cultural Connections

Laura Smith, Frostburg State University

Audience: Undergraduate: Lower Division

Relevance and social connections are applied to botany and plant biology courses using the matrix assessment technique. Transition from rote memorization to higher-level skills occurs through connecting students to the topic and to core concepts and competencies in biology.

Friday, 11:45 AM

Table #B1

Pollen and Public Health: A Citizen Science Project

Tiffany Carey, University of Michigan

Audience: Grades 9-12, Undergraduate: Lower & Upper Division

Urban areas have especially high rates of allergies and asthma, and there is strong evidence that pollen exposure is a contributing factor. We collaborated with high school students in Detroit, Michigan to investigate allergenic pollen concentrations and land use including vacant lots, residential areas, and parks.

Table #B2

How interactive is your Classroom? Collecting Data Using the Student Participation Observation Tool (SPOT)

Katrina Roseler, San Jose State University

Audience: Educators at all levels

Have you wondered how interactive your classroom is? Using the SPOT application, educators can assist each other in collecting real-time data about the activities of students during instruction. Participants who bring computers will get to use the application.

Table #B3

Real-time Construction and Implementation of Formative Assessment Using Clickers

Andrew Martin, University of Colorado

Audience: Undergraduate: Lower & Upper Division

Presentation focuses on real-time (during class) construction of clicker questions and formative assessment with immediate feedback in a large-enrollment setting as a general tool for instructors to assess student understanding prior to a lesson and generating an estimate of learning gains during a single class.

Table # B4

Monkeyflowers for the Masses: A hands-on Resource for Teaching Genetics and Evolution

Lila Fishman, University of Montana

Audience: Grades 9-12, Undergraduate: Lower & Upper Divisions

The wildflower genus *Mimulus* (monkeyflowers) has long been a model system for investigations of adaptation and speciation. A group of monkeyflower researchers are developing (college-level) laboratory modules that capitalize on the tremendous diversity, tractability, and genome resources of *Mimulus* to teach basic genetics and evolution concepts.



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Table #B5

ENSIweb: Evolution & NOS Classroom-tested Lessons & Other Resources

Lawrence Flammer, ENSIweb

Audience: Grades 9-12

ENSI is a top resource for interactive lessons on NOS and evolution. It's used by teachers in secondary sciences and undergraduate science courses, with more than 75 ready-to-go lessons. After 16 years, it still gets 2-3,000 hits per month. The newly released text supplement *Science Surprises: Exploring the Nature of Science* utilizes and organizes the use of ENSI's NOS lessons, and assures that all of the NGSS expectations for NOS are met.

Table #B6

QUBES Hub: A Vision of Online Collaboration in Teaching and Learning in Quantitative Biology

M. Drew LaMar, College of William and Mary

Audience: Grades 9-12, Undergraduate: Lower & Upper Division

We will discuss the desired functionality for a central online hub (QUBES: Quantitative Undergraduate Biology Education and Synthesis), designed to facilitate exchange amongst quantitative biology educators and bridge the gap between biologists and mathematicians who educate undergraduates at this interface.

Table #B7

Use of Flip Teaching to Enhance Student Understanding in High School Science Courses

Rob Iverson, Gunderson High School

Audience: Grades 9-12

The incorporation of technology with new teaching strategies, flip teaching, in science courses may increase a student's understanding of difficult concepts, such as thermal expansion of water as additional consequences of global warming.

Table # B8

Engaging Students and Indigenous Communities in Global Health Research

Slavko Komarnytsky, NC State University; Debora Esposito, NC State University

Audience: Grades 9-12, Undergraduate: Lower & Upper Divisions, Graduate, Other

Mobile Discovery kit explores chemical biodiversity of local ecosystems and uncovers its potential to improve human health by rapidly measuring anti-infective properties of diverse biological samples, thus providing exceptional long-term student engagement in global health research.



OPEN SCIENCE NETWORK
IN ETHNOBIOLOGY



Join representatives of the Open Science Network (OSN) and get involved in this collaborative network of ethnobiology educators. The learning community is open to all educators interested in the field of ethnobiology and the curriculum and practices endorsed by the *Vision and Change for Biology*.

Funded by the National Science Foundation, OSN uses open technology and an open culture to facilitate the exchange of educational techniques, materials, and experiences across institutional and international borders.

To join or learn more about OSN, visit the following website:
www.opensciencenetwork.net

Table #B9

Modules in Ecology and Evolution Development (MEED) Program

Laura Super, University of British Colum; Catherine Hoffman; Adriana Suarez-Gonzale

Audience: Grades 9-12

The Modules in Ecology and Evolution Development (MEED) program provides hands-on learning in ecology and evolution to K-12 students through modules (experiential learning activities). University of British Columbia graduate students attend outreach workshops, create modules, and present to K-12 classes.

Table #B10

Bugs and Botany: A Play-based Approach to Bridging Science and Society

Lauren Hull, Frostburg State University

Audience: Grades 9-12, Undergraduate: Lower & Upper Division

Integrating play-based education into science curriculum allows students to discover core concepts and engage creatively in a non-restrictive environment; facilitating physical, social and intellectual development. Participants will explore play concepts in plant-insect interaction activities, connecting societal needs and biological processes.

**Saturday Luncheon
12:10 PM Ballroom 2**

**Scientific Storytelling with
the Green Ninja Project**

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Guest speaker:

*Dr. Eugene Cordero,
San Jose State University*

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- Strategies for focusing on the big ideas of biology and student understanding of these ideas
- Tips for creating your own inquiry-based activities

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Workshops

PRECONFERENCE

Teaching about Topics in Bioinformatics **1:00pm – 5:00pm Martin Luther King Jr. Library** **Room 217**

Joshua Mackie, San Jose State University

Audience: Grades 9-12, Undergraduate Lower Division

'Bioinformatics' can be defined as digital data analysis in biology.

The goal of this workshop is to examine the use of DNA sequence data in describing biodiversity, exploring the tools available for teachers and students to develop real-life based research-learning experiences.

FRIDAY

Using Google Geo Tools For Education

1:30PM - 2:30PM Ballroom 1

John Bailey, Google Inc.; Emily Henderson, Google Inc.,

Audience: All levels

Recently Google released several new geo tools. The Google Geo Edu Team will lead participants through a series of hands-on, content relevant tasks that will help to build understanding and skill with these tools using content relevant to biology students.

Evolution in Action in the Classroom with Avida-ED **Digital Evolution Software**

1:30PM - 2:30PM Ballroom 3

Wendy Johnson, Michigan State University; Robert Pennock, Michigan State University

Audience: Grades 9-12, Undergraduate: Lower and Upper Divisions

Avida-Ed is a free software program that provides an instance of evolution allowing students to develop and test questions about the mechanisms of natural selection. Software and lesson plans provided. Participants may wish to bring a laptop.

Connecting Scientists and K-12 Students with The **GLOBE Program**

1:30PM - 3:30PM ENG 301

Peggy Foletta, The GLOBE Program

Audience: Grades 9-12

The GLOBE Program is a science and education program that connects students, teachers and scientists from around the world to better understand, sustain and improve Earth's environment. By engaging students in hands-on learning of Earth system science, GLOBE is an innovative way for teachers to get students of all ages excited about scientific discovery.

SATURDAY

Dyeing to Learn Objectives: Developing Learning **Objectives for a Lab on Making Natural Dyes from** **Plants**

1:30PM - 2:30PM Ballroom 2

Sunshine Brosi, Frostburg State University; Karen Hall, Botanical Research Institute of Texas

Audience: Grades 9-12, Undergraduate: Lower and Upper Divisions, Informal Education

Using an activity on natural plant dyeing, participants will develop and peer-review learning objectives and align objectives and assessments to core concepts and competencies in Vision and Change. This is a participant-driven, active-learning workshop to allow participants to experience team-based learning, and share practical ideas concerning how to implement team-based learning successfully in their classes.

Teaching Biology Using Team-Based Learning **1:30PM - 2:30PM ENG 301**

David Grise, Texas A&M University-Corpus Christi

Audience: Undergraduate: Lower Division

This is a participant-driven, active-learning workshop designed to allow participants to experience team-based learning, a form of active learning, and share practical ideas concerning how to implement team-based learning successfully in their classes.

Natural History Collections as Resources for Vision **and Change in Undergraduate Education**

1:30PM - 3:30PM Ballroom 1 (2-hour workshop)

Eileen Lacey, UC Berkeley; Joseph A. Cook, Museum of Southwestern Biology, University of New Mexico; Kayce Bell, Museum of Southwestern Biology, University of New Mexico; Corey Welch, Biology Scholars Program, UC Berkeley

Audience: Undergraduate: Lower and Upper Divisions

The goal of this workshop is to outline the multiple ways in which the vast physical and digital resources associated with natural history collections can be used to promote the critical modifications to undergraduate education outlined in the AAAS Vision and Change document published in 2011.

Teaching Statistics in the High School and College Life **Science Courses Using Free Biointeractive Resources**

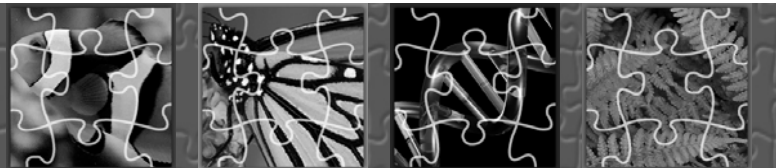
1:30PM - 3:30PM Ballroom 3 (2-hour workshop)

Paul Strode, Fairview High School, Peter Szameitat, Fairview High School

Audience: Grades 9-12, Undergraduate: Lower and Upper Divisions

In response to the NGSS data and error analysis requirements, participants will discuss the math skills needed for high school graduation and college life science courses, practice calculating descriptive statistics, and perform the t-Test.

LifeDiscoveryEd Digital Library (LDDL)



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Networking Sessions

During the conference and beyond

Friday 3:50 pm

Join a group that interests you

- Grades 9-12
- Lower division undergraduate (2 yr or 4 yr institutions)
- Upper division undergraduate
- Community College
- Minority-serving Institutions
- Incorporating research into curriculum
- Enhancing quantitative skills in biology
- Enhancing labs
- Incorporating sustainability and social sciences into biology

Saturday

3:10 pm Synthesis

3:50 pm Closing Plenary

What's in store for the future of Biology Education?

Sign up at registration table for more networking after the conference

Field Trips

Friday October 3

4:30 pm—6:00 pm

The amazing San José State University Biological Specimens Collection



SJSU boasts several collections of world renown. The entomology collection contains more than 1 million described species, drawing numerous researchers to their holdings!! The herbarium has about 15,000 species and the Botany Garden houses more than 100 native plants. Take a tour of the splendid biodiversity of the West in an hour and learn how to access their database! \$5

Sunday October 5

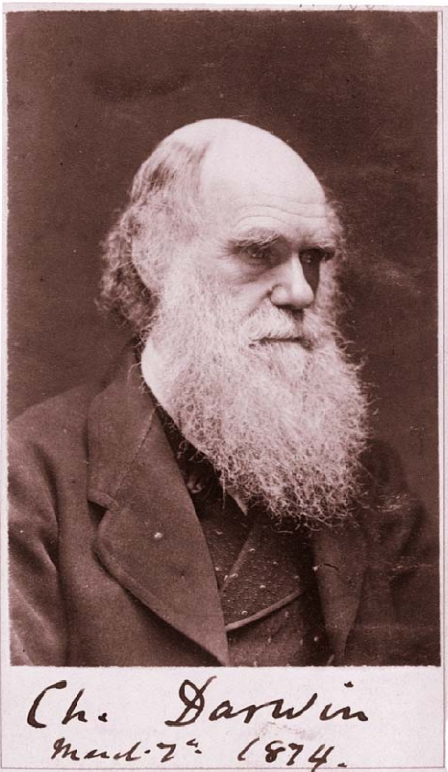
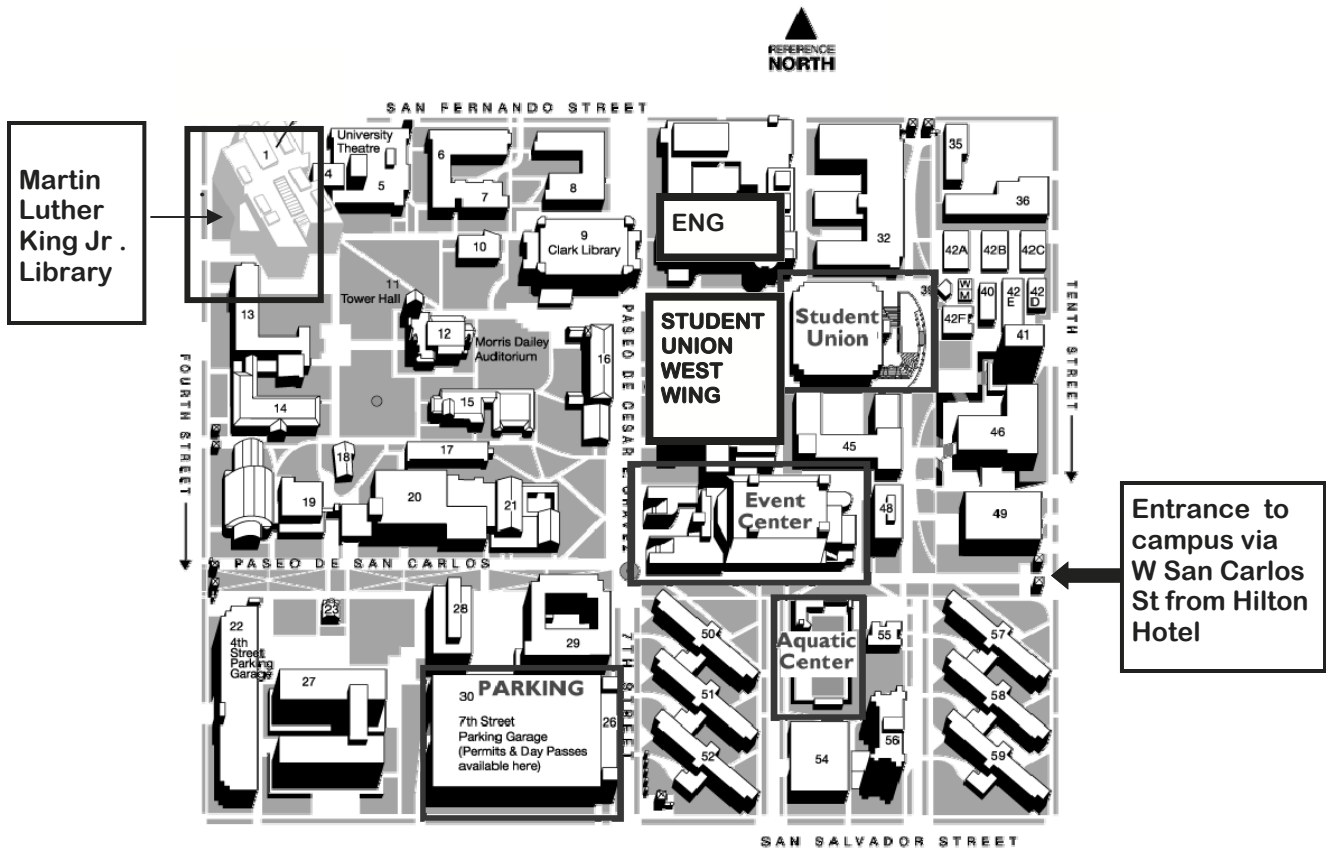
8:00 am—3:30 pm

The Monterey Bay Aquarium



Join your fellow conference attendees for a day at the Monterey Bay Aquarium. With thousands of plants and animals representing over 600 hundred species, there will sure to be something that catches your attention. Perhaps it is the giant Kelp Forest exhibit or the new Tentacles exhibit. Come explore! Behind-the-scenes tour included. \$55

SJSU Campus



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promotes advancement of scientific understanding of evolution and supports outreach and education at all levels.



SSE outreach targeting education include:

- EVO101, a satellite session for K-12 educators, Professional Development Workshop for undergraduate educators, and Education Symposium at the annual SSE meeting
- The annual Gould award lecture (see past lectures archived on our web site)
- The T.H. Huxley Award for an SSE member presentation at NABT
- Participation in the USA Science & Engineering Festivals, Washington, DC

You could be one of us! SSE membership includes a rate for K-12 educators with an interest in evolution. Information about the SSE can be obtained at:

<http://cms.gogrid.evolutionssociety.org/>

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