

Exploring Biology for a Changing World

LIFE DISCOVERY — DOING SCIENCE
Biology Education Conference



A project of the

**LifeDiscoveryEd
Digital Library**



**University of Minnesota
Continuing Education Conference
St. Paul, Minnesota
March 15 – 16, 2013**

Organized by:
Ecological Society of America
Botanical Society of America
Society for the Study of Evolution
Society for Economic Botany

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

Life Discovery—Doing Science Inaugural Biology Education Conference



Advancing Quality Ecology Education &
Broadening Participation in Ecology

Strategies for Ecology Education, Diversity and Sustainability (SEEDS)

Mentoring undergraduate students

EcoEd Digital Library & Teaching Issues and Experiments in Ecology

Teaching resources for undergraduate educators

Future of Environmental Decisions: Continental-scale Ecology Education

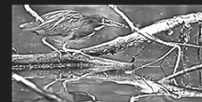
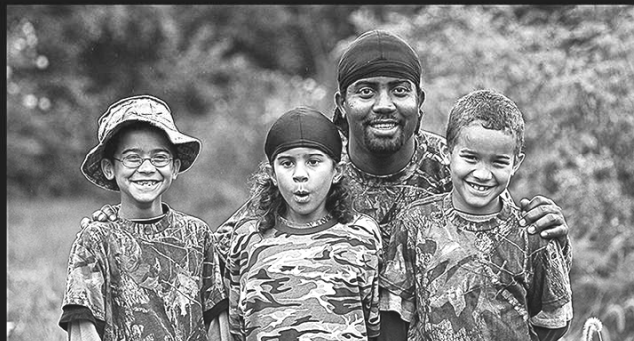
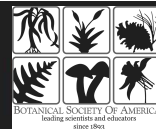
Workshops and resources for faculty and students



ESA Education & Diversity Programs Office



our dad takes us on science adventures...



We use big words, like confluence (two rivers coming together) & nocturnal (night creatures).
We discover new things—animals, birds, bugs, frogs, turtles, mushrooms, cool plants...
Sometimes mom says we get way too dirty, but that's what scientists do!
We explore ideas—did you know trees get their food from the air?

**science
is great fun!**



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NOTE: 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 registrations desk, view them online, or download them (.pdf) at the conference website

www.esa.org/ldc



Shuttle Schedule



Friday

Radisson Hotel to Conference Center: 7:15 AM
7:45 AM

Conference Center to Radisson Hotel: 7:30 PM
8:00 PM

Saturday

Radisson Hotel to Conference Center: 7:15 AM
7:45 AM

Conference Center to Radisson Hotel: 5:30 PM
6:00 PM

Arrangements can be made at the Hotel Lobby and Conference Registration Desk for shuttle service at times not listed on the schedule.

About this conference

The biological understanding of our world, from the DNA in cells to the effect of our actions in the biosphere, is advancing rapidly. Our changing world presents exciting opportunities for Life Discovery and challenges for teaching, study and learning. The branches of biology that deal with plants, animals, behavior, ecology and evolution, collectively referred to as organismal and environmental biology, hold many keys to understanding life in a changing world.

This conference will highlight leading science, curriculum design and implementation, and data exploration in a research-rich biology education for high school and undergraduate students.

A major goal of the conference is to foster communities of practice and encourage the sharing of best practices in biology education across grades. The Education Share Fair will be a central event for participants to contribute to a collection of lesson ideas as well as teacher-friendly scientific resources including photo collections, figures and charts, and datasets which will be published in the LifeDiscoveryEd Digital Library. The LifeDiscoveryEdDL is built on the model currently offered by the Ecological Society of America.

Conference Planning Committee

The **LIFE DISCOVERY – DOING SCIENCE** Inaugural Education Conference
is a new collaborative initiative among:

Ecological Society of America
Botanical Society of America
Society for the Study of Evolution
Society for Economic Botany

The collaborating societies will jointly manage the LifeDiscoveryEd Digital Library
and serve as curators of Society-specific collections within the digital library.

Partner Representatives:

Tom Meagher, Conference Chair, *Professor, Biology, University of St. Andrews, Scotland*

Jeffrey R. Corney, Local Organizing Chair, *ESA Education Section chair, Managing Director, Cedar Creek Ecosystem Science Reserve, University of Minnesota, MN*

Sunshine L. Brosi, *Assistant Professor, Frostburg State University, MD*

Louise Mead, *Director of Education, BEACON, Michigan State University, MI*

Kristin Jenkins, *Pre-faculty Programs, Institute for Biology Education, University of Wisconsin, Madison and Director, BioQUEST*

DC Randle, *Biology Teacher, St. Francis High School, MN*

ESA Staff:

Teresa Mourad, *Director of Education and Diversity Programs, Ecological Society of America*

Andrea McMillen, *Education Programs Coordinator, Ecological Society of America*

Tricia Crocker, *Meetings Associate, Ecological Society of America*

Kristin Haas, Yukari Suzuki & Yoomee Kim, *Education Interns, Ecological Society of America*

working together we
will make a difference



are you taking part in the evolution?

planting science
join us, make a difference



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

Sponsored advertisement

Friday Keynote Speaker and Panelists

Opening Keynote Address:

Building Partnerships with Scientists & Educators

Friday 8:30 AM, Room 135



Jay B. Labov is Senior Advisor for Education and Communication for the National Academy of Sciences (NAS) and the National Research Council (NRC). He has directed or contributed to fifteen National Academies reports focusing on teacher education, advanced study for high school students, K–8 education, and undergraduate education. He has served as Director of committees on K–12 and undergraduate science education, the National Academies Teacher Advisory Council, and was Deputy Director for the Academy’s Center for Education. He also directed a committee of the NAS and the Institute of Medicine that authored *Science, Evolution, and Creationism* and oversees the NAS’s efforts to confront challenges to teaching evolution in the nation’s public schools. He oversees an effort at the Academy to work with professional societies and with state academies of science on education issues. He also oversees work on improving education in the life sciences under the aegis of the NRC’s Board on Life Sciences. Dr. Labov is an organismal biologist by training. Prior to accepting his position at the Academy in 1997, he spent almost 20 years on the biology faculty at Colby College in Maine. He is a Kellogg National Fellow, a Fellow in Education of the American Association for the Advancement of Science, and a Woodrow Wilson Visiting Fellow.

Keynote Panel:

Digital Resources and Learning for the Future

Friday 4:30 PM, Room 135



Dr. Sam Donovan is a Research Associate Professor in the Department of Biological Sciences at the University of Pittsburgh, and the Director of Undergraduate Programs for the BioQUEST Curriculum Consortium. He received his B.S. in Biology at Virginia Tech and M.S. in Ecology and Evolution at the University of Oregon. Teaching and curriculum development opportunities led him to two related conclusions: he really enjoyed teaching and it would be valuable to know more about education theory and research. The next step was a PhD in Science Education from the Department of Curriculum and Instruction at the University of Wisconsin–Madison. Dr. Donovan’s scholarship involves research on student learning, curriculum design, and faculty development projects. His learning research focuses on how students reason about evolutionary events and interpret phylogenetic diagrams. He has had a series of NSF supported curriculum and faculty development projects that focus on evolution education, integrating bioinformatics across the biology curriculum, and using networked communications and computing resources to engage students in doing science. Much of this work has been done in collaboration with the BioQUEST Curriculum Consortium, a 25-year national reform effort in biology education.



Nancy Geving is a high school science coach for St. Paul Public Schools. Prior to starting this position in 2007, she was a Biology and Environmental Science teacher at Central High School in St. Paul for 16 years. She enjoys the outdoors and being active, one reason why she enjoyed teaching the Environmental Science classes. During her tenure at Central High School, she led student groups on trips to Grand Cayman for scuba diving and to the Amazon Rainforest of Peru. In her current position, she is involved with teachers in all of the St. Paul Public School high schools, which has been a great experience and opportunity to see all of the good things going on in the St. Paul Public School system.



Dr. Susan Gill is the Director of Education at the Stroud Water Research Center, in Avondale, PA. Her interest in the environment began when she was an undergraduate and took her first courses in ecology, geology and soils at the University of Pennsylvania. After graduation, she worked as an environmental planner, completing environmental impact statements on proposed highway projects. She quickly realized that she was on the wrong side of the process. People knew intuitively that paving open space was a bad idea, but did not have the knowledge necessary to mount an effective counter argument. After leaving the planning profession, she earned an MA in Environmental Education at Arcadia University (then Beaver College) in Philadelphia. Knowing that she needed to have strong science foundation, she then entered the PhD program in geology at the University of Pennsylvania, where she did research on environmental interpretation from fossil soils. After graduation, she stayed at UPENN as the Director of Professional Programs in the Department of Earth and Environmental Science, where she directed professional Master’s programs in Environmental Studies and Applied Geoscience. Five years ago, she was offered the opportunity to move to the Stroud Water Research Center as the Director of Education, where she works with an amazing group of environmental scientists and educators. This move has allowed her to develop innovative educational applications such as Model My Watershed.

Saturday Keynote Speakers and Panels

Keynote Panel:

Building Pathways and Partnerships between K12 and College

Saturday 8:45 AM, Room 135



Jim MaKinster is an Associate Professor of Science Education at Hobart and William Smith Colleges. His work focuses on science teacher professional development, curriculum development, and use of geospatial and Web 2.0 technology in educational settings. MaKinster directed the GIT Ahead project (NSF ATE) and currently directs the Crossing Boundaries project (NSF ITEST). In addition to technology-focused curriculum development, Crossing Boundaries has focused on creating a variety of opportunities for students to see scientific and environmental careers in action.



Kara Butterworth has 7 years of experience as a middle school and high school science teacher, covering courses including biology, chemistry and environmental science. She received a MS in Ecology, Evolutionary and Organismal Biology at Iowa State University where she was trained as a botanist and continued her education to earn a teaching certification through Rio Salado College in Tempe, AZ. Currently, as a teacher at Clear Creek High School in Evergreen, CO, she incorporates PlantingScience, a learning and research resource, bringing together students, plant scientists, and teachers from across the nation, into her classroom. This allows her to incorporate plant based inquiry activities into the classroom and to test and develop the future of PlantingScience. She has field tested new modules, participated in focus groups as a panel member, and presented PlantingScience student projects at the annual Botanical Society meetings in 2011 and 2012.



Gillian Roehrig is an associate professor of science education in the STEM Education Center at the University of Minnesota. She received her Ph.D. from the University of Arizona in 2002 and was an assistant professor in the Department of Chemistry at San Diego State University prior to moving to Minnesota in 2004. Her research focuses on professional development, STEM integration, and culturally relevant STEM education for American Indian students.

Closing Keynote Address:

Science of Life in a Changing World

Saturday 4:30 PM, Room 135



Carlos A. Botero, a Distinguished Postdoctoral Fellow in the North Carolina State University Initiative for Biological Complexity, was born in Bogotá, Colombia and has a distinguished career as an evolutionary ecologist. He earned a BS in Biology and graduated Magna cum Laude and Valedictorian at the Universidad de los Andes and a PhD Neurobiology and Behavior from Cornell University. He is interested in the basic principles that drive the evolution of flexibility in adaptive traits. In particular, he researches the effect of ecological drivers on the dynamics and outcome of evolution. He explores these topics using a combination of theoretical modeling, phylogenetic comparative methods, and work in the field, focusing primarily on the evolution of complex traits. His work usually involves birds, but previous and ongoing collaborations include projects on insects, mammals, and even humans.

Friday Short Presentations

Listed in alphabetical order by 1st author's last name

This session format is designed for presentations that enhance understanding of key concepts, or project activities that feature effective ideas and approaches. Presentations are 20 minutes followed by 20 minutes of Q&A.

Using Technology to Connect Students and Scientific Data

10:45 AM – 11:25 AM, Room 155

Keri Barfield, Botanical Research Institute of Texas; April Sawey, Botanical Research Institute of Texas; Jason Best, Botanical Research Institute of Texas

Abstract: There are limited, often outdated and inconsistent resources available to teachers and students regarding botanical specimens. Participants will gain knowledge about how the use of technology in the classroom can connect students to scientific data and research.

Pollinator Collecting for the Lab and Classroom

3:00 PM – 3:40 PM, Room 62

Gregory Diersen, Martin Luther College

Abstract: This method of collecting pollinators with pan traps allows anyone to collect specimens without a great time investment, net or killing jar. Find out about pan trapping experiences from grade school children through ecological research.

Community College Undergraduate Research Initiative (CCURI) at Anoka-Ramsey Community College

3:00 PM – 3:40 PM, Room 83

Kristen S. Genet, Anoka-Ramsey Community College; Joan McKeernan, Anoka-Ramsey Community College

Abstract: Anoka-Ramsey Community College (ARCC) is a partner in the NSF-funded CCURI. We have been working to establish research experiences integrated into existing courses, develop a new research-based course, and provide summer opportunities for research in collaboration with the University of Minnesota.

Engineering and Nature

10:00 AM – 10:40 AM, Room 62

Britt Forsberg, Bell Museum of Natural History

Abstract: Participants will take part in engineering challenges to bring back to their classrooms. We will solve engineering problems found in nature, observe how plants and animals respond to these pressures, and see how humans use nature's ingenuity in our own designs.

NEON Education: Building Capacity for Engaging Students and Society with Ecological Data

2:00 PM – 2:40 PM, Room 83

Wendy Gram, NEON

Abstract: The National Ecological Observatory Network (NEON) wants students to confidently discover, analyze and use data both in their science endeavors and everyday lives. NEON will provide opportunities for students and educators to collect, visualize, analyze and interpret environmental data.

Data Nuggets: Unearthing Inquiry Skills

10:45 AM – 11:25 AM, Room 62

Melissa Kjolvik, Kellogg Biological Station, Michigan State University; Elizabeth Schultheis, Kellogg Biological Station, Michigan State University.

Abstract: Data Nuggets are worksheets that provide students with practice interpreting quantitative information and making claims based on evidence. Students are introduced to a scientific topic, challenged to answer a scientific question based on provided data and support a scientific claim using graphs.

The Open Science Approach: A Transferable Field School Model for Problem-Based Learning

3:45 PM – 4:20 PM, Room 83

Pat Harrison, Botanical Research Institute of Texas; April Sawey, Botanical Research Institute of Texas; Keri Barfield, Botanical Research Institute of Texas; Dave Reedy, Botanical Research Institute of Texas; Kent W. Bridges, Retired-University of Hawaii–Manoa

Abstract: The Conservation Ethnobiology Field School is partnering with the Open Science Network in Ethnobiology to create an experience in which students will work collaboratively with research scientists using a Problem Based Learning model.

Is That a Career? Inspiring the Next Generation with Multimedia Conservation Biology Role Models

1:15 PM – 1:55 PM, Room 155

Jim MaKinster, Hobart and William Smith Colleges; Nancy Trautmann, Cornell Lab of Ornithology

Abstract: Web-based videos, Google Earth explorations, and blogs provide middle and high school students with role models in conservation biology. Field tests showed teacher enthusiasm for weaving these into their teaching and consequent increased student interest in science and potential careers.

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

10:00 AM – 10:40 AM, Room 155

Kristin McCully, University of California, Santa Cruz Department of Ecology and Evolutionary Biology; Doris Ash, University of California, Santa Cruz Department of Education

Abstract: 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.

LifeDiscoveryEd Digital Library

2:00 PM – 2:40 PM, Room 62

Teresa Mourad, Ecological Society of America; Andrea McMillen, Ecological Society of America

Abstract: LifeDiscoveryEd Digital Library is an online collection of digital resources to advance outstanding biology education.

Learn about this collaborative effort of four scientific professional societies to jointly promote high quality, peer-reviewed educational resources and to support a community of practice for 21st century biology education.

Next Generation Science Standards and Biology Instruction

3:00 PM – 3:40 PM, Room 155

John Olson, Science Content Specialist, Minnesota Department of Education; Susan Singer, Biology Professor, Carleton College

Abstract: New national science standards are expected to be completed soon and these Next Generation Science Standards could be adopted by many states. Explore the Framework document, which defines the science core ideas and practices for our next generation of students.

Technology and the Textbook: Adding Interactivity to Improve Understanding

10:00 AM – 10:40 AM, Room 83

Alison Perkins, School of Journalism/Montana PBS; Emiko Paul, Roberts & Co. Publishers; Doug Emlen, University of Montana; Carl Zimmer, Science Writer

Abstract: The Evolution: Making Sense of Life e-book application builds on the engaging, narrative style of the textbook by adding interactivity to make formative and summative assessment available to the learner, giving the learner more control of their own learning experience.

Using Inexpensive Webcams for Time-Lapse Imaging & Video Analysis in the Biology Classroom

2:00 PM – 2:40 PM, Room 155

Stephen G. Saupe, College of Saint Benedict/Saint John's University; Megan Levis, College of Saint Benedict/Saint John's University; Chi Le, College of Saint Benedict/Saint John's University

Abstract: This presentation will demonstrate how to create and analyze time-lapse movies using inexpensive cameras and software.

Learning Styles and Bloom's Taxonomy in the Teaching of Critical Thinking in Human Biology

3:45 PM – 4:25 PM, Room 42

Valerie J. Wheat, Ph.D., Jefferson Community and Technical College

Abstract: Teaching students to think critically and how to learn and master complex topics is a goal of general education science. This presentation will give you tools to help students learn about themselves and begin developing critical thinking skills in the science classroom.

Understanding the Redesigned AP Biology Course and its Impact on High School Biology and

Undergraduate Science Courses

10:45 AM – 11:25 AM, Room 83

Brad Williamson, The University of Kansas

Abstract: An overview of the changes to the redesigned AP Biology course, labs and exam will be provided. The reasoning for the redesign as well as its impact on high school biology and undergraduate science courses will be discussed.

Campus Trees Project: Using Phenology to Engage Students in the Process of Science

1:15 PM – 1:55 PM, Room 83

Sara Wyse, Bethel University; Tammy Long, Michigan State University

Abstract: The Campus Trees Project is a laboratory experience designed for students to practice the process of science. Students work collaboratively to engage with the phenology occurring around them on their campus by designing, testing, and evaluating original methods they develop.

Share Fair Roundtables

1:15 PM – 2:00 PM, Room 62

3:45 PM – 4:30 PM, Room 62

See pages 13–14 for more details.

We want your feedback!

Please complete the conference evaluation coming to your email inbox, or complete the online evaluation.

<http://www.esa.org/lcd/evaluations/>

Thank you,
The LDC Planning Committee!

Friday At-a-Glance

- 7:30 AM **Registration Open - Lobby**
- 8:30 AM **Welcome Announcements & Opening Keynote Address - Room 135**
Building Partnerships with Scientists & Educators
 Jay Labov, Senior Advisor for Education and Communication for NAS and NRC
- 9:45 AM Break - Beverages & Snacks are available on the Upper Level

Beverage Service is available
7:30 AM – 3:30PM
on the Upper Level.

	Short Presentations Room 83	Short Presentations Room 62	Short Presentations Room 155	Workshop * Room 32
10:00 AM	Technology and the Textbook: Adding Interactivity to Improve Understanding Perkins; Paul; Emlen; Zimmer	Engineering and Nature Forsberg	Protecting Populations: Emphasizing the Importance of Mathematical Modeling in Undergraduate Ecology McCully; Ash	Place-Based Environmental Education: Creating a Professional Learning Community A. Sawey; Friday; M. Sawey
10:45 AM	Understanding the Redesigned AP Biology Course and its Impact on High School Biology and Undergraduate Science Courses Williamson	Data Nuggets: Unearthing Inquiry Skills Kjelvik; Schultheis	Using Technology to Connect Students and Scientific Data Barfield; A. Sawey; Best	
11:30 AM	Lunch - Courtyard on the Upper level			
12:30 PM	Exhibits open in the Lobby near registration			

	Short Presentations Room 83	Share Fair & Presentations Room 62	Short Presentations Room 155	Workshop * Room 32
1:15 PM	Campus Trees Project: Using Phenology to Engage Students in the Process of Science Wyse; Long	Share Fair Roundtables See pages 13 - 14 for more details.	Is That a Career? Inspiring the Next Generation with Multimedia Conservation Biology Role Models MaKinster; Trautmann	Statistics in the High School Biology Classroom: Going Beyond the Mean Strode
2:00 PM	NEON Education: Building capacity for engaging students and society with ecological data Gram	LifeDiscoveryEd Digital Library Mourad; McMillen	Using Inexpensive Webcams for Time-Lapse Imaging & Video Analysis in the Biology Classroom Saupe; Levis; Le	
2:45 PM	Break - Beverages & Snacks are available on the Upper Level			
3:00 PM	Fieldtrip to the Raptor Center * (3:00 PM – 4:00 PM)			Fieldtrip cancelled

	Short Presentations Room 83	Share Fair & Presentations Room 62	Short Presentations Room 155	Workshop * Room 32
3:00 PM	Community College Undergraduate Research Initiative (CCURI) at Anoka-Ramsey Community College Genet; McKearnan	Pollinator Collecting for the Lab and Classroom Diersen	Next Generation Science Standards and Biology Instruction Olson; Singer	Using Online Natural History Databases to Support Innovation in Undergraduate Education Dewey; Barbaro
3:45 PM	The Open Science Approach: A Transferable Field School Model for Problem-Based Learning Harrison; A. Sawey; Barfield; Reedy; Bridges	Share Fair Roundtables See pages 13 - 14 for more details.	Learning Styles and Bloom's Taxonomy in the Teaching of Critical Thinking in Human Biology Wheat	
4:30 PM	Keynote Panel: Digital Resources and Learning for the Future - Room 135 Sam Donovan, University of Pittsburgh, PA Nancy Geving, St. Paul Public Schools, MN Susan Gill, Stroud Water Research Center, PA			
5:45 PM	Dinner and a Movie: "The Making of the Fittest: Evolving Switches, Evolving Bodies" Following dinner, join HHMI Scientist-Educator Laura Bonetta, PhD, for a special screening of this short film (see pg 16).			

Saturday At-a-Glance

7:30 AM **Registration Open - Lobby Upper Level**
Coffee Conversation: Making Data Discoverable and Accessible for Inquiry (see pg 12) - **Room 155**

8:30 AM **Welcome Announcements & Keynote Panel - Room 135**
Building Pathways and Partnerships between K12 and College
Jim MaKinster, Hobart and William Smith Colleges, NY
Kara Butterworth, Clear Creek High School, CO
Gillian Roehrig, University of Minnesota, MN

Beverage Service is available
7:30 AM – 3:30PM
on the Upper Level.

9:45 AM Break - Beverages & Snacks are available on the Upper Level

	Short Presentations Room 83	Share Fair & Presentations Room 62	Short Presentations Room 155	Workshop *
10:00 AM	Biological Dilemmas: Improving Argumentation Skills with Writing-to-Learn Activities on Socio-Scientific Issues Wallace; Balgopal	The Making of an Online Campus Flora: College Students Joining the Flora of Rutgers Campus Struwe; Spitz; Zambell; Sweeney	Ecological Forecasting (EcoCasting) – Using Computer Models to Teach Ecology Concepts Pazol; Del Muro	Engaging Students as Scientists Sikes-Thurston; Brademan
10:45 AM	Using Digital Image Analysis to Integrate Mathematics and Computers into Inquiry Laboratories Baker; Selby	Share Fair Roundtables See pages 13 - 14 for more details.	Using Wikispaces for Collaborative Content Creation in a Non-Major's Biology Lab M. Sawey; A. Sawey	
11:30 AM	Lunch - Courtyard on the Upper level			
12:30 PM	Exhibits open in the Lobby near registration			

1:15 PM **Fieldtrip to the Raptor Center** * (1:15 PM – 2:15 PM)

	Short Presentations Room 83	Share Fair & Presentations Room 62	Short Presentations Room 155	Workshop *
1:15 PM	Case It: Molecular Biology Computer Simulations for Case-Based Learning Bergland; Klyczek	Where Goes the Climate, so Goes the Ecosystem Corney	What's in Your Investigation Toolkit? Digital Resources for Personalized, Anytime Science Learning Hemingway; Adams	What Lives Where, and Why? Understanding Biodiversity Through Geospatial Exploration Trautmann; MaKinster
2:00 PM	The Impact of Technology-Integrated-Curriculum on Student Knowledge and Attitudes about Global Climate Change Roehrig; Karahan; Bhattacharya	Share Fair Roundtables See pages 13 - 14 for more details.	Function of the Plant Cell Wall: Use of <i>Arabidopsis thaliana</i> as a Teaching Tool in the Plant Anatomy Laboratory Lamb	

2:45 PM Break - Beverages & Snacks are available on the Upper Level

	Short Presentations Room 83	Short Presentations Room 62	Short Presentations Room 155	Workshop *
3:00 PM	Connecting High School Students to Authentic Research Projects and Practicing Scientists Flowers; Balcerzak	LifeDiscoveryEd Digital Library: Science Pipes Klemow	Lessons from the "Bioenergy Farm": A Computer Game to Explore Land Management Complexities Nye; Greenler; Arnold	Cloud Forest Immersion: Engaging Students in Exploration through Web-Based Learning Environments Goldsmith; Willcox; Fulton
3:45 PM	Discovering Solutions from the Tree of Life: Using Biomimicry to Teach Evolution and Explore Databases Snell-Rood	Bioblitz! Connecting Urban Schools to Science and Technology through Research-Based Learning Norton Taylor	Beyond Concept Maps: System Models as a Tool for Simplifying Complexity in Undergraduate Biology Long; Dauer	
4:30 PM	Keynote Speaker: Science of Life in a Changing World - Room 135 Carlos A. Botero , North Carolina State University, NC			

* Pre-registration necessary for workshop sessions and fieldtrips. Please check at the registration desk for additional information regarding participation in these sessions.

Saturday Short Presentations

Listed in alphabetical order by 1st author's last name

This session format is designed for presentations that enhance understanding of key concepts, or project activities that feature effective ideas and approaches. Presentations are 20 minutes followed by 20 minutes of Q&A.

Using Digital Image Analysis to Integrate Mathematics and Computers into Inquiry Laboratories

10:45 AM – 11:25 AM, Room 83

Stokes S. Baker, University of Detroit Mercy; Karen Selby, University of Detroit Mercy

Abstract: How can digital image analysis be used in developing instructional materials? Can inquiry-based digital image analysis laboratory activities develop mathematical thinking? At the University of Detroit Mercy we use ImageJ software to engage undergraduates in learning organismal and environmental biology.

Case It: Molecular Biology Computer Simulations for Case-Based Learning

1:15 PM – 1:55 PM, Room 83

Mark Bergland, Biology Department, University of Wisconsin-River Falls; Karen Klyczek, Biology Department, University of Wisconsin-River Falls

Abstract: This session will demonstrate how to use the Case It computer simulation to analyze case studies based on honey bee virus detection and evolution, as well as strategies such as role playing for engaging students in learning molecular biology.

Where Goes the Climate, so Goes the Ecosystem

1:15 PM – 1:55 PM, Room 82

Jeffrey Corney, University of Minnesota

Abstract: By understanding the fundamental links between ecology and climatology, one can more readily teach the controversial topic of climate change by exploring its potential effects on the ecosystems in which we all live. This presentation will demonstrate how to effectively ground the issue of climate change into the more tangible realm of climate's direct effects on the flora and fauna living around us in the here and now.

Connecting High School Students to Authentic Research Projects and Practicing Scientists

3:00 PM – 3:40 PM, Room 83

Susan Flowers, Washington University Institute for School Partnership; Phyllis Balcerzak, PhD, Washington University Institute for School Partnership

Abstract: We will report on the overlapping successful outcomes of two separate NSF projects impacting high school level life sciences learning through connections to current research. A two-pronged approach targets both high school students and high school biology teachers.

What's in Your Investigation Toolkit? Digital Resources for Personalized, Anytime Science Learning

1:15 PM – 1:55 PM, Room 155

Claire Hemingway, Botanical Society of America; Catrina Adams, Botanical Society of America

Abstract: Looking for resources to support student-centered investigations or tailor your lessons about plant ecology and biology? Join us to explore new resources and interactive tools on PlantingScience that can personalize a collaborative learning experience for you and your students.

LifeDiscoveryEd Digital Library: Science Pipes

Saturday, 3:00 PM – 3:40 PM, Room 62

Kenneth Klemow, Wilkes University; Teresa Mourad, Ecological Society of America

Abstract: Are you interested in having your students learn ecological concepts through data exploration? Does the steep learning curve associated with data analysis packages hamper student progress? Come and learn how SciencePipes can help students visualize data to learn ecological concepts.

Function of the Plant Cell Wall: Use of *Arabidopsis thaliana* as a Teaching Tool in the Plant Anatomy Laboratory

2:00 PM – 2:40 PM, Room 155

Rebecca Lamb, Ohio State University

Abstract: Understanding of plant development is dependent on knowledge of the underlying anatomy. Inquiry based exercises are not often used in plant anatomy laboratories. A laboratory module in which students explore the unique plant cell wall will be presented.

Beyond Concept Maps: System Models as a Tool for Simplifying Complexity in Undergraduate Biology

3:45 PM – 4:20 PM, Room 155

Tammy Long, Michigan State University; Joe Dauer, Michigan State University

Abstract: For students at all levels, active and iterative system modeling can promote learning about biology. In this presentation, participants will integrate model construction into existing course objectives and develop activities and assessments that facilitate and reveal students' learning.

Lessons from the "Bioenergy Farm": A Computer Game to Explore Land Management Complexities

3:00 PM – 3:40 PM, Room 155

D. Leith Nye, Great Lakes Bioenergy Research Center (GLBRC); John Greenler, GLBRC; Kate Arnold, Middleton High School

Abstract: How can computer games engage students in investigating and solving real-world environmental challenges? We present "Bioenergy Farm," an online, multiplayer game in which students compete to grow bioenergy crops to meet energy demands and enhance landscape ecosystem services.

Ecological Forecasting (EcoCasting): Using Computer Models to Teach Ecology Concepts

10:00 AM – 10:40 AM, Room 155

Jon Pazol, West Leyden High School; Lisa Del Muro, Wheeling High School

Abstract: Using NetLogo, a computer modeling, internet-based program, students can explore the effects of changing variables in food webs, toxin accumulation, and invasive species. Teachers will learn how to easily integrate the models and curriculum into a variety of lessons.

The Impact of Technology Integrated Curriculum on Student Knowledge and Attitudes about Global Climate Change

2:00 PM – 2:40 PM, Room 83

Gillian Roehrig, STEM education Center,UM; Engin Karahan, STEM center, University of Minnesota; Devarati Bhattacharya, STEM Center, University of Minnesota;

Abstract: We will present curriculum and results from the implementation of a climate change unit in a high school classroom. We will share student-constructed media artifacts to represent their awareness and activism in solving critical environmental problems like global climate change.

Using Wikispaces for Collaborative Content Creation in a Non-Major's Biology Lab

10:45 AM – 11:25 AM, Room 155

Michael Sawey, Texas Christian University; April Sawey, Botanical Research Institute of Texas

Abstract: Easy access to enormous quantities of information can stifle, rather than expand, a student's learning. Encouraging students to work collaboratively using resources like Wikispaces allows them to become more invested in their own learning process and creators of a larger product.

Discovering Solutions from the Tree of Life: Using Biomimicry to Teach Evolution and Explore Databases

3:45 PM – 4:20 PM, Room 83

Emilie Snell-Rood, University of Minnesota

Abstract: Courses on Evolutionary Biomimetics can be used to convey the practical importance of evolutionary biology, and allow students to explore existing biodiversity databases.

The Making of an Online Campus Flora: College Students Joining the Flora of Rutgers Campus

10:00 AM – 10:40 AM, Room 62

Lena Struwe, Rutgers University; Lauren Spitz, Rutgers University; Chris Zambell, Rutgers University; Patrick Sweeney, Yale University, Peabody Museum of Natural History

Abstract: We developed a field and online-based flora from student plant biodiversity inventories. Over 10% of the state's species were found on campus. Students gained excellent skills in many methodologies and topics, while collecting research data useful for many research disciplines.

Share Fair Roundtables

2:00 PM – 2:40 PM, Room 27

3:45 PM – 4:30 PM, Room 62

See pages 13–14 for more details.

Bioblitz! Connecting Urban Schools to Science and Technology through Research-Based Learning.

3:45 PM – 4:20 PM, Room 62

Kimberly Norton Taylor, Botanical Research Institute of Texas

Abstract: The Botanical Research Institute of Texas (BRIT) utilizes a community Bioblitz to connect urban students and teachers to authentic research, real data collection, and practicing research scientists in mutually beneficial research-based learning focused on students' local plant communities.

Biological Dilemmas: Improving Argumentation Skills with Writing-to-Learn Activities on Socio-Scientific Issues

10:00 AM – 10:40, Room 83

Alison Wallace, Minnesota State University Moorhead; Meena Balgopal, Colorado State University

Abstract: Learn how writing-to-learn activities on contemporary biological issues encourage the use of scientific and personal evidence and argumentation by secondary school and college students. Evaluate argumentation levels in sample essays and explore ways to use this model in your courses.

Saturday Morning Conversation

Making Data Discoverable and Accessible for Inquiry



7:45 AM – 8:15 AM, Room 155

Join Dr. Tanya Dewey for coffee and conversation about an upcoming Research Coordination Network Incubator meeting organized by the Animal Diversity Web (animaldiversity.org) and recently funded by NSF.

This meeting will focus on strategies for enhancing data discovery and ways to make those data more usable in inquiry-based biology teaching. The meeting will tackle the following questions:

- 1) What are the challenges associated with data sharing across biological databases?
- 2) What are potential and practical solutions to enable data sharing?
- 3) How can datasets be enhanced to facilitate their discovery and usability in educational contexts?
- 4) How can education organizations best share practices and experiences to enable authentic inquiry and enhance their effectiveness.

Feedback and recommendations from the community are welcome! Information and updates are available on the project website: Data in Inquiry (<https://sites.google.com/a/umich.edu/datainquiry/>).

Share Fair Roundtables

All Share Fair Roundtables take place in Room 62

This session is designed for educators to create or revise lesson plans or activities with a peer working group. Each lesson or idea will be presented by the author at a roundtable with up to 9 other participants. There will be time for each author to describe their lesson idea. Discussions will follow, along with feedback and ideas regarding the core concepts addressed, methodology, misconceptions, assessment or educational extensions. Participants will circulate among presenters at 15–20 minute intervals.

Friday, 1:15 PM – 2:00PM

Inspiring Connections to the Environment: Kelp Forest-Based Ecology and the Human Dive Response

Kristin McCully, University of California, Santa Cruz
Abstract: SCWIBLES develops high school inquiry-based environmental science modules. “Otters and Urchins” introduces ecology of the kelp forest ecosystem and science process skills. In “Hold Your Breath,” students measure human stress responses to cold water to learn about the circulatory system.

Stream Monitoring Using Macroinvertebrates to Examine the Water Quality for the Health of Stream Biota

DC Randle, St. Francis High School, Minnesota
Abstract: Stream biological monitoring program, often called biomonitoring, is both a stream health assessment and educational program. This biomonitoring program uses macroinvertebrates to determine stream health. High school science classes are the primary volunteers. The experience affords students an opportunity to learn scientific methodologies and become involved in local natural resource management.

Using Research to Prepare High School Students for College Science Classrooms

Jeff Marlow, LaVergne High School, Tennessee
Abstract: Students engaged in real research experiences should be better prepared for the challenges they will face in a university-level lab science. My lesson requires students to develop data collection skills as they study water quality.

The Virtual Evolution Stickleback Lab

Laura Bonetta, HHMI’s Educational Resources Group; Jennifer Bricken, HHMI’s Educational Resources Group;
Abstract: Join us for a tour of The Virtual Stickleback Evolution Lab. This interactive online lab is designed to teach students about evolutionary patterns by analyzing the body structures of stickleback collected from lakes and of fossils recovered from a quarry.

Friday, 3:45PM – 4:30PM

Polyculture: Using Ecological Principles to Increase the Sustainability of Agriculture.

Simon Pearish, University of Illinois, Urbana–Champaign
Abstract: Students will engage in research and outreach as they test the hypothesis that the detrimental effects of conventional farming can be reduced using ecological principles.

Connecting Students to Biodiversity in Everyday Life

Jennifer Imamura, University of California, Berkeley
Abstract: This three-lesson sequence aims to demonstrate to students that they are connected to and depend upon far more species than they realize. Students count the species in their lunches, explore connectivity through social networks, and build networks of species interactions.

Using Permanent Forest Plots to Estimate Tree Biomass and Carbon Accumulation in Forests

Kathleen Shea, St. Olaf College
Abstract: The goal of this project is to establish permanent research plots to address questions related to tree biomass, carbon accumulation, invasive species and/or disturbance at a local site and/or across a range of sites.

Earn CEUs or Academic Credit

We are pleased to offer all conference participants the opportunity to earn 1.0 Continuing Education Unit or 1.0 graduate-level course credit from the University of Minnesota.

To be eligible to earn CEUs or Academic Credit, all paperwork must be completed and payment received *before* leaving the conference.

CEU : \$10.00 | Academic Credit : \$322

**Additional Information is available at
the Conference Registration Desk**

Share Fair Roundtables, continued

Saturday, 10:45AM – 11:30AM

The Plasmodium Problem Space: An Online Resource for Biological Inquiry

Sam Donovan, University of Pittsburgh

Abstract: Problem Spaces are a way of organizing research data and tools around biological scenarios. The Plasmodium Problem Space is built around molecular sequence data and provides a rich context for looking at ecological, systematic, evolutionary, and molecular research questions.

Identification of Microorganisms Enriched from Winogradsky Columns

Brian M. Forster, St. Joseph's University

Abstract: Students prepare various types of Winogradsky columns using local environmental samples. Students then learn to identify microorganisms that have been enriched in the column using extracted chlorophyll absorption spectrums. The presence of these microorganisms is then confirmed using 16s rRNA analysis.

Arctic Grayling on the North Slope of Alaska: Using Research to Teach Genetics and Biotechnology in the Classroom.

Eve Kendrick, Northside High School, Tuscaloosa Co., Alabama

Abstract: We developed a hands-on lesson that covers DNA extraction, PCR processing, and gel electrophoresis in the context of current research on populations of arctic grayling. This lesson will help students master basic genetics and biotechnology concepts.

Saturday, 2:00PM – 2:45PM

Observing Plants with Project BudBurst Single Reports

Sarah Newman, NEON, Inc.

Abstract: The goal of this activity is to get students outside making observations of plants, to learn about the plant life cycle first hand, and compare the data they collect with data from others around the country through Project BudBurst.

Climate Change and Impacts on Ecosystems: Using an Online Learning Environment for Making Predictions about Future Climate

Tanya Dewey, University of Michigan Museum of Zoology

Abstract: The Center for Essential Science seeks to receive feedback to refine an 8 to 12 week middle and high school curriculum that focuses on the impacts of climate change on ecosystems. This curriculum provides authentic distribution modeling tools to students through a media-rich online learning environment.

Model My Watershed

Susan Gill, Stroud Water Research Center

Abstract: Model My Watershed is a web-based application that uses real data and a professional-grade model that allows students to model hydrology in their neighborhoods. This application is available for SE Pennsylvania and Northern Delaware, with plans to expand nationwide.

Fieldtrips

The Raptor Center

~~Friday, 3:00 PM – 4:00 PM~~ Canceled

Saturday, 1:15 PM – 2:15 PM



Participants should meet 5–10 minutes before the fieldtrip begins across from the registration area (see the map on page 15). Participants will need to walk a short distance from the conference center to the Raptor Center to participate in the field trip. Field trips will be limited to a capacity of 25 participants per trip.

Cost: \$10 per conference attendee.

Sign-up for field trips at the registration table.

This exciting program, based on Minnesota and national science standards, is a learning experience your group will not soon forget. This program is ideal for groups or interactive family events. We explore the different raptors found in Minnesota and their role in the environment. Participants learn the three key features of all raptors and learn why they are different from other birds. We discuss the positive and negative impact humans have on our environment, and participants are inspired by some of our greatest environmental success stories, such as the peregrine falcon and the bald eagle.

Workshops *

All workshops take place in Room 32

* Participation in workshops is limited to a specific capacity. Signups were available during registration. If you are interested in participating in a workshop and have not pre-registered, please check availability at the registration area.

FRIDAY

Place-based environmental education: Creating a professional learning community

10:00 AM – 11:30 AM

April Sawey, Botanical Research Institute of Texas; Tracy Friday, Botanical Research Institute of Texas; Michael Sawey, Texas Christian University

Abstract: Workshop participants will learn about strategies, models and resources to provide engaging opportunities for their students to study the world as scientists on topics with real world application and relevance to ecology and earth systems dynamics.

Statistics in the High School Biology Classroom: Going Beyond the Mean

1:15 PM – 2:45 PM

Paul Strode, Fairview High School, Boulder Valley School District

Abstract: The presenter will clarify the difference between the experimental hypothesis and the null statistical hypothesis and participants will generate and analyze data with various statistical tests to help students deal with messy biological data and support their conclusions.

Using Online Natural History Databases to Support Innovation in Undergraduate Education

3:00 PM – 4:30PM

Tanya Dewey, University of Michigan Museum of Zoology; Tracy Barbaro, Encyclopedia of Life.

Abstract: This workshop will introduce two natural history databases, the Animal Diversity Web and the Encyclopedia of Life. Participants will learn how these online natural history databases and their associated tools have been used to enhance undergraduate education.

SATURDAY

Engaging Students as Scientists

10:00 PM – 11:30 AM,

Erin Sikes-Thurston, FCPS Herndon High School; LouEllen Brademan Ph.D, FCPS Instructional Services.

Abstract: Workshop participants will learn about strategies, models and resources to provide engaging opportunities for their students to study the world as scientists on topics with real world application and relevance to ecology and earth systems dynamics.

What Lives Where, and Why? Understanding Biodiversity Through Geospatial Exploration

1:15 PM – 2:45 PM

Nancy Trautmann, Cornell Lab of Ornithology; James MaKinster, Hobart and William Smith Colleges

Abstract: Three technology-based lessons introduce students to biodiversity through geospatial analysis. Using interactive map-based PDFs, students interpret spatial data, create bar graphs, and compare across ecoregions. With Google Earth and satellite imagery, they assess landscape change and predict ecological impacts.

Cloud Forest Immersion: Engaging Students in Exploration through Web-Based Learning Environments

3:00 PM – 4:30PM

Greg Goldsmith, University of California, Berkeley; Maia Willcox, University of California, Berkeley; Drew Fulton, Drew Fulton Photography.

Abstract: Use an interactive web-based learning environment to take a virtual visit to a tropical montane cloud forest, one of the world's rarest and most endangered ecosystems, where you will learn about strategies for engaging students in active and participatory learning.

PROMOTING ENVIRONMENTAL LITERACY



To find out about our scholarships, funding opportunities, and learning resources, please visit the NOAA Education Resource Portal:

www.education.noaa.gov

Sponsored advertisement

Friday Night—Dinner and A Movie

Friday, 5:45 PM, Courtyard

After dinner, join HHMI Scientist-Educator Laura Bonetta, PhD, for a special screening of the short film “*The Making of the Fittest: Evolving Switches, Evolving Bodies*,” from a series crafted to engage students with memorable examples of the evolutionary process in action. Watch the film and learn about complementary classroom materials. Dr. Bonetta will take your questions.

Movie Summary: “*The Making of the Fittest: Evolving Switches, Evolving Bodies*,”

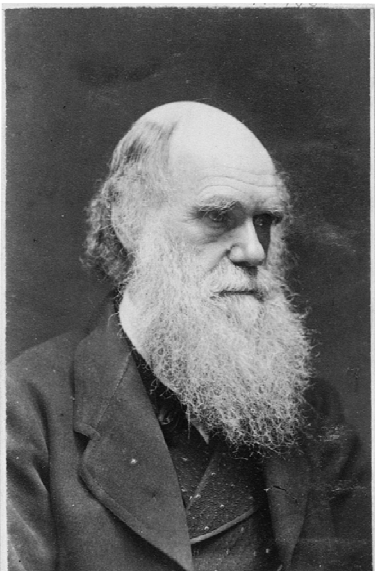
After the end of the last ice age, 10,000 years ago, populations of marine stickleback fish became stranded in freshwater lakes dotted throughout the northern hemisphere in places of natural beauty like Alaska and British Columbia. These remarkable little fish have adapted and thrive, living permanently in a freshwater environment drastically different than the ocean. This film tells the story of the dramatic transformation of stickleback living in lakes, with fish in some populations completely losing long projecting body spines that defend them from large predators. Various scientists, including David Kingsley and Michael Bell, have studied populations of freshwater threespine sticklebacks and identified key genes and genetic switches involved in the evolution of body transformation. They have even documented the evolutionary change over thousands of years by studying a remarkable fossil record from the site of an ancient lake.



Laura Bonetta, obtained her PhD from the University of Toronto in 1992. After a postdoctoral fellowship at the Imperial Cancer Research Fund in London, UK, she left bench research in molecular biology to become an editor for the scientific journal *Nature*. That experience led to editorial positions at *Molecular Medicine*, *Nature Medicine* and the Howard Hughes Medical Institute (HHMI). She continued working as freelance writer, editor and a regular contributor to *Nature*, *Science*, *Cell* and several National Institutes of Health (NIH) publications. In February 2012, she joined the Educational Resources Group at HHMI where she develops multimedia science education resources for the classroom.

The *Society for the Study of Evolution*

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



Ch. Darwin
Mar. 7th 1874.

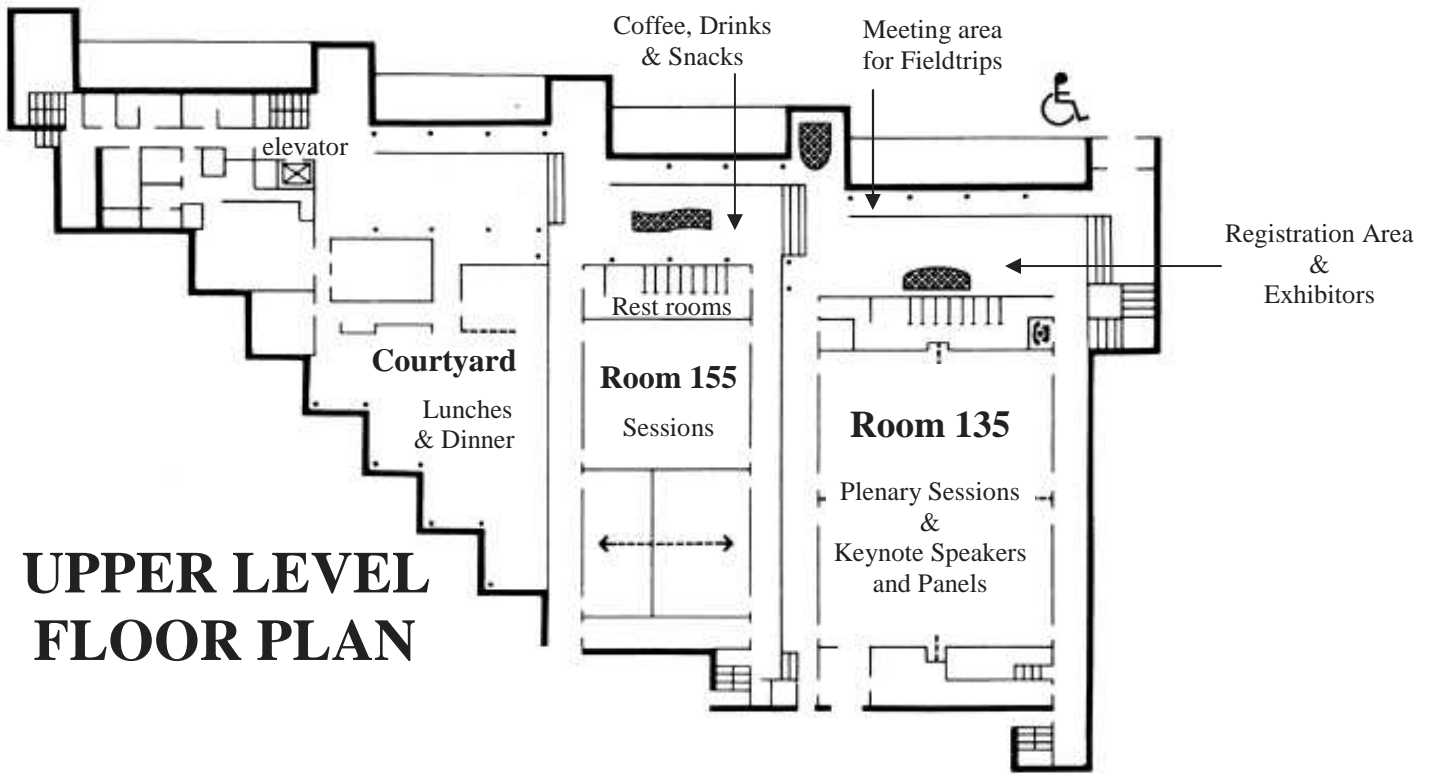
Upcoming SSE outreach targeting education includes:

- EVO101, a satellite session for K-12 educators at the annual SSE meeting, Snowbird, Utah, 22 June 2013
- 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, Atlanta, GA, 20-23 November
- Participation in the third USA Science & Engineering Festival, Washington, DC, 26-27 April 2014

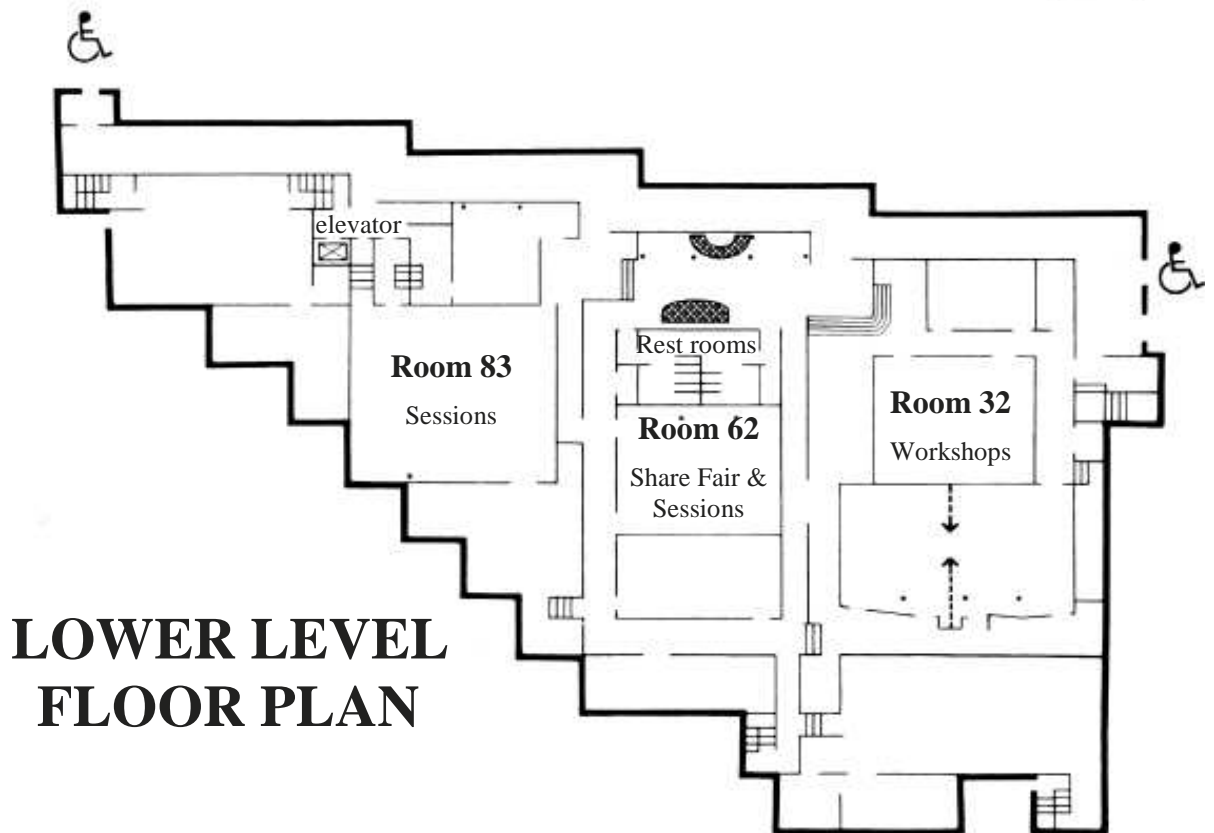
You could be one of us! SSE membership includes a rate for K-12 educators with an interest in evolution. Information about the SSE can be obtained at:

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

Continuing Education Conference Center



**UPPER LEVEL
FLOOR PLAN**



**LOWER LEVEL
FLOOR PLAN**

Exhibitors

We thank all of the companies, agencies, and organizations for their support, which has made this conference possible. All sponsors and exhibitors are listed on the back cover of this program. Those listed below have booths in the foyer near Conference Registration Desk. Please visit these exhibits throughout the conference.

SimBio: The open-ended experiments and built-in feedback of SimBio's interactive ecology, evolution and cell-biology modules engage students in critical thinking and intellectually satisfying, discovery-based learning. Sophisticated simulations of biological systems (not just click-and-watch animations) create a rich learning environment while auto-graded tests and other instructor resources streamline implementation. Come see for yourself!

Howard Hughes Medical Institute (HHMI): HHMI's biointeractive.org website has free, award-winning multimedia education materials for the biology classroom, including animations, videos, short films, lectures, virtual labs, hands-on activities, and other interactives.

LI-COR: LEEF (LI-COR Environmental Education Fund) helps bring research-grade instrumentation into the hands of undergraduates by providing matching grants and discounts to Primarily Undergraduate Institutions. Join the list of innovative schools across the US and Canada that are incorporating these instruments into their courses. Stop by our booth to learn more.

Open Science Network in Ethnobiology is a collaborative network open to educators and students interested in the exchange of innovative curricula and educational resources that advance the field of ethnobiology. Funded by the National Science Foundation (NSF), the OSN uses open technology to facilitate the exchange of educational techniques, materials, and experiences across institutional and international borders. You can learn more about OSN by viewing our website, www.opensciencenetwork.net

The Will Steger Foundation supports educators, students and the public with science-based interdisciplinary educational resources on climate change, its implications and solutions to achieve climate literacy. We offer professional development opportunities and curriculum resources focused on climate and energy literacy for Grades 3–12 educators.

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 inaugural education conference.

We offer a special thanks to the **University of Minnesota** for their support in multiple facets of this conference, from the facility, coordinating CEUs and Academic Credit to field trip options.



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

Animal Behavior Society	National Center for Ecological Analysis and Synthesis
American Institute of Biological Sciences (AIBS)	National Education Association (NEA)
BEACON Center for the Study of Evolution in Action	National Evolutionary Synthesis Center (NESCent)
Center for Excellence in Education (CEE)	National Socio-Environmental Synthesis Center
Ecological Research as Education Network (EREN)	Virginia Association of Science Teachers

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