

FRIDAY

NOVEMBER 4

ABBREVIATION KEY

E: Elementary School

MS: Middle School

HS: High School

2Y: Two-Year College

4Y: Four-Year College

GA: General Audience

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FRIDAY



7:30AM – 8:45AM**First Timers' Breakfast**

Plaza Ballroom E • Meal Function (Tickets Required) • GA

NABT Conference “first timers” are invited to learn more about NABT and the Professional Development Conference over a complimentary breakfast. Each table will have an NABT leader available to answer your questions and help you make the most of your time in Denver.

The NABT First Timers' Breakfast is made possible through the generous support of

**10:30AM – 11:45AM****NABT Committee Meeting: Global Perspectives Committee**

Director's Row F • Committee Meeting • GA

Jacqueline McLaughlin, Committee Chair

1118 | Graduate Student Networking and Mentoring Workshop

Governor's Square 9 • Instructional Strategies & Technologies • Symposium (75 minutes) • 4Y

Are you interested in networking, receiving tips from experienced mentors, or having professionals review your CV? Come to the graduate student mentoring and networking workshop!

NABT Graduate Student Committee

1136 | Online Resources for Energy Concepts in High School Biology

Governor's Square 10 • General Biology • Hands-on Workshop (75 min) • HS

This session will feature free research-based online materials for teachers to enhance their understanding of energy crosscutting concepts as they teach biology. Session will emphasize energy inputs and outputs for the production and use of biofuels.

Susan Kowalski and Betty Stennett, BSCS, Colorado Springs, CO

1048 | Implementing Vision and Change at the Departmental Level with PULSE Rubrics: A Hands-on Workshop for College and University Faculty

Governor's Square 11 • Global Education • Hands-on Workshop (75 min) • 2Y, 4Y

Participants will engage with a sample of resources developed by the Partnership for Undergraduate Life Science Education (PULSE) for implementing Vision and Change recommendations at the department/institutional level.

David Marcey, California Lutheran University, Thousand Oaks, CA; Lisa Elfving, University of Arizona, Tucson, AZ; and Steven Robinow, California State University-Chico, Chico, CA

9:15AM – 10:15AM**GENERAL SESSION SPEAKER****David McConnell**

See Page 8 for biography.

What Research Tells Us About Effective Strategies That We Will Actually Use

Plaza Ballroom ABC • Special Speaker • GA

Over the last three decades, discipline-based education research (DBER) in a variety of STEM fields has revealed a variety of empirically validated instructional practices that contribute to improvements in student learning and a reduction in attrition. Classes that support these teaching practices are often termed “active learning environments” and are characterized by small group work, ongoing monitoring of student learning, and lessons that challenge students to apply higher level thinking skills. Even the most dedicated instructor may be challenged to identify which combination of active learning strategies would be best suited to their class setting. Dr. McConnell will share what his research group observed when they visited more than two hundred college geoscience classes and the implications for instructors seeking to adopt or increase their use of active learning strategies. He will make the case that we should consider what research in educational psychology tells us about student learning processes when we make decisions about pedagogical changes. He will also demonstrate how instructors can foster an adaptable teaching approach that blends a mix of in-class and out-of-class activities that support student learning and can be readily applied regardless of situational factors such as class size, instructional support and course content.

10:30AM – 4:00PM

Special Programming Presented by Bio-Rad Laboratories

All sessions in Plaza Court 1

Damon Tighe

8:00AM – 9:15AM

Enzymes: Technology Inspired by Nature

AP Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

With rising greenhouse gases, scientists look to nature for a biofuel solution. In this hands-on workshop extract a mushroom enzyme used for biofuel processing and design experiments to quantify its properties. Aligns with AP Biology Big Ideas 2, 4.

10:30AM – 11:45AM

Algae Beads: Study Photosynthesis and Cellular Respiration

General Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Use algae beads in a single colorimetric inquiry investigation to study both photosynthesis and cellular respiration (AP Biology Big Idea 2). Also test the effects of light intensity, light color, temperature, and other organisms on these processes.

12:00PM – 12:30PM

Starting a Biotech Program one piece of equipment at a time

Biotechnology • Hands-on Workshop (30 min) • HS

Starting a biotech program doesn't need to be a huge up front investment. Many educators have started biotech programs one piece of equipment at a time. Learn the tips and tricks used to build the framework of a successful biotechnology course.

2:00PM – 3:15PM

Contagion! Track the Spread of Dangerous Disease

Biotechnology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Disease can spread like wildfire through populations. In this hands-on lab workshop you will assume the role of an epidemiologist and use an ELISA assay to track viruses like HIV, Ebola, Zika, and SARS. See if you can find patient zero.

3:30PM – 4:00PM

Get that Grant Money!

Instructional Strategies/Technologies • Hands-on Workshop (30 min) • HS, 2Y, 4Y

Successful grant writing doesn't need to be rocket science, and it can take your teaching to new heights. Get resources and learn some powerful tips for success from experienced grant writers to get you to the next level.

10:30AM – 11:45AM *continued*

1014 | SMART (Students Modeling a Research Topic) and MAPS (Modeling a Protein Story) Teams: Taking Teaching Protein Structure and Function to the Next Level

Governor's Square 12 • General Biology • Symposium (75 minutes) • HS

SMART and MAPS teams are groups of students and teachers, that explore protein structure-function relationships and their relevance to current research by developing 3D physical protein models that allow them to present their "molecular story".

Chris Chou, Longmont High School, Longmont, CO; and Diane Munzenmaier, Milwaukee School of Engineering, Milwaukee, WI

1004 | Genes, Genomes and Personalized Medicine: An NIH-SEPA Project

Governor's Square 14 • Genetics • Hands-on Workshop (75 min) • HS, 2Y, MS

This workshop introduces new instructional tools that go beyond teaching the fundamentals of DNA structure and the flow of genetic information to teaching DNA as information. Materials will include DNA models, gene maps, and a genomic story.

Tim Herman and Gina Vogt, MSOE Center for BioMolecular Modeling, Milwaukee, WI

1127 | DNA Detectives: Applications of DNA Profiling

Governor's Square 15 • Biotechnology • Hands-on Workshop (75 min) • MS, HS, 2Y

Have fun working through our new online interactive and hands-on activity that teach the science behind DNA profiling. Learn how this technique is being used to help stop the ivory trade and to solve crimes and mistaken paternity cases.

Mark Eberhard, Helen Snodgrass, and Laura Bonetta, HHMI BioInteractive, Chevy Chase, MD

997 | Discussion-Based Classrooms - Teaching Biology Without Direct Instruction

Governor's Square 16 • Instructional Strategies & Technologies • Hands-on Workshop (75 min) • HS

This session will follow the style of discussion-based teaching we use in our classrooms. The session will focus on modeling talk skills, giving feedback, and teaching students to hold each other accountable for using evidence to make arguments.

Rafael Quizon and Ivy McDaniel, Noble Street Charter Schools, Chicago, IL

1076 | Exploring and Teaching with Mathematical Models in the Biology Classroom - Meeting the Challenge

Governor's Square 17 • AP Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

An important part of *The AP Biology Curriculum Framework* is the development and use of mathematical models. This workshop will explore models and strategies to incorporate models from each of the Big Ideas in your classroom and lab.

Brad Williamson, University of Kansas, Lawrence, KS

Special Programming Presented by University of Nebraska at Kearney

10:30AM – 11:45AM
and 12:00PM – 1:15PM

Online Education for Biology and Science Teachers

Plaza Court 4 • General Biology • Symposium (75 min) • MS, HS, 2Y, 4Y

Join this session to learn about the University of Nebraska at Kearney's online Master of Science in Biology and Master of Science in Education Science/Math Education programs. UNK offers over 400+ online courses geared toward advancing teachers.

Brian Peterson

10:30AM – 1:15PM

Special Programming Presented by Fisher Science Education/G-Biosciences

All sessions in Plaza Court 3

Ellyn Daugherty

10:30AM – 11:45AM

Proteins are the Cash of Biotech - The rAmylase Project

Biotechnology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Proteins are usually colorless and always submicroscopic. How can scientists recognize and measure protein presence and activity? In this BS4NM hands-on workshop, participants conduct and study amylase with three protein assays (tests).

12:00PM – 1:15PM

Biotech is STEM - Molecular Modeling with Your Students

Biotechnology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Biotechnology is STEM and easy to implement. In this workshop, teachers will learn how to use a free web-based molecular modeling program to study DNA and protein structure. STEM biotech curriculum implementation strategies will also be presented.

1053 | Improving Science Practices Through Evaluating Scientific Journal Articles

Plaza Court 5 • AP Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Experimental design is at the forefront of the AP Science Practices. Reading and evaluating journal articles is one method to help students understand experimental design. This workshop provides a concrete, scaffolded method to teach this skill.

Christina Palfy, Adlai E. Stevenson High School, Arlington Heights, IL; and Karen O'Connor, Stevenson High School, Lincolnshire, IL

976 | Melanin: A Model NGSS Storyline

Plaza Court 6 • General Biology • Demonstration (75 min) • MS, HS

Using melanin and albinism as the driving phenomenon, this three-dimensional unit serves to integrate multiple concepts in a cohesive storyline. Concepts integrated into this storyline include genetics and evolution in a single unit.

Jason Crean, Lyons Township High School, Western Springs, IL; Kathy van Hoeck, York Community High School, Elmhurst, IL; and Michele Koehler, Riverside-Brookfield High School, Brookfield, IL

942 | It's Statistics, Not Sadistics: Simply and Effectively Utilize Statistics in Science Classes to Teach the Scientific Method

Plaza Court 7 • Science Practices • Hands-on Workshop (75 min) • HS, 2Y, 4Y

The AAAS Vision and Change suggest we teach science the way scientists do science and to use statistics to test hypothesis. This session will equip teachers to use Student's t-test and Chi Squared test in their home classrooms to test inquiry labs.

Matthew Craig, Gillette College, Gillette, WY; and Dan Porter, Amarillo College, Amarillo, TX

10:30AM – 12:30PM

NABT AP BIOLOGY SYMPOSIUM

All sessions in Plaza Ballroom F

10:30AM – 11:30AM

1089 | EK + SP = LO: Remodeling Legacy AP Biology Questions to Align with the Redesigned Exam

AP Biology • Symposium (60 min) • HS

Participants will investigate strategies for modifying legacy AP Biology questions that specifically align with objectives from the revised AP Biology curriculum and will use the Curriculum Framework to construct a full-length summative exam.

Jennifer Pfannerstill, North Shore Country Day School, Winnetka, IL; and Bob Kuhn, Centennial High School, Roswell, GA

11:30AM – 12:00PM

1006 | Measuring Learning Outcomes with Good Multiple-Choice Questions

AP Biology • Hands-on Workshop (30 min) • HS, 2Y, 4Y

Join ETS Test Developers to practice writing formative and summative questions to measure defined learning outcomes. Emphasis will be given to reverse-engineering questions to specifically align with instructional objectives and assessment goals.

Mitch Price and Chris Gentile, Educational Testing Services, Princeton, NJ

12:00PM – 12:30PM

1007 | Beyond the Mean: Using Data for Instruction and Assessment Curriculum Development • Hands-on Workshop (30 min) • HS, 2Y, 4Y

ETS Test Developers will discuss appropriate uses of data from different types of assessments and strategies that use data to drive learning and to inform teaching. Emphasis will be given to analysis of question performance on assessments.

Chris Gentile and Mitch Price, Educational Testing Services, Princeton, NJ

10:30AM – 11:45AM continued
1036 | Identifying Strengths and Problems: Using College Board Learning Objectives to Improve Assessment and Metacognition in AP Biology

Plaza Court 8 • AP Biology • Hands-on Workshop (75 min) • HS, GA

AP Biology requires both conceptual understanding and application of science practices. Come see

how spiraling assessments aligned to the Curricular Framework support student growth and self-assessment while preparing them for success on the AP exam!

Kate Ingemunson and Stephen Traphagen, Rolling Meadows High School, Rolling Meadows, IL

10:30AM – 12:30PM

1141 | 2016 Evolution Symposium: Emerging Research in Evolutionary Biology

Plaza Ballroom D • Evolution • Symposium (120 min) • HS, 2Y, 4Y

Join us for a talk featuring new research in evolutionary biology and a workshop on using authentic data from this new research in your classroom! See page 33 for complete details.

Sponsored by the BEACON Center for the Study of Evolution and the American Society of Naturalists.

12:00PM – 12:30PM

NABT Committee Meeting: Archival Committee

Director's Row F • Committee Meeting • GA

Carrie J. Bucklin and Jill Maroo, Committee Chairs

1016 | Identifying Changes in Preservice Biology Teachers' Science Teaching Efficacy After Facilitating an Authentic Biology Research Course

Governor's Square 9 • Instructional Strategies & Technologies • Paper (30 min) • 2Y, 4Y

Come learn how our approach to preparing preservice science teachers (PSTs) to teach biology strengthens science teaching efficacy. We will share the pedagogical strategies to aid other teacher preparation programs who prepare PSTs.

Julie Angle, Lance Forshee, and Donald French, Oklahoma State University, Stillwater, OK

10:30AM – 4:00PM

Special Programming Presented by HudsonAlpha

All sessions in Plaza Court 2

10:30AM – 11:45AM

The Making of and Science Behind *Touching Triton*

Instructional Strategies/Technologies • Symposium (75 min) • HS, 2Y, 4Y

The development of *Touching Triton* posed interesting challenges along the way. In this session, presenters will explain how *Touching Triton* was made from learning concepts to a serious game and dive into the scientific content covered in the game. **Adam Hott**

12:00PM – 12:30PM

Big Data, Big Science, Big Impact
Genetics • Symposium (30 min) • HS, 2Y, 4Y, GA

Today's Big Data projects (HapMap, ENCODE, etc.) were born out of our desire to know more about the human "Code of Life." Learn how these projects continue to expand our understanding of genetic variation present in the human genome. **Neil Lamb**

1:00PM – 2:00PM

What it Takes: Human in Deep Space

Anatomy & Physiology • Symposium (60 min) • MS, HS, 2Y, 4Y

Getting humans into space and maintaining their health is a truly interdisciplinary effort. Explore how engineering and human health are used to make space missions a success. HudsonAlpha and Lockheed Martin team up to discuss human spaceflight. **Adam Hott**

2:00PM – 3:15PM

My Patients Used to be Your Students

Genetics • Symposium (75 min) • MS, HS, 2Y, 4Y

Join a genetic counselor to discuss common genetics misconceptions encountered in the clinic. Learn about modern genomics and leave with strategies to bridge the gap between classroom and health care decisions. **Kelly East**

3:30PM – 4:00PM

Refocus

Instructional Strategies/Technologies • Symposium (30 min) • MS, HS, 2Y, 4Y

Avoid many of the pitfalls of traditional genetic disorder projects and learn new ways to create projects that focus on underlying genetic concepts. This session focuses on ways to get students thinking past "what does an affected person look like". **Madelene Loftin**

Want to enhance the way your students learn about the genetics of disease?

TOUCHING TRITON®

With this online interactive game, your students work together to ensure the health and safety of a deep space crew while learning the genomics of common disease. **Touching Triton** teaches the complexity of common disease risks from family history, environment and individual genomic profiles. Students begin to understand how genetics and lifestyle choices affect their health. Learn more at bit.ly/touching-triton.

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Touching Triton engages students in a longterm space flight storyline while helping them build an understanding of common complex disease risk.

triton.hudsonalpha.org

12:00PM – 12:30PM continued

1092 | Having a BLAST with Plants: Using Rubisco to Explore Evolutionary Relationships

Governor's Square 10 • Evolution • Paper (30 min) • HS, 2Y, 4Y

The evolution of Rubisco, the enzyme which fixes carbon dioxide, is illustrated by comparing the sequences of the small subunit. We shall review a new BLAST activity using online data and discuss the evolution of plants and photosynthesis.

Elizabeth Cowles, Eastern Connecticut State University, Willimantic, CT

1024 | Developing Student Thinking in the Biology Classroom Without Recreating Your Entire Year: Analysis of the Rigor of Your Lessons

Governor's Square 11 • General Biology • Hands-on Workshop (30 min) • ES, MS, HS

Learn what increasing rigor means, how to quantify rigor in lessons, and how to incorporate strategies to develop student thinking. Quality time will be allotted for collaboration among participants. Bring your lessons to adapt!

Rachel Lytle, Brentwood High School, Brentwood, TN; and Kim Sadler, Middle Tennessee State University, Murfreesboro, TN

1022 | Foolproof Gel Electrophoresis for Pennies Per Student

Governor's Square 12 • General Biology • Paper (30 min) • HS, 2Y

Unable to purchase expensive DNA kits and micro-pipettes? Learn how to create samples containing a mixture of dyes of different molecular weights which result in interesting banding patterns that can be used in fragment and variation analysis.

Teresa Fulcher, Pellissippi State Community College, Knoxville, TN

1015 | Investigating a Rare Disease through Hands-on and Blended Settings

Governor's Square 14 • General Biology • Hands-on Workshop (30 min) • HS, GA

Explore a rare disease (Pompe disease) through face-to-face collaborative learning groups and hands-on activities as well as through virtual environments. Pilot results and lessons will be shared. BYOD to try out the web-based WISE version!

Julie Bokor, University of Florida, Gainesville, FL

1133 | Engaging Students with Authentic Scientific Literature

Governor's Square 15 • Instructional Strategies & Technologies • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Learn how to effectively introduce primary literature in your classroom by packaging an annotated science paper, HHMI BioInteractive multimedia, and an active learning piece to provide the necessary scaffolding while maintaining student engagement.

Chi Klein, Scott Sowell, and Melissa Csikari, HHMI BioInteractive, Chevy Chase, MD

1019 | Improving Student Success in Introductory Biology: The Use of Summative Assessment as an Inclusive Practice

Governor's Square 16 • Curriculum Development • Paper (30 min) • 2Y, 4Y

The effect of the use of summative assessment on underrepresented minorities in Introductory Biology.

Oluwaseun Agboola and Anna Hiatt, East Tennessee State University, Johnson City, TN

1026 | Bringing Professional Biological Research into the Classroom

Governor's Square 17 • Instructional Strategies & Technologies • Demonstration (30 min) • HS

There are many benefits to sharing published biological studies with students, such as practicing analysis and interpretation of data that doesn't seem to have a "right answer." I'll share specific examples and general tips for finding more.

Kim Failor, Stanford Online High School, Stanford, CA

1098 | Lessons Learned from a Flipped Classroom

Plaza Court 5 • Science Practices • Paper (30 min) • 2Y, 4Y, GA

The flipped class depends on the efficiency and quality of content-delivery materials and diverse and engaging student-centered learning activities to apply and assess understanding of that content. Failures and successes of flipping will be discussed.

Kathy Gallucci, Elon University, Elon, NC

1093 | Engaging Graduate Teaching Assistants in Lesson Study to Improve Instruction in an Introductory Biology Laboratory Course

Plaza Court 6 • General Biology • Paper (30 min) • 4Y

This session will discuss how lesson study, a type of professional development, advanced graduate teaching assistants' pedagogical content knowledge (PCK) in order to improve the quality of instruction in an introductory biology laboratory course.

Sandra Lampley, University of Alabama in Huntsville, Huntsville, AL; and Grant Gardner, Middle Tennessee State University, Murfreesboro, TN



NABT 2016 Evolution Symposium
Emerging Research in Evolutionary Biology



Why be blue in a swamp?
The evolution of color patterns and color vision in killifish

Dr. Rebecca (Becky) Fuller
Department of Animal Biology
School of Integrative Biology
University of Illinois



Data Nugget Workshop

The Determinants of Male Color Pattern: Nature, Nurture, and their Interaction

Drs. Rebecca Fuller, , Melissa Kjelvik, Elizabeth Schultheis, Alexa Warwick, and Louise Mead
University of Illinois and BEACON Center for the Study of Evolution in Action at Michigan State University



10:00AM – 12:30PM

NABT 2016 Evolution Symposium: Emerging Research in Evolutionary Biology

Plaza Ballroom D • Evolution • GA

Join us to hear about new research in evolutionary biology and a workshop on using authentic data in your classroom.

Why Be Blue in a Swamp? The Evolution of Color Patterns and Color Vision in Killifish

Animal communication happens when one organism emits a signal, which then travels through the environment and is detected by the sensory system of another. The environment in which signaling occurs can dramatically alter signal transmission and result in selection where different signals are favored in different environments. The bluefin killifish provide a compelling example. Some populations are found in crystal clear springs (where UV and blue light are highly abundant) and others are found in tannin-stained swamps (where UV/blue light is depauperate). Paradoxically, males with blue color patterns are abundant in swamps and are rare in springs. The resolution to this paradox requires a consideration of how genetics and the environment influence trait expression, as well as the direction of natural and sexual selection in different habitat types, and the manner in which animals with different visual systems perceive the same color pattern.

Rebecca Fuller, University of Illinois at Urbana-Champaign, Champaign, IL

Data Nugget Workshop: The Determinants of Male Color Pattern: Nature, Nurture, and their Interaction

Data Nuggets are hands-on activities designed to improve the scientific and quantitative skills of students by having them graph and interpret scientific data gathered by practicing scientists. This workshop will provide an overview of Data Nuggets and present a Data Nugget featuring data on the genetic and environmental basis of color pattern expression in killifish. This Data Nugget will allow students to determine whether color pattern expression is due to 'nature' (e.g., genetics), 'nurture' (e.g. environment), or the interaction of the two.

Rebecca Fuller, University of Illinois at Urbana-Champaign, Champaign, IL; and Melissa Kjelvik, Elizabeth Schultheis, Alexa Warwick, and Louise S. Mead, BEACON Center for the Study of Evolution in Action, Michigan State University, East Lansing, MI

12:00PM – 12:30PM *continued*
**986 | Ecological Service Learning:
Connecting Natural and
Human Communities**

Plaza Court 7 • Ecology/Environmental
Science/Sustainability • Paper (30 min)
• HS, 2Y, 4Y

We will explore NCCC's ecological service-learning projects in life-science laboratory courses! Students' reflections and outcomes will be included, and opportunities for funding and partnership building for similar projects will also be discussed.

Tara Jo Holmberg, Northwestern Connecticut
Community College, Winsted, CT

**954 | Introductory Biology
Students' Use of Rubrics and
Reflection Questions as Scaffolds
to Engage in Metacognition and
Enhance Understanding**

Plaza Court 8 • General Biology •
Paper (30 min) • 2Y, 4Y

Learn about the design and use of scoring rubrics, reflection questions, and instruction on their use to support introductory biology students as they learn to engage in metacognition and consider their own understanding of biological concepts.

Jaime Sabel, University of Nebraska-Lincoln,
Lincoln, NE

12:45PM – 1:45PM

AP Biology Section Luncheon

Director's Row E • AP Biology • Meal Function
(Tickets Required) • HS

You have the big ideas and enduring understandings covered. But what about the science practices and the labs? And that exam? Meet other AP Biology teachers in a friendly informal setting to share questions and insight. You may even finally get to meet some of your favorite fellow AP teachers in person.

Four-Year Section Luncheon

Director's Row I • Meal Function (Tickets
Required) • 4Y

Join faculty, education researchers, graduate students, and others who make four-year colleges and universities their professional home. Network with colleagues and friends (and make new ones) at this event. The lunch will include a special presentation of the Four-Year College and University Section Awards.

Two-Year Section Luncheon

Director's Row J • Meal Function (Tickets
Required) • 2Y

Students at two-year colleges are as diverse as their instructors. Share your challenges, epiphanies, and best practices with other two-year and community college educators who "get it." The winners of the *Two-Year College Biology Teaching* and *Prof. Chan Teaching Award* will also be announced.

2:00PM – 3:15PM

**NABT Committee Meeting:
Nominating Committee**

Director's Row F • Committee Meeting • GA

Donald French, Committee Chair

**Special Programming
Presented by Bio-Link and AC2**

**How to Give Your Students
the Best of Everything in
Biotechnology**

Plaza Court 4 • Biotechnology •
Symposium (75 min) • GA

Biotechnology is exciting, but challenging to teach on your own. Bio-Link is a 20-year-old network of colleges and high schools that share information, curriculum, and experiences. In this session, learn where to find expert help.

Linnea Fletcher

12:45PM – 3:15PM

Special Programming Presented by BIOZONE

All sessions in Plaza Court 3

Richard Allan

12:45PM – 2:00PM

BIOZONE's AP Biology: From Content Coverage to Understanding

AP Biology • Demonstration (75 min) • HS

BIOZONE presents innovative approaches for teaching AP Biology within the thematic framework of the four big ideas. Find out how BIOZONE's pedagogical approach can improve student achievement in the current environment. Attendees receive free samples.

2:00PM – 3:15PM

Biology for NGSS: A New Approach for a New Program

General Biology • Demonstration (75 min) • HS

Successfully implement the high school life science component of the NGSS program with BIOZONE's newest series. Strongly focused on student inquiry and written from first principles to address all aspects of NGSS. Attendees receive free review copy.

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Find out by taking our quick quiz, and receive a free microbe button! Check out our classroom resources and discover educator opportunities! Come to Booth #415 to find out more.

ASM Presents: Vectors of Disease

featuring Dr. Brian Foy of Colorado State University, the first researcher to document sexual transmission of the Zika virus.

Friday, Nov. 4, 2:00 – 4:00 pm, Plaza Ballroom D



Engage Your Students in Citizen Science

Do you want your students involved in science and to understand the role it plays in everyday life? The latest themed *JMBE* issue focuses on the interdisciplinary topic of scientific citizenship.

For more information, visit <http://bit.ly/2bchLq4>



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Visit us at Booth #415!

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2:00PM – 3:15PM

1066 | The Exposome: Making Chemical Exposures Relevant to Biology Instruction

Governor's Square 9 • AP Biology • Demonstration (75 min) • HS, 2Y, 4Y

Conduct a graphing/data interpretation activity that introduces the concept of the exposome while reinforcing learning about DNA damage and repair and cancer formation in response to exposure to cancer-causing chemicals such as vinyl chloride.

Dana Haine, University of North Carolina, Chapel Hill, NC

1002 | Simple, Inexpensive Ways to Develop Understanding of the Most Difficult Biological Concepts

Governor's Square 10 • General Biology • Hands-on Workshop (75 min) • MS, HS, 2Y

Addressing crowd-sourced feedback on the most difficult biological concepts to teach, participants will explore active, non-lecture content delivery with cheap materials. Student learning will focus on models, representations, and data analysis.

Chi Klein, Saint Stephen's Episcopal School, Bradenton, FL

1096 | Now You See It, Now You Don't - Patterns in Ecology

Governor's Square 11 • Ecology/Environmental Science/Sustainability • Hands-on Workshop (75 min) • MS, HS, GA

The natural world presents an unlimited variety of patterns to explore. Participants will engage in activities that will bring to life the CCC of patterns and the role patterns play in biology. All participants will leave with goodie bags and lessons.

Jim Clark, San Lorenzo Unified School District, San Lorenzo, CA; and Jesse Stonewood, Armadillo Technical Institute, Phoenix, AZ

1105 | Simulating Genetic Drift with EXCEL

Governor's Square 14 • Evolution • Hands-on Workshop (75 min) • HS, 2Y, 4Y

This workshop provides the necessary tools for a class to build a simulation of evolution with genetic drift and natural selection on more realistic spatial and temporal scales and learn as actual evolutionary biologists do.

Ryan Langendorf, University of Colorado, Boulder, CO; and Paul Strode, Fairview High School, Boulder, CO

979 | Using the 5E Instructional Model to Teach Life Science: An Immersive Learner Experience

Governor's Square 16 • Science Practices • Hands-on Workshop (75 min) • MS, HS

Why do we sweat? Why do we shiver? These questions and more will be covered in our session, which will introduce participants to the New Visions Living Environment (Biology) Curriculum and its immersive, engaging 5E model of teaching.

Andrea Robinson, New Visions, New York City, NY

1018 | Modeling in the Pre-AP Biology Classroom

Governor's Square 17 • Instructional Strategies & Technologies • Hands-on Workshop (75 min) • HS

Giving students opportunities to engage in "sense-making" through modeling is a core practice for AP and NGSS. Join the fun as we engage in modeling tasks and explore rubrics for assessing students' modeling practices. We will also share best practices.

Jason Crean, Lyons Township High School, LaGrange, IL; and Karen Lionberger, College Board, AP Program, New York, NY

1094 | The AP Curriculum Meets Vision and Change: Incorporating Active Learning in Small Classrooms and in Large Lecture Halls

Plaza Ballroom F • AP Biology • Hands-On Workshop • HS, 2Y, 4Y

AP teachers and college professors will jointly learn how to transition from traditional lectures towards active classrooms that empower learners. Participants will design activities that meet the expectations of both AP and Vision and Change.

Jennifer Pfannerstill, North Shore Country Day School, Winnetka, IL; Brian Lazzaro, Cornell University, Ithaca, NY; and Nancy Morvillo, Florida Southern University, Lakeland, FL

1071 | Temperature Conversions: Explaining $y=mx+b$

Plaza Court 5 • Science Practices • Hands-on Workshop (75 min) • HS, 2Y, 4Y

This activity is designed for teachers to learn how to explain and make sense of the linear equation to students. Participants will collect data, draw a graph, and identify each part of the slope equation to seamlessly integrate math and science.

Umadevi Garimella, University of Central Arkansas, Conway, AR

934 | Visualizing Student Thinking Using the NGSS Approach

Plaza Court 6 • Instructional Strategies & Technologies • Hands-on Workshop (75 min) • HS, MS

Get students to think beyond the story line to explaining "why". The goal of this workshop is to provide teachers with examples of student work and rubrics in applying the Cross Cutting Concepts within the NGSS curriculum using visual modeling.

Elizabeth Gonzalez, Montclair High School, Montclair, CA; and Christine Yang, Chaffey High School, Ontario, CA

990 | GMO Detection Without PCR

Plaza Court 7 • Biotechnology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Explore hands-on, PCR-free ways to simulate GMO detection that mimic real life technology, including microarrays and immunochromatographic tests. Supplement your curriculum with relevant yet time and budget friendly activities. Lesson plans provided!

Summer Cortinas, BioNetwork, Asheville, NC

957 | Not Just Blowing Bubbles: Modeling Population Demographics

Plaza Court 8 • AP Biology • Hands-on Workshop (75 min) • HS, 2Y

Ecology is all about energy and relationships. In this encore workshop, participants will actively model ecological concepts such as logistic and exponential growth, carrying capacity, and survivorship curves and explore data analysis possibilities.

Pamela Close, Hickman High School, Columbia, MO; and Lee Ferguson, Allen High School, Allen, TX

2:00PM – 4:00PM**1043 | ASM Presents: Vectors of Disease**

Plaza Ballroom D • Microbiology & Cell Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

New and emerging infectious diseases are filling the news headlines. Many of these diseases are associated with animal or insect vectors. Come hear what we know about vector-borne disease and transmission from the first researcher to report sexual transmission of Zika virus. This session will also feature a demonstration of a new classroom activity developed to help students understand human immune defenses and pathogen virulence strategies.

Brian Foy, Colorado State University, Fort Collins, CO; Katherine Lontok, American Society for Microbiology, Washington, D.C.; and Dave Westenberg, Missouri S&T, Rolla, MO

2:00PM – 3:15PM**APS INVITED SPEAKER**

W. Larry Kenney

See page 10 for biography.

Aging in a Changing Climate: Physiology in Context

Director's Row H • Anatomy & Physiology • Special Speaker • GA

If current conditions continue, mean global temperature is projected to rise 1-2°C over the next 50 years. The effects of climate change on the environment are well known, but what does that mean for human health? Humans are tropical animals, evolved from tropical climates and well adapted to tolerate even extremely hot environmental conditions. This presentation will focus on the physiology of human aging in an ever-warming climate, how and why older men and women are at risk during episodic heat waves, and (potentially) what we can do about it.

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2:00PM – 4:00PM continued

NABT Biology Education Research Symposium

Governor's Square 12 • Symposium • GA

NABT is proud to present the 8th Annual Biology Education Symposium. Presentations were accepted through a double-blind review process that was open to biology instructors and researchers at all levels.

Full abstracts are available on page 40 and proceedings will be posted at www.NABT.org

1132 | Inquiry-based Ecology Using a Citizen Science Trail Camera Project

Governor's Square 15 • Ecology/Environmental Science/Sustainability • Hands-on Workshop (120 min) • HS

HHMI BioInteractive presents a citizen science platform to identify animals in trail camera images from Gorongosa National Park, Mozambique. Participants will explore trail camera data, investigate ecological questions, and analyze data on computers.

Amy Fassler, David Hong, Takisha Reece, and Bridget Conneely, HHMI BioInteractive, Chevy Chase, MD

3:30PM – 4:00PM NABT Committee Meeting: Professional Development Committee

Director's Row F • Committee Meeting • GA

Catherine Ambos, Chair

967 | From Folklore to Herbal Medicines to Science

Governor's Square 9 • General Biology • Demonstration (30 min) • HS, 2Y, 4Y

Many cultures have herbal medicines and some are related to folklore. Come learn how the effectiveness of these remedies can be tested in the lab using readily available supplies and

organisms such as bacteria, yeast, *C. elegans* and brine shrimp.

Linda Sigismondi, University of Rio Grande, Rio Grande, OH

921 | Breaking Down the Stages of Cellular Respiration

Governor's Square 10 • General Biology • Hands-on Workshop (30 min) • HS, 2Y, 4Y

This session will provide instructors with worksheets they can use to help their students better understand the stages of cellular respiration.

Deborah Cardenas, Collin College, Plano, TX

1056 | Phylocards - A Plant Evolution Card Game

Governor's Square 11 • Evolution • Hands-on Workshop (30 min) • MS, HS, 4Y

Plant diversification can be a challenging subject to teach, particularly if live plants are not available. Through a simple game-based approach called Phylocards, we put a new twist on teaching plant evolution that uses phylogenetic tree-thinking.

J. Phil Gibson, University of Oklahoma, Norman, OK

1030 | Authentic Research In The Classroom: Using Plant-Based Research To Explore Ecological Responses to Global Change

Governor's Square 14 • Ecology/Environmental Science/Sustainability • Demonstration (30 min) • HS, 2Y, 4Y

Explore a series of modules spanning a range of organizational scales that utilize regional questions about global change to engage students in authentic research. Learn how to use large, public data sets to teach science practice skills and ecology.

Jennifer Ward, University of North Carolina-Asheville, Asheville, NC; Anna Hiatt, East Tennessee State University, Johnson City, TN; Alisa Hove, Warren Wilson College, Swannanoa, NC; and Howard Neufeld, Appalachian State University, Boone, NC

1073 | Accessibility of Biology Lab for Students Who are Blind Increased by Making Novel Models and Tactile Items

Governor's Square 16 • General Biology • Paper (30 min) • HS, 2Y

Attend this session and learn how to make inexpensive models and tactile items. These items can make a variety of organisms and structures observed in a General Biology lab accessible to students who are blind or vision impaired.

Linda Smith-Staton, Pellissippi State Community College, Knoxville, TN

1095 | Getting More Out of Less: Designing Short Homework Assignments that Focus on Application and Analysis

Governor's Square 17 • Curriculum Development • Hands-on Workshop (30 min) • 2Y, 4Y, GA

Studies on student learning show work outside of class focusing on application and analysis produce higher achievement on course learning outcomes. See how shorter homework assignments incorporating higher order thinking improve student learning.

Julie Minbiole, Columbia College Chicago, Chicago, IL

958 | Introducing Bioinformatics Resources to Study Human Disease

Plaza Ballroom F • AP Biology • Hands-on Workshop (30 min) • HS, 2Y, 4Y

The study of human disease using publicly available computational resources, such as databases of genetic sequence and protein structure, is explored through Green Fluorescent Protein (GFP) in this lesson from the American Society of Human Genetics.

Julie Nadel, American Society of Human Genetics, Bethesda, MD

978 | Assessing Students' Prior Knowledge of the Chemistry in Cellular Respiration

Plaza Court 5 • General Biology • Paper (30 min) • 2Y, 4Y, GA

Wouldn't it be useful to know what chemistry knowledge concerning cellular respiration your students have? Come listen to our progress creating the Chemistry in Cellular Respiration Concept Inventory.

Lance Forshee and Donald French, Oklahoma State University, Stillwater, OK

1085 | Implementing Profession-Based Learning and Entrepreneurship in the Bioscience Classroom

Plaza Court 6 • Curriculum Development • Paper (30 min) • HS, 2Y

Wanting to provide real-world and authentic experiences for your students while also maintaining a rigorous curriculum? Techniques, tips, and lessons-learned on how to infuse profession-based teaching and entrepreneurship into your bioscience program.

Joe Whalen, Blue Valley CAPS, Overland Park, KS

1039 | Feedback for Learning in Biology

Plaza Court 7 • Instructional Strategies & Technologies • Hands-on Workshop (30 min) • MS, HS

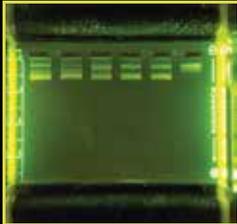
Participants complete an inheritance activity that will be used for demonstrating feedback models that are incorporated into the classroom. Self, peer, teacher, and whole class feedback strategies are illustrated. The NGSS in HS Genetics are targeted as the learning goals for this activity.

Donna Satterthwait, University of Tasmania, Hobart, Tasmania

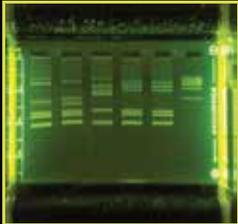
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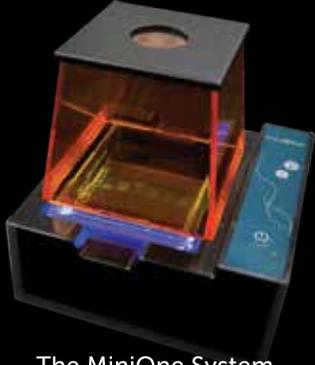
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NABT BIOLOGY EDUCATION RESEARCH SYMPOSIUM

2:00PM – 4:00PM • GOVERNOR'S SQUARE 12

SCHEDULED PRESENTATIONS:

Authentic Research Experience in the Introductory Biology Laboratory Improves Student Perception of Laboratory Skills, Knowledge and Interest in Scientific Research

Jacqueline S. McLaughlin, David E. Favre, Suzanne Weinstein, The Pennsylvania State University, and Christine M. Goedhart, Citrus College

Authentic undergraduate research laboratory experiences are essential to aid in the implementation of science education reform mandates and to effectively train a new generation of biology students who can think critically. These types of experiences have been shown to improve student comfort with, and perceptions of, science and to increase student persistence within the discipline, particularly for underrepresented student populations. Here we present assessment data on a unique four-step pedagogical framework that allows students to develop scientific thinking and practices while authentically engaging in the scientific process. This framework was used to transform a sophomore-level introductory biology laboratory course for biology majors at a 4-year college branch campus and an honors introductory biology laboratory course for non-majors at a 2-year college. The goal of the transformation was to provide students with the opportunity to experience scientific research in the manner in which professional research scientists conduct it through devising, designing, executing, interpreting, and communicating their experimental results. Student responses to the assessments utilized in this study showed improvements in students' perceptions of their laboratory skills and knowledge, and their interest in doing further research in the laboratory. The simplicity and flexibility involved in the four-step model allows it to be easily adopted for use within the unique infrastructure and resource environments at a variety of institutions and at different levels of biological study, effectively increasing student access to authentic scientific research.

Learned Inequality: Racial Labels in the Biology Curriculum can Affect the Development of Racial Prejudice by Affecting the Perception of Human Biological Variation

Brian M. Donovan, The Biological Sciences Curriculum Study (BSCS) and Stanford University

For over a century, genetic arguments for the existence of racial inequality have been used to oppose policies that promote social equality. And, over that same time period, American biology textbooks have repeatedly discussed genetic differences between races. This experiment tests whether racial terminology in the biology curriculum causes adolescents to develop genetic beliefs about racial difference, thereby affecting prejudice. Individual students ($N = 135$, grades 7-9) were randomly assigned within their classrooms to learn either from: (i) four text-based lessons discussing racial differences in skeletal structure and the prevalence of genetic disease (racial condition); or (ii) an identical curriculum lacking racial terminology (nonracial condition). Over three-months that coincided with this learning, students in the racial condition grew significantly more in their perception of the amount of genetic variation between races relative to students in the nonracial condition. Furthermore, those in the racial condition grew in their belief that races differ in intelligence for genetic reasons significantly more than those in the nonracial condition. And, compared to the nonracial condition, students in the racial condition became significantly less interested in socializing across racial lines and less supportive of policies that reduce racial inequality in education. These findings show how biology education sustains racial inequality, and conversely, how human genetic education could be designed to reduce it.

A Curriculum Model for Integrating the Three NGSS Dimensions and Utilizing Published Biology Data

Louisa A. Stark and Nicola C. Barber, University of Utah, Salt Lake City, UT; Martin Fernandez and Jo Ellen Roseman, American Association for the Advancement of Science, Washington, D.C.

Realizing the vision for science education outlined in the Framework for K-12 Science Education and Next Generation Science Standards (NGSS) requires developing curricula that integrate disciplinary core ideas, science practices and crosscutting concepts. Attending to these three dimensions, we developed and tested high school biology lessons and closely-aligned assessment items on natural selection. The curriculum leverages the use of published scientific data to authentically integrate (a) the Life Science Disciplinary Core Ideas of Biological Evolution and concepts from Heredity needed to understand evolution, (b) the Science Practices of Analyzing and Interpreting Data, Using Mathematics and Computational Thinking, and Engaging in Argument from Evidence, and (c) the Crosscutting Concepts of Patterns, and Cause and Effect. Pilot testing the lessons via a treatment-only design revealed significant student learning gains from pre-test to post-test ($n=308$, $t=4.265$, $p<0.001$). Teachers reported on post-enactment surveys that the lessons differed greatly from how they typically taught natural selection but that they would continue to use the materials. Our work provides a model for curriculum

development integrating the three dimensions of the NGSS with published scientific data and gives preliminary evidence of promise for this approach to increasing students' understanding of natural selection.

Reducing College Biology Students' Perceived Conflict between Religion and Evolution

M. Elizabeth Barnes, James Elser, and Sara E. Brownell, Arizona State University, Tempe, AZ

Up to sixty percent of students in college biology classes have been shown to reject evolution. The source of rejection most often stems from an interplay of students' misconceptions about evolution and their perceptions that evolution is in conflict with their religious beliefs. While college evolution instructors are often versed on how to provide instruction on understanding of evolution, they are often unsure about how to reduce students' perceptions that evolution is in conflict with religious beliefs. We asked how our evolution curriculum influences students' perceptions of evolution and religion. Using an open ended survey, we analyzed students' perceptions of conflict between evolution and religion before and after instruction. We found that over the course of the module, the number of students who perceived that evolution and religion are in conflict was reduced by half. Surprisingly, we saw this reduction among both religious and non-religious students. This study suggests that by incorporating explicit discussion of the perceived conflict between religion and evolution we may be able to ameliorate students' perceived conflict and thus improve student attitudes towards evolution. In the session we will provide a detailed description of our curriculum as well as practical suggestions for how to implement our module.

Using Human Case Studies to Teach Evolution

Briana Pobiner, Smithsonian Institution, Washington, D.C.; Paul Beardsley, California State Polytechnic University, Pomona, CA; Connie Bertka, Science and Society Resources, Potomac, MD; and William Watson, Diocese of Camden Catholic Schools, Camden, NJ

Studies demonstrate that evolution is one of the most difficult aspects of biology to teach and learn due to cognitive and cultural barriers to understanding and accepting core concepts of evolution. Despite the potentially controversial topic of human evolution, research at the college level suggests that a pedagogical focus on human examples is a useful way to teach core concepts of evolutionary biology. Here we report on a project that developed and field tested (1) three curriculum units for high school Advanced Placement biology classes that teach core evolutionary concepts using case studies of human evolution (Adaptation to Altitude, Evolution of Human Skin Color, and Malaria), and (2) a Cultural and Religious Sensitivity (CRS) Teaching Strategies Resource to encourage and help equip high school teachers to promote positive dialogue around the topic of evolution in their classrooms. During the 2013-2014 school year 304 students field tested the curriculum units and 148 students also field tested one of the two CRS activities in 10 schools in 10 states. Feedback indicates that the materials align very well with the criteria established to guide the development process and assessments suggest that they generally increase both understanding and acceptance of evolution among students.

Fidelity of Implementation of Peer Instruction in High School Biology Classrooms

Jennifer Parrish, Grant Gardner, Leigh McNeil, and Tom Cheatham, Middle Tennessee State University, Murfreesboro, TN

This NSF funded DRK-12 project, Promoting Active Learning in Science (PALS), sought to facilitate and evaluate the transfer of Peer Instruction (PI) from undergraduate physics to high school biology classrooms. Participating high school biology teachers ($n = 22$) used PI over the course of two semesters. Teacher self-report data, classroom observations, and open-ended questionnaires revealed the motivation for using pedagogically-critical aspects of PI varied by instructor. Teachers often chose not to use PI because of concerns that materials were at too high of a cognitive level for their students and numerous adaptations to the pedagogy were made that affected fidelity of the strategy. This presentation will focus on the adaptations necessary to successfully move PI into high school biology classrooms and how to help teachers differentiate PI without unknowingly omitting critical features that can lead to a reduction of pedagogical effectiveness.

SPECIAL GUEST PRESENTER:

Marcelle A. Siegel, University of Missouri, Columbia, MO
Recipient of the 2015 NABT Four-Year Section Research in Biology Education Award

3:30PM – 4:00PM *continued*
1062 | DNA Sequencing in the High School Classroom

Plaza Court 8 • Biotechnology • Demonstration (30 min) • HS, 2Y

We will introduce the Independent Research Project our students perform on bacterial species identification by way of DNA sequencing. This project has grown out of a collaboration with scientists at the Broad Institute of Harvard and MIT.

Julie Boehm and Ken Bateman, Wellesley High School, Wellesley, MA

4:00PM – 5:30PM
Exhibit Hall Closing Reception

Plaza Court • Special Program • GA

It's last call in the Exhibit Hall. This is your last chance to talk with exhibitors and get those freebies for the classroom. Join us for a reception, drawings for prizes, and more.

Sponsored by: 

5:30PM – 6:30PM
HHMI Night at the Movies Pre-Reception

Plaza Ballroom E • Special Event (Tickets Required)

This free red-carpet event will begin at 5:30pm with a reception including free food and drink.

6:30PM – 8:00PM
HHMI Night at the Movies with Sean Carroll

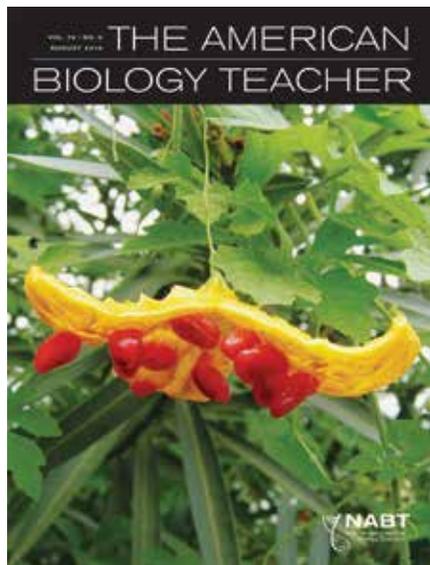
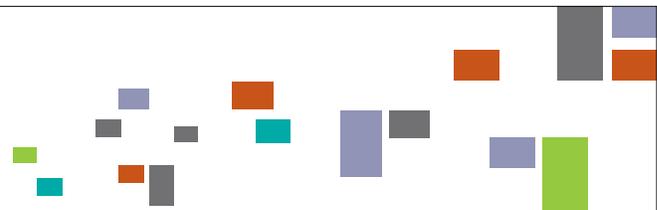
Plaza Ballroom ABC • Special Event (Tickets Required)

HHMI BioInteractive (www.biointeractive.org) and NABT are pleased to host the 6th Annual *HHMI Night at the Movies with Sean Carroll*. Join Dr. Carroll for the premiere of a new short film and discussion.



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ISSN: 0002-7685
 eISSN: 1938-4211
 Impact Factor: .229
 Published: Monthly except June and July; combined Nov/Dec issue

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