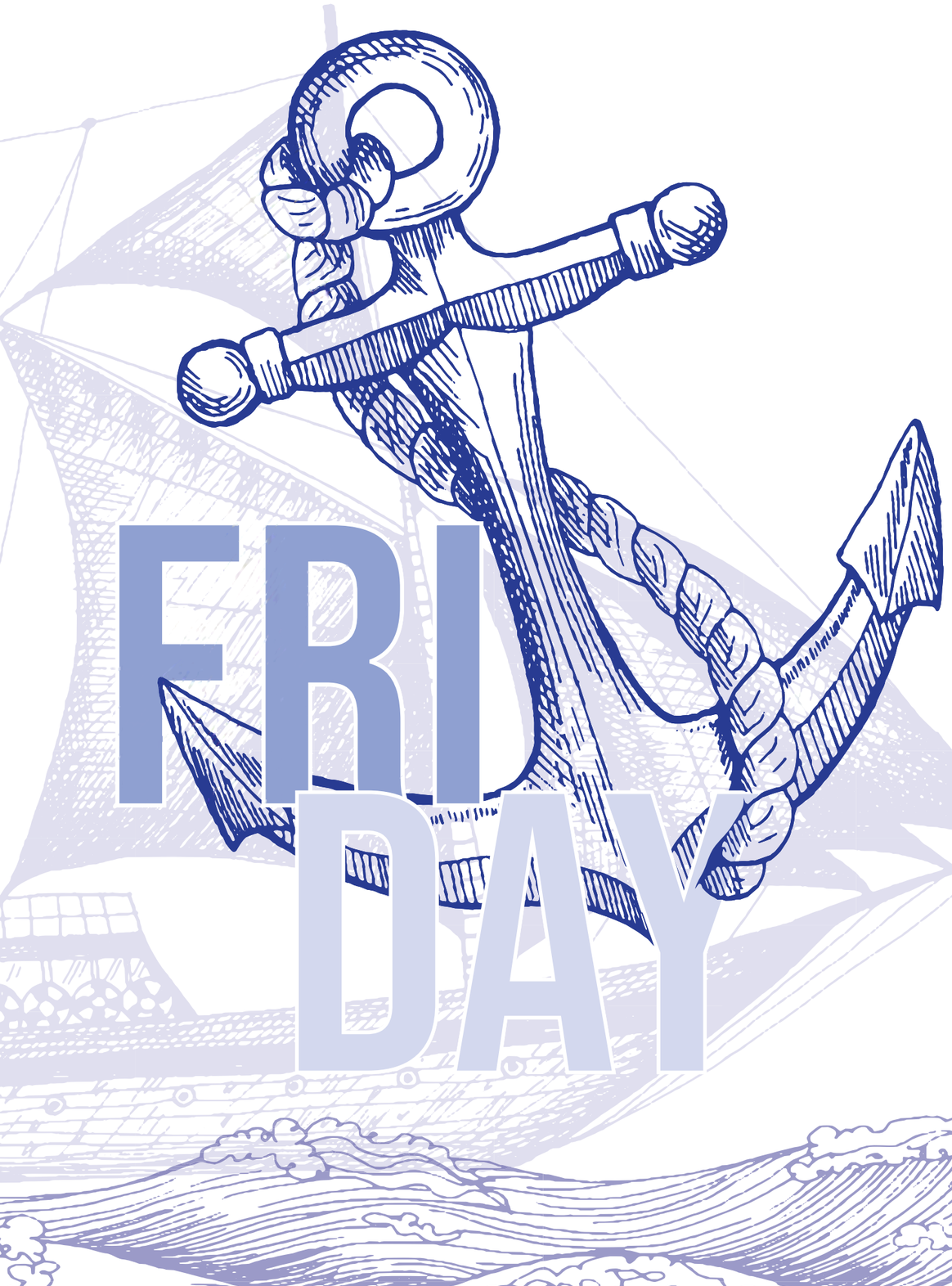

7:30AM–8:30AM

NABT First Timers' Coffee Break

Grand Ballroom VIII & IX (3rd Floor) • Special Event • GA

First-time attendees are invited to learn more about NABT, the 2023 Professional Development Conference, and network with former "first timers". NABT Mentors will be available to answer your questions and help you make the most of your time in Baltimore.

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

hhmi BioInteractive

8:00AM–9:00AM

SPECIAL PROGRAMMING PRESENTED BY BIO-RAD

1536-98363 PCR Amplified: Advanced Topics & Techniques

Grand Ballroom II (3rd Floor) • Biotechnology • Demonstration (60 min) • HS, 2Y, 4Y

Learn about the versatile techniques of PCR (qPCR, ddPCR, etc.) and real-world applications in life science research, clinical and molecular diagnostics like gene expression, disease outbreaks, mutation detection, and more.

Damon Tighe, Bio-Rad Laboratories, Hercules, CA

8:00AM–9:00AM CONT.

SPECIAL PROGRAMMING PRESENTED BY MINIPCR

1536-98401 Build It To Understand It: An Active Learning, Low-Cost Approach To Electrophoresis and Micropipetting

Laurel A & B (4th Floor) • General Biology • Demonstration (60 min) • HS, 2Y

The new Bandit™ STEM Electrophoresis Kit allows students to assemble and use a high-quality electrophoresis system with well thought out labs, all at a price you didn't think was possible!

Alex Dainis, miniPCR bio, Cambridge, MA

8:30AM–9:00AM

NABT Meet & Greet

Harborside Ballroom (4th Floor) • Committee Meeting • GA

This is your chance to get more involved with the NABT Community. Learn more about different opportunities from NABT committee chairs, section chairs, and regional coordinators.

9:15AM–10:15AM

Rajiv McCoy

See biography on page 9

Human Genome Evolution Across Scales of Biological Organization

Grand Ballroom V & VI (3rd Floor) • Special Speaker (60 min) • GA

Genetic variation mediates much of the phenotypic diversity observed in nature. DNA sequencing and related assays have produced a wealth of data that allow us to test long-standing hypotheses about how evolution shapes genetic variation and ensuing phenotypes. The scale and complexity of these data, in turn, require the development of novel computational and statistical methods tailored for their analysis.

Showcasing these themes, Dr. McCoy will describe recent foci in his lab that span scales of biological organization. The first regards one of the most surprising features of human biology, whereby less than half of all conceptions survive to live birth. Using data from in vitro fertilized embryos reveals diverse mechanisms of chromosome mis-segregation and their role in pregnancy loss. Extending from cells to individuals to populations, the McCoy lab is also developing resources and methods for studying abundant and impactful classes of genetic variation that have eluded the field, including contribution to the first gapless assembly of a human genome. This research has uncovered new evidence of historical natural selection, including selection favoring alleles inherited via ancient interbreeding with Neanderthals. Lastly, Dr. McCoy will end the talk by describing recent work generating and analyzing a large gene expression dataset from globally diverse human populations, creating a more complete view of gene expression evolution.

Together, this research helps explain the origins and maintenance of genetic variation underlying the phenotypes that make us all unique.

10:30AM–12:30PM

NABT EVOLUTION SYMPOSIUM PRESENTED BY NCSE

The Road to Extinction

Laurel C & D (4th Floor) • Evolution • Special Session (120 min) • GA

How to Survive a Mass Extinction

There's never been a mass extinction like it. Sixty-six million years ago, an immense asteroid struck the Earth and approximately 75% of known species disappeared virtually overnight. Yet many forms of life made it through the catastrophe, from feathered dinosaurs, to our primate ancestors. In this talk, award-winning author of "The Last Days of the Dinosaurs", Riley Black will replay what made the difference between survival and extinction as the Age of Dinosaurs ended and the Age of Mammals began.

Riley Black, Science Writer, Las Vegas, NV

The Road to Extinction

Are humans living through the sixth great extinction? While extinction is a major feature of the history of life, students often have a variety of preconceived notions about Earth's fossil record. This lesson set explores the relationships between extinction, evolution, and biodiversity in an effort to resolve these issues. Teachers will explore a free NGSS-aligned storyline from the National Center for Science Education that investigates mass extinctions to better understand how current populations adapt (or not) to human impacts. Walk away with hands-on activities grounded in primary evidence from the fossil record that allow students to explore possible solutions to mitigate the adverse impacts on biodiversity that often result from human activity.

Chandler Tawney, L'Anse Creuse Public Schools, Clinton Township, MI and Blake Touchet and Lin Andrews, National Center for Science Education, Oakland, CA

10:30AM–11:45AM

SPECIAL PROGRAMMING PRESENTED BY EDVOTEK

1536-97069 Introducing Your Students to Gene Editing with CRISPR

Dover A (3rd Floor) • Biotechnology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Explore the Nobel Prize-winning gene-editing tool CRISPR with your students! In this workshop, we'll experiment with guide RNA design, curing genetic diseases, and changing bacterial genes!

Thomas Cynkar, Stephanie Sturm, Edvotek, Washington, DC

1536-93403 Meet the 2023 HudsonAlpha Guidebook

Dover B & C (3rd Floor) • Biotechnology • Demonstration (75 min) • GA

Want to include cutting-edge genetic discoveries in your class? Meet the 2023 HudsonAlpha Guidebook. This free resource is packed with "too new for textbooks" content, phrased in student-friendly language.

Kelly East and Madelene Loftin, HudsonAlpha Institute for Biotechnology, Huntsville, AL

SPECIAL PROGRAMMING PRESENTED BY CAROLINA BIOLOGICAL SUPPLY COMPANY

1536-97083 Photosynthesis, Cellular Respiration, and Enzymes: Teaching Common Biology Concepts with Alginate Beads

Essex A (4th Floor) • General Biology • Hands-on Workshop (75 min) • ML, HS, 2Y

Participants will make and use alginate beads containing algae, yeast, and enzymes. They will learn how the beads can be used to teach photosynthesis, cellular respiration, and enzymatic processes.

Crystal Risko, Carolina Biological Supply Company, Burlington, NC

1536-94431 Engineering in Biology: Free Labs and Project-Based Learning

Essex B & C (4th Floor) • Ecology / Environmental Science / Sustainability • Hands-on Workshop (75 min) • HS

Engineering Tomorrow STEM labs is developed and delivered by engineers for free and can work well in your biology classroom! Come learn about the program and receive complimentary Teacher Toolkit!

Marissa Maggio, Stuyvesant High School, New York, NY and Constance Chiplock, Engineering Tomorrow, Fairfax Station, VA

1536-94410 The American Association of Immunologists Presents: AAI Teachers Research Program—Immunology Lessons for the Classroom

Grand Ballroom I (3rd Floor) • Microbiology & Cell Biology • Hands-on Workshop (75 min) • HS

Learn how to bring the excitement of immunology research to students in the classroom with units presented by teachers from the AAI Summer Research Program for Teachers.

Mike Criscitiello, Texas A&M University, College Station, TX

SPECIAL PROGRAMMING PRESENTED BY BIO-RAD

1536-98394 Hands-On Chromosomal Gene Editing with the Out of the Blue CRISPR Kit

Grand Ballroom II (3rd Floor) • Biotechnology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

CRISPR's most relevant uses require more than just knockouts! In this hands-on workshop, use CRISPR-Cas9 to cut and repair an E. coli chromosomal gene while learning about essential experimental controls.

Damon Tighe, Bio-Rad Laboratories, Hercules, CA

1536-96778 Designing a Phenomenon-Based Genetics Learning Sequence with BioInteractive Stickleback Resources

Grand Ballroom III & IV (3rd Floor) • General Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Join us as we explore a phenomenon-driven learning sequence that elicits student interest and builds knowledge utilizing BioInteractive resources about inheritance patterns and the control of gene regulation in sticklebacks.

Kasey Christopher, Duquesne University, Pittsburgh, PA and Helen Snodgrass, Sidwell Friends School, Bethesda, MD

1536-94447 Climate Hope in the Classroom: Using Local Climate Impacts and Environmental Actions to Teach Climate Science

Grand Ballroom VII (3rd Floor) • Ecology / Environmental Science / Sustainability • Hands-on Workshop (75 min) • ML, HS, GA

Attendees will walk through a task that engages students in climate science and inspires them to action. The task centers regional impacts, environmental actions, and strategies to address climate anxiety.

Erin Capra, West High School, Salt Lake City, UT; Erin Smith, Berkeley High School, Berkeley, CA; Lucas Risinger, West Albany High, Albany, OR; Jody DeAraujo, Balboa High School, San Francisco, CA

10:30AM–11:45AM CONT.

1536-93653 What Are We Learning Again? Reducing Cognitive Clutter to Focus Students on Science Practice

Grand Ballroom VIII (3rd Floor) • Instructional Strategies • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Advanced labs often require students to perform unfamiliar procedures, acquire new content, and often end in frustration. Come see how NGSS science practices can clarify learning goals in sophisticated labs.

Stephen Traphagen, Oak Park and River Forest High School, Oak Park, IL; Julie Minbiole, Columbia College Chicago, Chicago, IL; and Kirstin Milks, Bloomington High School South/Indiana University Bloomington, Bloomington, IN

1536-94267 Tasks and FRQs: Deciphering the Science Practices in AP Biology

Grand Ballroom IX (3rd Floor) • AP Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

This session will explore the AP Biology Science Practices that students should develop. The session will also model how the science practices are assessed in FRQs.

Catherine E. Walsh, College Board, New York, NY and Chris Monsour, Tiffin Columbian High School, Tiffin, OH

1536-94391 QB@CC Biological and Mathematical Methods to Assess Biodiversity

Grand Ballroom X (3rd Floor) • Ecology / Environmental Science / Sustainability • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Using QB@CC "Impact of Introduction of American Bullfrogs on Species Diversity Activity" to demonstrate a biological and mathematical approach to teaching species biodiversity concepts in the classroom and beyond.

Christine Patrum, Georgia State University, McDonough, GA and Heather Zimbler-DeLorenzo, Georgia State University, Mableton, GA

Justice, Equity, Diversity, & Inclusion (JEDI) Committee

Iron (4th Floor) • Committee Meeting (75 min) • GA

The JEDI Committee helps NABT develop programs and resources that address the needs of a diverse community of biology teachers to ensure full access and opportunities following the guidance articulated by the NABT values statement.

Enya Granados, Committee Chair

1536-96394 Scientific Literacy Re-visioned

Kent A (4th Floor) • Nature of Science • Demonstration (75 min) • 2Y, 4Y, GA

Workshop participants will explore activities illustrating components of the new model of scientific literacy for undergraduates developed by the NSF-funded "Liberal Art of Science" (AAAS, 1990) revision project.

Gordon Uno, University of Oklahoma, Norman, OK, Sam Donovan, BioQUEST, Pittsburgh, PA

1536-94367 The BioGraphI Curriculum: Valuing Diverse Identities and Fostering Data Literacy in Biology

Kent B & C (4th Floor) • Curriculum Development • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Learn how to adapt open educational resources from the Biologists and Graph Interpretation (BioGraphI) Project to improve representation of diverse scientists and incorporate data interpretation skills in your courses.

Rachel M. Pigg, University of Louisville, Louisville, KY; Suann Yang, SUNY Geneseo, Geneseo, NY; Stanley M. Lo, University of California San Diego, La Jolla, CA; Sheela Vemu, Waubonsee Community College, Chicago, IL; Elizabeth Hamman, St. Mary's College of Maryland, St. Mary's City, MD; Catherine L. Quinlan, Howard University, Washington, DC

SPECIAL PROGRAMMING PRESENTED BY MINIPCR

1536-98408 Using Synthetic Biology to Explore the Central Dogma and Protein Structure

Laurel A & B (4th Floor) • General Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Use the cell-free BioBits® system to experiment directly with concepts that have previously been inaccessible in many educational settings. Simple to implement, authentic molecular investigations with bright fluorescent readouts!

Ally Huang, miniPCR bio, Cambridge, MA

12:00PM–12:30PM

1536-94138 How to Be A Better Teacher Collaborator

Dover A (3rd Floor) • Curriculum Development • Demonstration (30 min) • HS, 4Y, GA

This is a presentation on best practices for how to work with university research partners in urban contexts to facilitate teacher research enabling the use of their resources.

Richard Jacob Zimny, Julia R Masterman School, Philadelphia, PA

1536-94552 "Dear Colleague:" Meet Your NSF Program Officers

Dover B & C (3rd Floor) • Instructional Strategies • Symposium (75 min) • GA

This session will highlight some of NSF's key programs while also giving participants practical advice on how to improve their chances of impressing Reviewer #2.

Kalyn Shea Owens, National Science Foundation, Alexandria, VA

SPECIAL PROGRAMMING PRESENTED BY CAROLINA BIOLOGICAL SUPPLY COMPANY

1536-97082 Guiding Light: Measuring and Analyzing Fluorescence with a Serial Dilution

Essex A (4th Floor) • Biotechnology • Hands-on Workshop (30 min) • HS, 2Y, 4Y

Go hands-on with a serial dilution activity that uses a typical highlighter and unique viewer to examine the relationship between fluorescence intensity and concentration of fluorescent molecules.

Ryan Hainey, Carolina Biological Supply Company, Burlington, NC

1536-94443 Using Art to Engage Non-Biology Majors

Essex B & C (4th Floor) • Instructional Strategies • Hands-on Workshop (30 min) • HS, 2Y, 4Y

This session discusses how using various art forms to introduce biology topics engages students, maintains their interest, and provides unique connections to the subject matter.

Heather Minges Wols, Columbia College Chicago, Chicago, IL

1536-94453 Where Does the Pipeline Begin? A Peek into the Start-up of a Middle School Biotechnology Program

Grand Ballroom I (3rd Floor) • Biotechnology • Hands-on Workshop (30 min) • ML, HS, GA

Come learn about how we started a biotechnology-themed program at a middle school! It is never too early to expose learners to this exciting and fast-growing field.

Katherine Harris, Baylor College of Medicine, Richmond, TX

SPECIAL PROGRAMMING PRESENTED BY BIO-RAD

1536-98395 Track Norovirus Spread Using Modeling and Gel Electrophoresis

Grand Ballroom II (3rd Floor) • Biotechnology • Demonstration (30 min) • HS, 2Y, 4Y

Put your epidemiologist hat on and determine the transmission mode of a norovirus using molecular data, patient histories, and clues hidden in a restaurant.

Damon Tighe, Bio-Rad Laboratories, Hercules, CA

12:00PM–12:30PM CONT.

1536-96526 Take Math Anxiety Out Of Teaching Population Growth With HHMI BioInteractive's Lionfish Click & Learn

Grand Ballroom III & IV (3rd Floor) • General Biology • Hands-on Workshop (30 min) • HS, 2Y, 4Y

Come explore how to incorporate math concepts into life science curricula with BioInteractive's lionfish interactive. We'll discuss how to adapt this resource for active learning in online and in-person settings.

Megan Lupek, North Carolina State University, Raleigh, NC

Long Range Planning Committee

Iron (4th Floor) • Committee Meeting (30 min) • GA

Working with the Board of Directors and other NABT leaders, the Long Range Planning Committee develops goals and objectives that align with NABT's Strategic Plan.

Steve Christenson, Committee Chair

ABT Advisory Committee

James (4th Floor) • Committee Meeting (30 min) • GA

The ABT Advisory Committee helps ensure the American Biology Teacher publishes articles and highlights themes relevant to the teaching and learning of biology and life science at all levels.

William McComas, ABT Editor-in-Chief

1536-94294 Student-Centered Learning in Biology Content Using the Explorations of Diverse Scientists

Kent A (4th Floor) • General Biology • Paper (30 min) • ML, HS, GA

Biology texts provide legitimacy and belonging in science. The explorations of National Geographic African American scientist explorers connect socio-emotional learning and social awareness with biology content in the classroom.

Catherine L Quinlan, Howard University, Rockville, MD

1536-94366 How Focus Questions Work to Make Student Thinking Visible

Kent B & C (4th Floor) • Instructional Strategies • Hands-on Workshop (30 min) • HS, 4Y, GA

We will discuss using focus questions at the beginning of lessons and units as a way to improve student engagement, agency, and inclusion as they learn biology.

Thomas Oviatt and Paul K. Strode, Fairview High School, Boulder, CO

SPECIAL PROGRAMMING PRESENTED BY MINIPCR

1536-98405 Hands-on Activities to Bring CRISPR-Cas9 to Your Class

Laurel A & B (4th Floor) • Biotechnology • Hands-on Workshop (30 min) • HS, 2Y, 4Y

See our suite of CRISPR-Cas9 activities. We have something for everyone with both in vitro and in vivo CRISPR/Cas labs and free resources like paper modeling activities.

Ally Huang, miniPCR bio, Cambridge, MA

NABT Book Club

4th Floor Landing (4th Floor) • Special Program • Discussion (30 min) • GA

Join the NABT Book Club for a discussion of the 2024 selection and timeline. This community read is a great way to talk to other biology teachers about what you're learning in an informal (and fun) setting.

Cindy Gay, NABT Director-at-Large, Steamboat Springs, CO

12:45PM–1:45PM

NABT Lunch Break

Your conference registration includes a boxed lunch, and we invite you to pick up your lunch outside the Grand Ballroom and join a section event, meet up with friends, or find a quiet spot to relax and recharge.

Tickets for your entrée selection were made with your registration. Please present your lunch ticket to staff to pick up your boxed lunch.

AP Biology Section Luncheon

Grand Ballroom V (3rd Floor) • AP Biology • Meal Functions (60 min) • HS

Grab your lunch and meet other AP Biology teachers in a friendly, informal setting to share insights, ask questions, and build community. You may even get to meet some of your favorite AP colleagues in person. The luncheon includes a special presentation of the *Kim Foglia AP Biology Service Award*.

Sponsored by miniPCR bio

High School Level Luncheon

Grand Ballroom V (3rd Floor) • General Biology • Meal Functions (60 min) • HS

If you teach funny freshmen, serious seniors, and/or everyone in between, you will want to grab your lunch, grab a seat, and connect with other high school biology teachers in this informal setting.

Elementary and Middle-Level Luncheon

Grand Ballroom VII (3rd Floor) • General Biology • Meal Functions (60 min) • ELEM, MS

Grab your lunch and meet up with other elementary and middle-level teachers at this informal networking lunch designed to help you connect with colleagues.

Two-Year College Section Luncheon

Grand Ballroom VIII (3rd Floor) • General Biology • Meal Functions (60 min) • 2Y

Join a supportive community of two-year college educators to share your strategies, your struggles, and your successes. The winners of the *Two-Year College Biology Teaching Award* and the *Professor Chan Teaching Award* will also be recognized.

Four-Year College & University Section Luncheon

Grand Ballroom IX (3rd Floor) • General Biology • Meal Functions (60 min) • 4Y

Faculty, education researchers, graduate students, and anyone associated with four-year colleges and universities are invited to network with colleagues and learn about section programs and opportunities. There will also be a special presentation of the Four-Year College & University Section Awards. Be sure to grab your lunch before heading to the luncheon!

2:00PM–4:00PM

1536-94735 14th Annual Biology Education Research Symposium

Dover B & C (3rd Floor) • Instructional Strategies • Symposium (120 min) • 2Y, 4Y, GA

NABT is proud to present the 14th Annual Biology Education Research Symposium. Presentations were accepted through a double-blind review process that was open to biology instructors and education researchers at all levels. The format for the symposium is a traditional presentation of papers by individual or co-authors lasting 15 minutes each.

See page 34 for the full listing.

2:00PM–3:15PM

1536-97501 Writing for *The American Biology Teacher*

Dover A (3rd Floor) • Curriculum Development • Hands-on Workshop (75 min) • GA

Work with members of the ABT editorial team during this interactive session designed to help get your idea through submission, review, and acceptance.

William McComas, ABT Editor-in-Chief, University of Arkansas, Fayetteville, AR

SPECIAL PROGRAMMING PRESENTED BY MINIONE SYSTEMS

1536-99346 Wet and Dry Labs to Introduce CRISPR-Based Gene Editing

Essex A (4th Floor) • Biotechnology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Unveil CRISPR's genetic prowess in this novel wet and dry lab simulation to introduce high school and undergraduate students to CRISPR-based gene editing technology.

David Wollert, Chattanooga State Community College, Chattanooga, TN

14th Annual Biology Education Research Symposium

2:00PM – 4:00PM
Dover B & C
(3rd Floor)

The symposium is coordinated by the NABT Four-Year College & University Section's Research Committee.

Proceedings will be posted online at NABT.org

Instructional Strategies in AP Science Classes: A Systematic Literature Review

Robin Bulleri & Soonhye Park, North Carolina State University, Raleigh, NC

The Advanced Placement (AP) program provides an opportunity for students to learn rigorous, college-level content while they are in high school. In addition, it provides financial benefit as students can earn college credit with a qualifying score on the end of course exam (Kolluri, 2018). The College Board, who designs the AP courses and exams, aims to increase both access and equity in the AP program. Consequently, in the past two decades, the number of students who take an AP course has doubled, to nearly three million (Saavedra et al., 2021). Despite recent efforts to expand both equity and access to AP courses, however, significant gaps remain in both areas. Historically, high-income schools offered more AP courses than low-income schools. Due to dramatic financial support from federal, state, and local governments, 90% of students now attend a school offering at least one AP course (Long et al., 2019). However, gatekeeping practices such as prerequisite mathematics and science courses like chemistry, algebra II, and precalculus create barriers to AP science courses which, in turn, yield student populations that are less diverse than introductory courses (Kolluri, 2018). Further, quality AP programs require effective teachers along with support from school and district (Long et al., 2019). In particular, given the close relationship between teachers' instructional practices and student learning outcomes (Hattie, 2012; Liou, 2021), understanding how AP courses are delivered in classrooms is imperative to better support AP teachers to implement effective teaching approaches that will promote science learning for all students from diverse backgrounds. In this regard, this review study aims to identify and characterize instructional strategies implemented in AP science courses for biology, chemistry, environmental science (APES), and physics, that are featured in research articles about AP courses published for the past ten years using a systematic approach to literature review. In addition, this review aims to identify instructional strategies that are empirically supported to contribute to student learning outcomes in AP science courses.

How Should I Write Exam Questions: An Investigation into How Different Framings of Exam Questions in Biology Classes Can Influence Student Performance and Attitudes

Jeremy Hsu, Noelle Clark, Kate Hill, Melissa Rowland-Goldsmith, Chapman University, Orange, CA

Quizzes and exams are nearly ubiquitous across both K-12 and college biology courses, with such assessments often playing major roles in determining student success and persistence in science, technology, engineering, and math (STEM). However, little work has explored how the framing of assessment questions may influence student performance and affect, despite past work showing that small changes in questions can have large impacts. For instance, personalizing questions with students' interests (i.e., grounding scenarios in students' academic and extracurricular topics relevant to students) can increase motivation and learning (e.g., Awofala 2014; Bernacki & Walkington 2014; D'Agata 2015; Ku & Sullivan 2001; Melsky 2021). However, this past work has primarily been done in the context of math, physics, and engineering courses, and we are not aware of any work examining the influence of how questions are worded in biology classes on student performance or affect.

Here, we explore question framing in scenario-based constructed-response questions where students read real scenarios and predict results in the context of an undergraduate introductory molecular genetics course. These authentic assessments mimic real-world application since students think critically about open-ended tasks (Koh 2017; Wiggins 2019). We also situate our work in discourse comprehension (Van Dijk & Kintsch 1983). Under this theory (also known as construction-integration), students must build both a textbase and situation model when reading a new scenario. The textbase represents a basic understanding of the language used and contains only minimal levels of inferences, while the situation model represents more complex mental representations (Graesser & Zwaan 1995; Gunel et al. 2009; Kintsch 1986; Van Dijk & Kintsch 1983)

Do the Benefits of Collaborative Group Exams Extend Beyond Just Improved Student Learning?

Jillian Arzoumanian, University of Tampa, Tampa, FL; Suann Yang, SUNY-Geneseo, Geneseo, NY; Michelle Roux-Osovitz, Jeffrey Grim University of Tampa, Tampa, FL

Modern pedagogical approaches are adapted to facilitate student-centered learning to promote engagement and interpersonal skills. Collaborative group exams (CGEs) allow students to work together in collective peer groups after first attempting an assessment individually. The implementation of CGEs should convert exam-style assessments into learning opportunities focused on improving performance and learning.

Students seek an educational experience that will aid in achieving their academic, professional, and personal goals. Consequently, career readiness competencies were developed to provide students with the necessary resources employers look for, and increasing attention is given to promoting student well-being and a sense of belonging.

This study explores the effects of large-scale adoption of CGEs on student performance,learning, and group dynamics across all levels of a biology curriculum at a medium-sized private university, with quantitative and qualitative data recorded from 834 individual students. Our data indicate students at all levels benefit from CGEs, improving exam performance (by 44%) and perceived learning through positive group dynamics and peer interactions, which likely assist students' career preparation and promote student retention. Therefore, we recommend CGEs to all educators, especially those teaching biology, to ensure students' academic achievement, career readiness, and overall well-being both in and out of the classroom.

Causal Mechanisms Behind Changing Minds About Evolution Using Cultural Competence

Jamie Jensen, Brigham Young University, Provo, UT; Morgan Meyers, University of Georgia-Athens, Athens, GA; Jonathan Hodson, Dalton Bourne, Noah Emery Brigham Young University, Provo, UT

It has now been established that religious culturally competent strategies for evolution education (ReCCEE, Barnes & Brownell, 2017) can be successful. We have developed a ReCCEE strategy, which we refer to as the Reconciliation Model (RM), that appears to be successful in a variety of settings and religious affiliations in overcoming barriers to evolution acceptance, specifically among Judeo-Christian audiences (e.g., Ferguson & Jensen, 2021; Lindsay et al., 2019). Although some of the factors that influence acceptance have been studied, including religiosity (Glaze & Goldston, 2015; Rissler, et al., 2014), perceived conflict (Barnes et al., 2021), understanding the nature of science (Glaze & Goldston, 2015), and sometimes knowledge (see Dunk et al., 2017), very little is known about the causal mechanisms directly underlying this specific ReCCEE model (the RM). In this presentation, we will share the results of a combined analysis of nationwide survey data with classroom interventions that shed light on the potential causal mechanisms behind the RM.

Special Guest Presenter

Stanley Lo

University California San Diego, La Jolla, CA

Recipient of the 2023 NABT Four-Year College & University Section Research in Biology Education Award

2:00PM–3:15PM CONT.

1536-94390 DataVersify: Humanizing and Diversifying Scientist Role Models in Data Literacy Instruction

Essex B & C (4th Floor) • General Biology • Demonstration (75 min) • HS, 2Y, GA

Strategies and resources to use scientist profiles in tandem with data literacy instruction will be discussed. Results from our efficacy study, examining how the inclusion of diverse scientist role models in instruction affected student attitudes will also be shared.

Melissa Kjelvik, Michigan State University, Valdez, AK

1536-96935 Science Communication: It's Not Just about the Facts!

Grand Ballroom I (3rd Floor) • Instructional Strategies • Demonstration (75 min) • ML, HS, GA

Using vaccines as an example, this session will examine the complex relationship between science and science communication and explore the individual context on both sides of any message: messenger and recipient.

Charlotte A. Moser, Vaccine Education Center Children's Hospital of Philadelphia, Philadelphia, PA

SPECIAL PROGRAMMING PRESENTED BY BIO-RAD

1536-98396 The Plight of the Bumblebee: Studying Bee Genetic Biodiversity using DNA Barcoding

Grand Ballroom II (3rd Floor) • Biotechnology • Demonstration (75 min) • HS, 2Y, 4Y

Taxonomy in action: use visual cues and biotechnology techniques to sort bumblebees into separate species. Experience how PCR, sequencing, and bioinformatics help scientists distinguish bee species.

Damon Tighe, Bio-Rad Laboratories, Hercules, CA

1536-96527 Winging It: Using BioInteractive's CRISPR Resources to Unpack Primary Literature

Grand Ballroom III & IV (3rd Floor) • Science Practices • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Reading a scientific paper can seem daunting for students. During this workshop, we'll explore strategies for navigating primary sources using BioInteractive's suite of CRISPR activities.

Young Yoo, Augustana College, Rock Island, IL and Karen Avery, Pennsylvania College of Technology, Williamsport, PA

Informal Science Committee

Iron (4th Floor) • Committee Meeting (75 min) • GA

Help NABT identify initiatives, develop activities, and promote services that highlight how informal and community science programs can support biology and life science instruction.

Jill Maroo, Committee Chair

Awards Committee

James (4th Floor) • Committee Meeting (75 min) • GA

This committee coordinates the nomination and application process for the NABT Awards program. Committee members evaluate applications, select award recipients, and notify the honorees of their awards.

Jason Crean, Committee Chair

1536-94479 Enhancing Biology Education Through the Use of ChatGPT: Exploring the Benefits and Challenges

Kent A (4th Floor) • Technology in the Classroom • Demonstration (75 min) • ML, HS, 4Y

ChatGPT was released to much fanfare and consternation. Its brief utilization in Brandon Boswell's biology classroom (since January 2023) has had a compelling impact on his practice, students, and assessments.

Brandon Boswell, Broward County Public Schools, Miami, FL

1536-94545 Fostering Figuring and Fascination

Kent B &C (4th Floor) • Instructional Strategies • Hands-on Workshop (75 min) • HS, 2Y, GA

How can crafts (crocheting, 3D & 4D printing, origami), toys, games, and puzzles help us appreciate the beauty and utility of mathematics in engaging biology students? We'll show you!

John R. Jungck, University of Delaware, Newark, DE

SPECIAL PROGRAMMING PRESENTED BY MINIPCR

1536-98406 Using Molecular Tools to Identify Antibiotic Resistance Genes in Environmental DNA

Laurel A & B (4th Floor) • Ecology / Environmental Science / Sustainability • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Use PCR to detect antibiotic resistance genes in soil samples and contribute your data to a national database.

Alex Dainis, miniPCR bio, Cambridge, MA

2:00PM–3:15PM CONT.

1536-94499 EvolvingSTEM: A Three-Dimensional Laboratory Evolution Curriculum That Improves Student Learning and Engagement in Life Sciences

Laurel C & D (4th Floor) • Evolution • Hands-on Workshop (75 min) • ML, HS, 4Y

We will share a broadly adaptable, NGSS-aligned curriculum that uses authentic, student-led research to teach genetics, ecosystem dynamics, microbiology, and biotechnology skills within the organizing principle of evolution.

Abigail Matela, University of Pittsburgh, Pittsburgh, PA; Edwina Kinchington, Pittsburgh Science and Technology Academy, Pittsburgh, PA; and Karie Suhajda, Pittsburgh Creative and Performing Arts School, Pittsburgh, PA

3:30PM–4:00PM

1536-94515 The Highs and Lows and Joys and Woes of Creating and Maintaining a State NABT Affiliate

Dover A (3rd Floor) • International / Global Education • Hands-on Workshop (30 min) • GA

If you've ever wanted to bring NABT back to your home state, you may have considered establishing a state affiliate. Meet with colleagues who can help troubleshoot the hurdles of making that dream a reality.

Brenda Royal, Central Magnet School, Murfreesboro, TN and Robert Pruitt, Montgomery Bell Academy, Nashville, TN

3:30PM–4:00PM CONT.

SPECIAL PROGRAMMING PRESENTED BY ALGAE RESEARCH AND SUPPLY

1536-99094 Algae Beads and Brainy Brinys (Algae Culture and Brine Shrimp Experiment Kit)

Essex A (4th Floor) • AP Biology • Hands-on Workshop (75 min) • ML, HS, 4Y

We will play with algae beads for photosynthesis and respiration and with Brainy Brinys, a kit to grow algae and feed it to brine shrimp while quantifying everything!

Matthew Huber, Algae Research and Supply, Inc., Carlsbad, CA

1536-94385 Contextualizing the Social and Cultural Embeddedness of the Nature of Science Using the Lived Experiences and Narratives of Black Heritage

Essex B & C (4th Floor) • Curriculum Development • Paper (30 min) • ML, HS, GA

Preservice teachers engage in inquiry explorations using the science capital and cultural scripts of Black heritage. Findings using modified Views of the Nature of Science (version C) are presented.

Catherine L. Quinlan, Howard University, Rockville, MD

SPECIAL PROGRAMMING PRESENTED BY PIVOT INTERACTIVES

1536-98005 Data and the Science Practices for AP Bio

Grand 1 (3rd Floor) • AP Biology • Demonstration (30 min) • HS, 2Y, 4Y

Infuse data, the science practices, math, and more into your AP courses while being both effective and efficient as you try to cram in the CED before the May exam!

Eric Friberg, Pivot Interactives, Mendota Heights, MN

SPECIAL PROGRAMMING PRESENTED BY BIO-RAD

1536-98397 Personalized Medicine: Cell and Gene Therapy in Cancer Treatments!

Grand Ballroom II (3rd Floor) • Biotechnology • Special Speaker • HS, 2Y, 4Y

Learn about CAR-T cells and how immunotherapies are produced, how viral vectors deliver gene therapies, and how physicians use them to treat inherited genetic disorders.

James DeKloe, Solano Community College, Fairfield, CA

3:30PM–4:00PM CONT.

1536-96528 HHMI BioInteractive's Assessment Builder: A Crowdsourced Tool to Facilitate Assessment for Learning

Grand Ballroom III & IV (3rd Floor) • Instructional Strategies • Hands-on Workshop (30 min) • HS, 2Y, 4Y

We will demonstrate the capabilities of HHMI BioInteractive's Assessment Builder, a crowdsourced database of high-quality questions intended to improve learning in AP Biology and undergraduate introductory biology.

Angela Hodgson, North Dakota State University, Fargo, ND

1536-94517 Critical Conversations in Science: A Call to Equitable Practice Through Language

Grand Ballroom VIII (3rd Floor) • Instructional Strategies • Demonstration (30 min) • ELEM, MS, HS

Through personal narratives and culturally responsive pedagogy, this session will provide participants with the resources needed to support 2SLGBTQIA+ equitable practices in a classroom setting through inclusive language.

Cassandra Herndon, University of San Diego, San Diego, CA and Traci Richardson-McVicker, Oklahoma State University, Stillwater, OK

1536-94312 Strategies for Increasing Diversity and Inclusion and Reducing Bias in AP Environmental Science

Grand Ballroom IX (3rd Floor) • Ecology / Environmental Science / Sustainability • Hands-on Workshop (30 min) • HS, 2Y, 4Y

Design a more diverse, inclusive, and less bias-driven AP Environmental Science Course. Topics include designing curricular resources, evaluating grading practices, and updating classroom strategies. Participants will model a redesigned lesson.

Sarah Utley, New Trier Township High School, Evanston, IL and David Hong, College Board/La Habra Heights, CA

1536-94343 Sea to Sky: Free Online Educational Resources from the National Oceanic and Atmospheric Administration (NOAA)

Grand Ballroom VII (3rd Floor) • Ecology / Environmental Science / Sustainability • Demonstration (30 min) • ELEM, MS, HS

Join NOAA for a demo of our database of 1,300+ FREE educational resources covering ocean, coasts, Great Lakes, weather, and climate. Tour lesson plans and activities and ask us anything!

Bekkah Lampe, National Oceanic and Atmospheric Administration (NOAA), Silver Spring, MD

3:30PM–4:00PM CONT.

1536-98665 Student Poster Practice Session

James (4th Floor) • Instructional Strategies • Hands-on Workshop (30 min) • HS, 2Y, 4Y

Join other student presenters (and their mentors) for an informal practice session to help you prepare for the NABT Biology Education Poster Session.

Michael Moore and Rachel Pigg, NABT Biology Education Poster Session Coordinators

1536-93049 The Making of University Life Science Lab: A Vision and Change Transition

Grand Ballroom X (3rd Floor) • Instructional Strategies • Hands-on Workshop (30 min) • 2Y, 4Y

"Vision and Change: A Call to Action" appeared twelve years ago. This session shares one university's journey to bring the Vision and Change Core Competencies to fruition for non-majors biology.

Bob Melton and Alan Jones, University of Central Oklahoma, Edmond, OK

Retired Members Committee

Iron (4th Floor) • Committee Meeting (30 min) • GA

Engage NABT's active retired members to promote the initiatives of the association and facilitate service as mentors and volunteers.

Dennis Gathmann, Committee Chair

1536-94101 Implementing Standards-Based Grading When the Rest of Your School Uses Traditional Grading

Kent A (4th Floor) • General Biology • Demonstration (30 min) • ML, HS, 2Y

Wendy will share her experience transitioning her 9th grade class to standards-based grading and "making it fit" with the traditional 100-point grading scale. Example assessments and tips and tricks!

Wendy R. Johnson, Kentwood Public Schools, Kentwood, MI

1536-94522 Evaluating OER as an Inclusive Teaching Practice in STEM

Kent B&C (4th Floor) • Curriculum Development • Paper (30 min) • 2Y, 4Y

We share results from an institutional study on adoption of Open Educational Resources (OER) and Inclusive Access (IA) materials in helping address issues regarding access and equity across STEM courses.

Anna Hiatt, Hannah Ray, and Chad Brassil, University of Nebraska at Lincoln, Lincoln, NE

SPECIAL PROGRAMMING PRESENTED BY MINIPCR

1536-98410 True Blue: Bacterial Transformation Made Easy

Laurel A & B (4th Floor) • Biotechnology • Hands-on Workshop (30 min) • HS, 2Y, 4Y

Bacterial transformation made easy. Introduce a phenotypic change leading to bright blue colonies and antibiotic resistance. Protocol requires less than 45 minutes of class time and doesn't require any incubators.

Alex Dainis, miniPCR bio, Cambridge, MA

1536-92814 The Learning Unity & Diversity in Alabama Project: Resources for Teaching Evolution in General Biology

Laurel C & D (4th Floor) • Evolution • Demonstration (30 min) • HS

The LUDA project centered around the accurate teaching of human and non-human evolution in Alabama, developing, testing, and now sharing modules to address misconceptions, perceived conflict, and critical content.

Amanda Townley, Georgia Southern University, Statesboro, GA; Connie Bertka, Science & Society Resources, Potomac, MD; and Briana Pobiner, Smithsonian Institution Human Origins Program, Washington, DC

4:00PM–5:30PM

Exhibit Hall Closing Experience

Harborside Ballroom (4th Floor) • Special Event • GA

It's last call in the NABT Exhibit Hall. It is also your last chance to visit booths, talk to exhibitors, and get those freebies for the classroom. This special reception will include giveaways and grand prize drawings for the *Find the President Contest*.

5:00PM–7:30PM

1536-98434 HHMI Night at the Movies

Grand Ballroom V & VI (3rd Floor) • Special Event • GA

Join us for a sneak peek of the upcoming Wild Hope season from Tangled Bank Studios and help us celebrate Sean B. Carroll's pioneering approach to science storytelling and education.

WILDHOPE