Special Thanks

The Center for the Advancement of STEM Education (CASE) at Bridgewater State University extends its appreciation to Dean Goldstein of the Bartlett College of Science and Mathematics and Executive Vice President Frederick Clark for their continued support of CASE initiatives. CASE also thanks the President’s Office and the Trustees’ Office, faculty and staff associated with CASE, as well as all other departments and individuals at Bridgewater State University who have worked behind the scenes to make this conference possible. Additionally, we thank Peter Lawrence of Biomimicry New England for his generous contribution of time and exceptional ideas.

Please visit www.microsites.bridgew.edu/case for information on other CASE programs.

Thank you for attending!

A CASE Conference for K-12 Teachers
February 26, 2015
3:00 - 9:00 PM
Program Agenda

Unless otherwise noted, all activities will be in the Science & Mathematics Center.

3:00 - 3:30 pm Registration, Science & Mathematics Center Atrium
3:30 - 3:40 pm Welcome & Opening Remarks, Auditorium (Room 120)
   Jennie Aizenman
   Director of the Center for the Advancement of STEM Education (CASE)
   Bridgewater State University
   Arthur Goldstein
   Dean of the Bartlett College of Science and Mathematics
   Bridgewater State University

3:45 - 4:15 pm Plenary Session Auditorium (Room 120)
   Introduction of Plenary Speaker
   Peter Lawrence
   President and Co-founder of Biomimicry New England, Inc.
   Plenary Session
   The Role of Nature in STEM Education
   Sam Stier
   Founding Director of the Center for Learning with Nature

4:20 - 5:20 pm Session I, Concurrent Workshops
5:20 - 5:35 pm Self-Guided Building Tour
5:35 - 6:35 pm Session II, Concurrent Workshops
6:35 - 7:30 pm Buffet Dinner, Rondileau Campus Center Ballroom (Room 206)
7:30 - 8:40 pm Keynote Address, Rondileau Campus Center Ballroom (Room 206)
   Introduction of Keynote Speaker
   Edward Brush
   GreenLab Faculty Coordinator, Professor of Chemistry
   Bridgewater State University
   Keynote Address
   Green Chemistry and Biomimicry in Materials Design
   John Warner
   President and Chief Technology Officer of Warner Babcock Institute for Green Chemistry, LLC
   President of Beyond Benign Foundation

8:40 - 9:00 pm Questions and Discussion

Teaching STEM with Biomimicry, Room 130
Ayora Berry, PTC Academic Program Manager, Boston University Doctoral Student

This workshop is appropriate for Elementary, Middle, and High School Educators. Innovators often look to nature for inspiration. This practice dates back to renaissance thinkers such as Leonardo Da Vinci to current inventors such as Dava Newman from MIT. In this workshop we will introduce biomimicry teaching methods and engage you in a curriculum project that integrates biology, engineering, and art practices. All grade levels welcome and take-away materials included.
Introducing Green Chemistry Using Inspiration from Nature,
Room 477
Kate R. Anderson, Director of Education, Beyond Benign
This workshop is appropriate for Middle and High School Educators.
Engage your students with a biomimicry matching game to spark
interest and curiosity. Introduce key concepts of sustainable science,
green chemistry and engineering with a fun game that promotes
creativity and innovation.

Power of Trees, Room 267
Stella J. Karavas, Chief Executive Officer and David Robert, Chief Artistic
Officer, Voltree Power
This workshop is appropriate for Elementary, Middle and High School Educators.
We will be doing an overview on the science of tree power. We will be
doing a demo on how we are using our tree kit to add the "A" to STEAM
by converting bioelectric signals to art - various media including music.
We would like to request written feedback along with open Q&A.

Keynote Address
Green Chemistry and Biomimicry in Materials Design
John Warner
President and Chief Technology Officer of Warner Babcock
Institute for Green Chemistry
President of Beyond Benign Foundation
Technology has advanced significantly over the past several decades.
We have the ability to manufacture products with amazing complexity and
diversity. But our manufacturing processes typically use high temperatures,
high pressures and hazardous reagents to accomplish the synthetic
transformations necessary. In natural systems we find products of even
greater complexity and diversity, and yet they are "manufactured" in nature
at room temperature, ambient pressure, using water typically as a solvent.
Recognition and understanding these "natural tendencies" allows one to
design processes that have reduced toxicological and environmental
impact. This presentation will include a description of projects at the
Warner Babcock Institute that illustrate the use of molecular level
biomimicry as examples of green chemistry.

John Warner is the recipient of the 2014 Perkin Medal, widely
acknowledged as the highest honor in American Industrial Chemistry. He
received his BS in Chemistry from UMASS Boston, and his PhD
in Chemistry from Princeton University. After working at the Polaroid
Corporation for nearly a decade, he then served as tenured full professor at
UMASS Boston and Lowell (Chemistry and Plastics Engineering). In 2007
he founded the Warner Babcock Institute for Green Chemistry, LLC
(a research organization developing green chemistry technologies) where
he serves as President and Chief Technology Officer, and Beyond Benign
(a non-profit dedicated to sustainability and green chemistry education).
He is one of the founders of the field of Green Chemistry, co-authoring
the defining text Green Chemistry: Theory and Practice with Paul Anastas.
He has published over 200 patents, papers and books. His recent work in
the fields of pharmaceuticals, personal care products, solar energy and
construction and paving materials are examples of how green chemistry
principles can be immediately incorporated into commercially
relevant applications. Warner received The 2004 Presidential Award for
Excellence in Science Mentoring, the American Institute of Chemistry's
Northeast Division's Distinguished Chemist of the Year for 2002 and the
Council of Science Society President’s 2008 Leadership award. Warner
was named by ICIS as one of the most influential people impacting the
global chemical industries. In 2011 he was elected a Fellow of the
American Chemical Society and named one of “25 Visionaries Changing
the World” by Utne Reader.
Plenary Session
The Role of Nature in STEM Education

Sam Stier
Founding Director of the Center for Learning with Nature

The natural world is an endlessly fascinating and increasingly relevant aspect of human culture and technology. Nature-Augmented STEM education is a pedagogical emphasis that holds promise in catalyzing student interest in STEM subjects, improving academic performance and graduation rates, and innovating our way towards a sustainable world. We’ll investigate what role the natural world has beyond biology in enhancing STEM education, into subjects such as engineering, design, general science, chemistry, and math, and we’ll explore the exciting role nature-augmented education has in enriching STEM teachers’ craft and experience working.

Sam Stier is the Founding Director of the Center for Learning with Nature, a non-profit effort providing curricula and professional development to teachers to enrich STEM engagement in the classroom. Trained as an ecologist, Mr. Stier’s scientific research has been published in scientific journals, his curricula has been published in science teachers’ journals, he has published a book with Chelsea House on the Philippines for young readers, and contributed to a book on biomimicry with Candlewick Press for children. Mr. Stier served for several years as an environmental consultant to the World Bank, The U.S. Peace Corps, The Nature Conservancy, Conservation International, and World Wildlife Fund International. He was a National Science Foundation Fellow in Curricula Development, and was appointed to the Next Generation Science Standards Task Force by the Office of Planning and Instruction, Department of Education, for the State of Montana in 2012. For six years, Mr. Stier directed the youth education program at the Biomimicry Institute, established by renowned author and sustainable technology guru Janine Benyus (Biomimicry: Innovation Inspired by Nature). In addition to directing the Center for Learning with Nature, Mr. Stier is also a faculty member at Otis College of Art and Design in Los Angeles, where he teaches Science and Sustainable Design. Mr. Stier holds an M.S. from the School of Forestry and Conservation at the University of Montana, and a B.A. in Communications from Brown University.

He currently lives in Iowa, near his parents and where he grew up as a child and first fell in love with the natural world. He lives with his wife, two sons, two cats, hamster, and – on a good day – the chance appearance of two resident woodchucks in the backyard from the mysterious forest ravine beyond.

Biomimicry: Investigating Innovation Inspired by Nature, Room 461

Rudy Ruggles, President, Future Fixers

This workshop is appropriate for Middle School Educators.

Nature has been creating ingenious solutions to difficult design challenges for billions of years. Biomimicry is the application of these solutions to our modern world. This session will give an overview of this growing field and teach you a fun take on a classic card game that creates the perfect opening for a variety of science, technology, and engineering explorations. This session will focus on middle school classes, although it can easily be adapted to high school level subjects. All participants will receive a special deck of biomimicry cards to use with their students.

Green Chemistry, Biomimicry and Intermolecular Forces, Room 494

Ann Lambert, Chemistry Teacher, King Philip High School

This workshop is appropriate for High School Educators.

Introduce your students to cutting edge technologies inspired by nature. Explore the use of adhesives and intermolecular forces with your students. Investigate how biomimicry is being used by chemists to invent greener alternative products and processes with a case study activity and an accompanying interactive lab.

Inspired by Nature: Connecting Engineering and Biomimicry, Room 222

Kathleen Lambe, Ed.D. Assistant Professor, Fitchburg State University

This workshop is appropriate for Elementary and Middle School Educators.

This hands-on, interactive workshop will provide teachers of students in elementary/middle school with an activity to tie technology and engineering design to the natural world. Participants will explore examples of biomimicry, create their own engineering design for a useful tool or product and share their design with other participants.
Workshop Session II

Biomimicry Activities for Elementary Classrooms, Room 279

Peg LeGendre, Ed.D. K-12 Coordinator, Cambridge Science Festival and Science on the Street

This workshop is appropriate for Elementary School Educators.

Participants will engage in several hands-on biomimicry activities appropriate for elementary classrooms, including Clingons (contrasting household suction cups with octopi and clingfish), Fantastic Flyers (using a wind tube to test nature-inspired flying shapes), Bird Beak adaptations, and Hydrophobicity (Learning from the Lotus and Water-Strider). Participants will leave with activity packets and ideas for 5 minute schoolyard field trips.

Biomimicry in the Science Classroom, Room 283

Dianne McCarthy, Middle School Science Teacher, Ephraim Curtis Middle School

This workshop is appropriate for Middle and High School Educators.

Presentation will include ways to introduce Biomimicry within current curriculum. Suggestions for activities that can be easily incorporated will be shown. Teachers will leave with resources and sample lesson plans that can be adapted for different age levels.

Workshop Session I

Biodesign: Inspiring Invention through Multiple Modes of Inquiry, Room 275

Jennifer Bissonnette, Biological Programs Designer and Melita Morales, EPSCOR/STEAM Engagement & Communications Coordinator, Edna Lawrence- Nature Lab, RI School of Design

This workshop is appropriate for Elementary, Middle and High School Educators.

In this workshop, participants will take part in the design process, using multi-modal inquiry to come up with their own inventions inspired by science + art/design exploration of the form and function of natural history specimens. We will look at how artists at the Rhode Island School of Design make use of the Nature Lab’s collection containing over 80,000 specimens, two 150-gallon aquaria, micro-imaging and GIS labs within the studio environment. This workshop will offer insight into a working definition of STEAM curriculum which we hope will encourage future trans disciplinary collaborations between art and science teachers.

Biomimicry & Engineering, Room 174

Mike Smith, Program Director, New England Science & Sailing

This workshop is appropriate for Middle and High School Educators.

Throughout the history of life on earth, nature has gone through a process of trial and error to refine living organisms, processes, and materials. What can you learn from nature? Examine designs found in our natural world and make comparisons, evaluations, and connections to many things in our everyday lives. We will design new product plans and prototypes.

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Learning with the New Agile Atoms DNA/RNA Sets, Room 261
Kathy Vandiver, Director and Amanda Mayer, Coordinator, Community Outreach Education and Engagement Core, Center for Environmental Health Sciences, Massachusetts Institute of Technology
This workshop is appropriate for Middle and High School Educators.
The Agile Atoms nucleotides are a “step up” from the LEGO brick prototypes we created previously at MIT. This is an opportunity to learn about the dynamic nature of these playful educational tools that are now available. Participants will: 1) explore DNA structure by assembling genes from nucleotides; 2) emulate DNA replication at a basic or advanced level (leading/lagging strand) and 3) try out the molecular processes of transcription and DNA repair as well.

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