Twentieth Annual American Society for Microbiology
CONFERENCE FOR UNDERGRADUATE EDUCATORS

20 YEARS OF VISION, CHANGE & LEADERSHIP
MAY 16-19, 2013
THE INVERNESS HOTEL AND CONFERENCE CENTER
ENGLEWOOD, COLORADO

FINAL PROGRAM

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The 21st Annual
ASM Conference for Undergraduate Educators
May 15 - 18, 2014
Boston, Massachusetts

• Located in the Boston Metropolitan Area
• Held jointly with asm2014 to be held May 15 - 20, 2014
• Plenty of opportunities to share your best practices with colleagues

Preliminary Program Available November 2013
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<td>Microbial Ecology of the Human Lung during HIV Infection</td>
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<td>9:45 – 10:45 am</td>
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<td>11:00 am – 12:00 pm</td>
<td>• Developing and Assessing Principle-Based, Scientific Reasoning in Your Students</td>
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<td>9:45 – 10:45 am</td>
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Welcome

Welcome to beautiful Englewood, Colorado!

It is our pleasure to have you join us for the 2013 American Society for Microbiology Conference for Undergraduate Educators (ASMCUE). This is our twentieth anniversary celebration, and registration numbers are at a record high! Our conference theme, “20 Years of Vision, Change and Leadership” recognized this auspicious moment.

Part of the theme is also derived from the recognition in the document, Vision and Change in Undergraduate Education: A Call to Action published in 2011 by AAAS and funded by NSF. The report states that ASMCUE serves “as a venue that advances the scholarship of teaching and learning in biology.” This recognition is only possible because of wonderful community of people like you who strive for excellence, share your best practices and are willing to work together to reach a common goal. Keep up the great work! ASMCUE continues to be a major reason why ASM is a leader among scientific societies in teaching and learning professional development.

We have a great line up of plenary speakers including:
- Joseph Petrosino, Metagenomic Approaches for Microbiome Association and Disease Etiology Discovery
- Katrina Edwards, Intraterrestrial Life on Earth
- Graham Hatfull, Bacteriophage Discovery and Genomics: A Broadly Applicable Platform for Introducing Novice Scientists to Authentic Research
- A panel discussion from LINK: Leaders Inspiring Networks and Knowledge, an NSF-funded ASM program

We have worked hard to put together an outstanding conference program in a wonderful venue. We would like to sincerely express our appreciation to local organizers, Drs. Aimee Bernard and Timberley Roane, who were invaluable in providing expertise to help us find talented local speakers for many of our sessions. As always, the staff of ASM have been exceptional and gone above and beyond to help us make the conference a success. Do take a moment to thank them!

Some program highlights for this year are:
- In response to last year’s attendee feedback we are offering a new session track presenting different assessment tools and techniques
- Several resource sessions sponsored by LINK
- Eight different concurrent scientific sessions to choose from
- Concurrent pedagogy sessions focused on hot topics such as online learning, flipping the classroom, case study learning, and undergraduate research
- Sessions from PULSE: Partnership for Undergraduate Life Sciences Education, a joint effort of HHMI, NSF, and NIH to transform at the department level all institutions of higher learning related to life science, according to the recommendations in the Vision and Change document. Multiple PULSE Fellows will be present.
- Two presentations from the American Academy of Microbiology, on West Nile Virus and the Microbiology of Beer
- A special evening poster session reviewing the history of ASMCUE and celebrating our future

This year, ASMCUE is again meeting in conjunction with the ASM General Meeting and attendees will have an optional “field trip” to attend the asm2013 keynote sessions together.

This year’s conference promises to have something for everyone. We hope that you take advantage of all the opportunities to network with fellow like-minded colleagues, forge new friendships, and rekindle old ones. As you contribute, you can’t help but develop professionally while making a difference in our community, conference and society. We know because we’re not just organizers, we’re attendees too!

Sincerely,

Chair,
Todd Primm
Sam Houston State University,
Huntsville, Texas

Vice Chair,
Mary Mawn
SUNY Empire State College,
Saratoga Springs, New York

Abstract Review Chair,
Robyn Puffenbarger
Bridgewater College,
Bridgewater, Virginia

Microbrew Review Chair,
Jennifer Herzog
Herkimer County Community College, Herkimer, New York
Conference Planning Committee

20 Years of Vision, Change and Leadership
20th Annual ASM Conference for Undergraduate Educators
The Inverness Hotel and Conference Center
May 16-19, 2013

ASMCUE STEERING COMMITTEE

Todd Primm, Chair
Sam Houston State University, Huntsville, TX

Mary Mawn, Vice Chair
SUNY Empire State College, Saratoga Springs, NY

Robyn Puffenbarger, Abstract Review Chair
Bridgewater College, Bridgewater, VA

Jennifer Herzog, Microbrew Review Chair
Herkimer County Community College, Herkimer, NY

Aimee Bernard, Local Organizing Chair
University of Colorado, Denver, CO

Timberley Roane, Local Organizing Chair
University of Colorado, Denver, CO

ABSTRACT REVIEWERS

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Bridgewater College, Bridgewater, VA

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Washington State University, Pullman, WA

Stephen Nold
University of Wisconsin-Stout, Menomonie, WI

Naomi Wernick
University of Massachusetts Lowell, Lowell, MA

Amy White
Virginia Western Community College, Roanoke, VA

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Jennifer Herzog
Herkimer County Community College, Herkimer, NY

Michael Hanophy
St. Joseph’s College, Brooklyn, NY

Suzanne Long
Monroe Community College, Rochester, NY

Heidi Smith
Front Range Community College, Fort Collins, CO

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Chair, Education Board
The Ohio State University, Columbus, OH

Susan Merkel
Chair, Committee on Undergraduate Education
Cornell University, Ithaca, NY

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Kelly Gull
Manager, Faculty Programs

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Michelle Slone
Coordinator, Faculty Programs

Lyndsey Van Druff
Coordinator, Community Services and Support

American Society for Microbiology
Education Department
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Washington, DC 20036
ph: 202-942-9317
fx: 202-942-9329
Email: asmcue@asmusa.org
Conference Steering Committee

Todd Primm, Vice Chair, is an associate professor in the Department of Biological Sciences at Sam Houston State University, a comprehensive university in Texas with 18,000 students. He was the 2010 Distinguished Alumnus of the Graduate School of Biomedical Sciences of Baylor College of Medicine, where he earned a Ph.D. in biochemistry studying protein folding. He came to microbiology during his post-doc at NIH in the Tuberculosis Research Laboratory. His scientific research focuses on early drug discovery, bacterial pathogenesis, and microbial biomes in animals. His educational research is currently examining effectiveness of different active learning methods in the classroom and inquiry-based learning in exploratory labs. He is currently the President of the Texas ASM Branch, an ASM Biology Scholar, and an NIH/NSF/HHMI PULSE Fellow. He teaches general microbiology for majors, pre-nursing microbiology, cell biology for majors, and immunology.

Mary Mawn, Vice Chair, is an assistant professor and academic area coordinator in science, mathematics, and technology at the Center for Distance Learning, SUNY Empire State College, Saratoga Springs, NY, where she teaches courses in microbiology, genetics, molecular and cellular biology, and science education. Dr. Mawn earned a B.S. in biochemistry from the College of Mount Saint Vincent, Riverdale, NY, and an M.Ed. in educational technology and Ph.D. in molecular and cellular biology from the University of Massachusetts Amherst, where she studied ribosome structure and function in Escherichia coli and Saccharomyces cerevisiae. Her current research interests focus on identifying ways to teach scientific process skills in online undergraduate science courses, and promoting the professional development of science teachers through distance learning. She is a 2009-2010 ASM Biology Research Scholar.

Robyn Puffenbarger, Abstract Review Chair, is associate professor of biology at Bridgewater College, a private, liberal arts school with 1800 students. She has a bachelor’s of sciences in biology from Virginia Tech, and a Ph.D. in molecular immunology from the Medical College of Virginia. Her scientific research project range from the gene expression of the endocannabinoid system to determining the antigens involved in the immune response of turkeys infected with Bordetella avium. She was an ASM Biology Research Scholar in the 2012 cohort and is currently serving as Secretary of the Virginia Branch of ASM. Her research work in education is focused on increasing learning gains in introductory courses in genetics.

Jennifer Herzog, Microbrew Review Chair, is an assistant professor at Herkimer County Community College in Upstate NY. She received her graduate degrees at the Yale University School of Medicine, where she studied the pathogenesis of Kaposi’s Sarcoma Herpesvirus (KSHV). Jen currently teaches microbiology and non-majors general biology at HCCC, and has developed nearly 10 online or hybrid science courses. She has a strong interest in developing novel teaching strategies for science education and has developed programs for K-career microbiology education. Professionally, Jen has been an active member of the American Society for Microbiology for nearly 20 years, most recently serving at Section Chair for MicrobeLibrary and a regular contributor to ASM’s Journal of Microbiology & Biology Education. She currently serves as the digital author on two of McGraw-Hill's top selling microbiology textbooks. Jen's only hobby these days is spending time with her two children and drinking vast amounts of coffee.
Local Organizing Committee

Aimee Bernard, Local Organizing Chair, is a senior instructor in the Department of Integrative Biology at the University of Colorado Denver. Dr. Bernard earned her Ph.D. in immunology at the University of Rochester in 2001. She pursued postdoctoral studies at the Barbara Davis Center for Childhood Diabetes from 2001-2002 in a lab focused on the developmental biology of the pancreas and gastrointestinal system and at National Jewish Health from 2002-2006 in a lab focused on B cell biology and signaling. For the past six years she has taught immunology, molecular biology, virology, and general genetics to biology majors. In addition, Dr. Bernard has been the sole faculty member responsible for oversight of the for-credit biology internship course offered at UC Denver. In 2010, Dr. Bernard won the non-tenure track University of Colorado Denver College of Liberal Arts & Sciences Excellence in Teaching Award. In the summer of 2011 Dr. Bernard attended the HHMI/NAS Mountain West Summer Institute on Undergraduate Education in Biology as a participant and returned the following summer (2012) as a facilitator. During the 2013 ASMCUE, Dr. Bernard will co-present, “Doing the Classroom Flip: Are You Ready to Turn Your Classroom on its Head?,” sharing her experience using this pedagogical method in her current courses.

Timberley Roane, Local Organizing Chair, is an associate professor in the Department of Integrative Biology at the University of Colorado Denver. Dr. Roane earned her Ph.D. in soil, water and environmental science at the University of Arizona. She joined the faculty at the University of Colorado Denver in 1999, establishing a research program investigating microbial responses to chemical toxicity and functional roles of microorganisms. For the past twelve years she has taught microbiology to biology majors, as well as courses in microbial ecology and soil microbiology. In addition, she is the Director of the Biology M.S. Program, and actively mentors both undergraduate and graduate students, sponsors undergraduate and graduate research, and participates in biology curriculum development.

ASMCUE 2013 has gone mobile using Guidebook!

Download our FREE mobile guide to enhance your experience at ASMCUE 2013:

- create a personalized schedule
- browse speaker abstracts and biographies
- browse Poster Session and Microbrew abstracts
- browse exhibitors, maps and general show info

To get the guide, choose one of the methods below:

- Download ‘Guidebook’ from the Apple App Store or the Android Marketplace
- Visit http://guidebook.com/getit from your phone’s browser
- Scan the above image with your mobile phone (QR-Code reader required, e.g. ‘Red Laser’, ‘Barcode Scanner’)

The guide will be listed under the "Download Guides" section of the application.
General Information

Conference Statistics
There are 395 participants, compared to 337 in 2012. Of those registered, there are:

- 350 conference attendees and 45 exhibitors
- 286 ASM Members and 64 nonmembers (among the faculty participants)
- 45% first-time attendees
- 22 international attendees representing 15 countries
- 35 conference attendees registered for the Microbes are Fun 5K Run
- 173 conference attendees registered for the asm2013 field trip on Saturday
- 215 conference attendees registered for the asm2013 one-day pass on Sunday

Abstracts

Badges
Badges, available at registration, are required to enter all sessions and the Exhibit Hall. Your badge will be specially marked if you have registered for the asm2013 Sunday pass, purchased asm2013 field trip pass, or plan to participate in the Microbes are Fun 5K Run. Please consider your badge your entry ticket.

Internet Connection
Complimentary wireless service is provided in the following designated areas of the hotel: lobby, meeting space, and attendee hotel room.

Microbrew Sessions
These grassroots sessions, arranged by topics, provide a forum for sharing best practices and interesting activities used in laboratory and classroom teaching. Presentations are simple "chalk talks" (e.g., no PowerPoint) to facilitate informal discussion. Unlike the poster sessions, Microbrews do not require assessments. Sessions will be facilitated by volunteer attendees in order to make sure each presentation stays within the 15-minute presentation (10-minute presentation and 5 minutes for discussion). Sessions must stay on time so attendees are able to move from room to room quickly to see their desired session.

Microbrew Session I: Saturday, May 18, 10:30 AM – 11:30 AM
SESSION A: 10:30 AM
SESSION B: 10:50 AM
SESSION C: 11:10 AM

Microbrew Session II: Saturday, May 18, 2:30 PM – 3:30 PM
SESSION D: 2:30 PM
SESSION E: 2:50 PM
SESSION F: 3:10 PM

Poster Sessions
Poster sessions will be held Saturday, May 18, from 9:15 AM to 2:30 PM in Summit Ballroom. Two sessions are planned:

*Session A:* Author Presentations: Saturday, May 18, 9:15 AM – 10:15 AM
*Session B:* Author Presentations: Saturday, May 18, 1:30 PM – 2:30 PM

Presenters must set up and take-down/remove their posters according to the following schedule:

**Set up:** Friday, May 17, 3:00 PM – 6:00 PM
**Take down:** Saturday, May 18, 3:00 PM – 4:00 PM

Any posters left after Saturday’s take-down period will be discarded. The poster must fit into a 4’ (height) x 8’ (width) area.
Registration
Registration times and locations are listed below. Program books and badges are available at registration.

Thursday, May 16
2:00 PM – 8:00 PM – Hotel Lobby

Friday, May 17
7:00 AM – 8:00 PM – Hotel Lobby

Saturday, May 18
7:00 AM – 3:30 PM – Hotel Lobby

Microbes are Fun 5K Run (Registered Participants Only)
Registered participants will meet on Saturday, May 18 at 5:45 AM at the Inverness Hotel entrance. Someone will be on hand to walk you to the race starting location. The race will start promptly at 6:00am.

ASMCUE & asm2013 TRANSPORTATION

ASMCUE & asm2013 Locations
All ASMCUE sessions are held approximately 30 miles south of the Denver International Airport and 16 miles south of downtown Denver.

A - Denver International Airport (DEN)

B - The Inverness Hotel and Conference Center
200 Inverness Drive West
Englewood, CO 80112

C - Colorado Convention Center (site of asm2013)

Transportation for asm2013 Field Trip - Saturday, May 18
Attendees who registered in advance for the field trip Saturday evening to the asm2013 Opening Session and Reception will be provided with bus transportation to and from the Inverness Hotel and the Colorado Convention Center.

Buses to the Colorado Convention Center will load at 3:45 PM on Saturday and return to the Inverness Hotel around 9:30 PM. Badges will be marked with “asm2013 field trip” for registered attendees and serve as bus tickets.

Transportation to asm2013 - Sunday, May 19
Attendees who registered in advance for the complimentary one-day registration pass to attend asm2013 sessions will be provided with a special badge to gain access. Participants need to arrange transportation to the Colorado Convention Center on Sunday. Attendees can take a taxi or take the hotel shuttle to the RTD Light Rail and RTD Trip Planner. To get to the Convention Center attendees can go to either the Dry Creek or County Line Station and take Route 101 (schedule) to Theatre District/Convention Center Station for about $4 each way.

Hotel Shuttle
Complimentary shuttle is available to take attendees within a 5-mile radius of hotel which includes the Dry Creek and County Line Light Rail Stations from 6:00AM to 11:00PM. For a list of activities surrounding the hotel: Hotel Shuttle (pdf).

Special Events and Networking

Join us for a little work, a lot of networking, and just enough fun as we celebrate 20 years of teaching excellence!

ASMCUE has a reputation as a "working conference." Since its inception, when 100 educators came together to draft a core curriculum for microbiology, attendees have continued to develop resources to
advance excellence in teaching. Throughout the years, attendees have reviewed and developed resources for ASM's MicrobeLibrary and the Journal of Microbiology & Biology Education (JMBE). This year will be no different.

Please take a look at the events below to discover how 2013 ASMCUE attendees will be asked to lend their expertise in advancing ASM guidelines, participate in various networking opportunities, show their "school spirit" throughout the conference and, most importantly, envision the next 20 years.

Also, here is a great JMBE Perspective article by ASM Education Director, Amy Chang. Read through this celebration of how far the community has come and be inspired to think about the future: A Retrospective Look at 20 Years of ASM Education Programs (1990-2010) and a Prospective Look at the Next 20 Years (2011-2030)

The working lunches...

ASM Curriculum Guidelines: The Next Generation
Friday, May 17 at 11:45 am-1:45 pm


Our vision is that the community of microbiology educators will use these guidelines to define their own course learning goals, and that students in introductory microbiology courses gain a universal understanding of these core concepts. The success of the guidelines rests on the ability and willingness of the community of microbiology educators to adapt their teaching methods to address these learning goals, and then plan assessments to assure that students have met those goals. We hope educators will relate the core concepts to authentic examples, and engage students in active learning.

This session will begin with an overview of the guidelines and goals, followed by a short training session in how to write learning objectives that can align with effective assessments. Attendees will then break out into groups representing the six core concepts and write learning objectives related to the fundamental statements. Participants will also produce a list of appropriate assessment tools that would allow evaluation of student learning towards each learning objective.

After this session, participants should be able to:

- Explain how the new curricular guidelines can be used to support the understanding of core concepts;
- Write learning objectives based on the fundamental statements in the curricular guidelines; and
- Choose and design types of assessments that support the learning objectives.

The PULSE Community: Moving from "Vision" to "Change" in the Undergraduate Life Science Education
Saturday, May 18 at 11:30 am-1:30 pm

What will it take to bring about the necessary transformation of STEM higher education described in Vision and Change? PULSE (Partnership for Undergraduate Life Sciences Education) is a joint effort by National Science Foundation (NSF), National Institutes of Health (NIH) and Howard Hughes Medical Institute (HHMI) to stimulate systemic change in biology departments of post-secondary educational institutions. The PULSE Leadership Fellows are tasked with facilitating pathways to foster change in undergraduate life science education. This session will share the PULSE action agenda and the work to date, to facilitate communication with the broader scientific community and engage members of professional societies to incorporate their best teaching practices and their other efforts to implement change in life science education. Over lunch, attendees will breakout into groups to discuss best practices in fostering departmental and institutional change and make recommendations for stimulating change.
The networking...

Sharing Issues, Finding Local Support, and More

One of the top reasons attendees give for attending ASMCUE is the opportunity to network with fellow educators. Meals at the Conference are intentionally served as a group to allow a time and place for this important networking to occur. This year, the three breakfast meals have been organized to maximize attendee interaction.

Friday - Breakfast by Topical Areas
Several issues have been identified by the Steering Committee such as implementing the lab safety guidelines, community colleges issues, online learning, teaching large labs, and more.

Saturday - Breakfast by Location
ASM's supports thirty-five Branches organized by geographical territories that are defined by one or more states and/or zip code areas. On site, attendees will receive information about their branch and region, be encouraged to meet others in the same vicinity, and plan branch activities. International attendees will have an opportunity to meet as well.

Sunday - Free for All!
You are on your own! Take a chance. Sit at a table where you recognize no one. Experienced faculty, introduce yourself to a first-timer. First-timers, hobnob with a speaker or ASM leader. Go outside your comfort zone! You never know, you may meet a collaborator or a friend for life. Many close friendships were born and nurtured at an ASMCUE meeting.

ASM Faculty Programs Poster Session and Reception – A Walk Down Memory Lane and Visioning the Future
Friday, May 17 at 6:00 pm-8:00 pm
Join us to celebrate and reminisce about the past 20+ years of ASM faculty development programs, from the original movement to create an ASM membership category for educators, on to the birth of ASMCUE, the development of online education resources such as MicrobeLibrary and the Journal of Microbiology & Biology Education (JMBE) and faculty training institutes. Meet the volunteers who developed the vision for and helped to implement these resources. Have fun looking through historical photos and recollections. Most importantly, stop by the “Visioning Poster” and take time to dream about what the NEXT 20 years should look like and the role you would like to play in improving educational opportunities for faculty and developing students.

The fun...

ASMCUE Spirit Week: Dress for Microbial Success!

Thursday Night Reception – T-Shirt Design Fashion Show
Have you designed a microbial inspired t-shirt? Enter the Project Microbe Fashion Show and strut your best design down the runway. Attendees will cast their vote for the Project Microbe Runway Winner! Enter when you check-in at the registration desk on Thursday!

Friday – College and University Spirit Day
Represent your college or university! Break out your school jacket, t-shirts, ties & polos and show us your school spirit!

Saturday – Identify Your Community Day
Wear your “community” colors and represent your institution type so you can identify and network with your colleagues.

Community College = BLUE
Primarily Undergraduate Institution = GREEN
Comprehensive University = ORANGE
Doctoral-Degree Granting University = RED
International = PURPLE
Microbes are FUN 5K Run (Registered Participants Only)
Saturday, May 18 at 6:00 am-7:00 am

Registered participants will meet at 5:45 am at the Inverness hotel entrance. Someone will be on hand to walk you to the race starting location. The race will start promptly at 6:00 am. A map of the marked course is available: http://goo.gl/maps/n3bH3. Participants will receive a special “race swag bag” at the finish line which includes a t-shirt sponsored by John Wiley & Sons, Inc. and logo created by Imagineering, bottled water, snacks, and a surprise microbe! Prizes will be given for 1st, 2nd, and 3rd place finishers. The 5K will be held rain or shine. Although it is too late to register to run, ASMCUE attendees are welcome to come out and cheer their colleagues.

The collaborations...

ASM-NSF Leaders Inspiring Networks and Knowledge (LINK) Initiative
Thursday, May 16 at 6:45 pm-7:45 pm
Friday, May 17 at 8:00 am-9:00 am; 9:15 am-10:15 am; and 3:15 PM – 4:15 PM
Saturday, May 18 at 8:00 am-9:00 am

Join NSF research investigators in discussions about collaborations that simultaneously promote and sustain high quality undergraduate research, education and mentoring. Form an ASM LINK Mentoring Team and change how students prepare for scientific careers in the future. Learn more at multiple sessions planned throughout ASMCUE. The ASMCUE serves as a crossroad for linking research investigators with teaching scholars and undergraduate students.

ASMCUE/AAM Joint Program – Session to Delve into the Microbiology Behind News Events
Friday, May 17 at 10:30-11:30 am and 2:00 pm-3:00 pm

The ASM Education Board and the American Academy of Microbiology will sponsor two “frequently asked question” (FAQ’s) sessions:
- If the Yeast Ain’t Happy, Ain’t Nobody Happy: The Microbiology of Beer
- West Nile Virus

In an effort to identify resources that deepen students’ understanding about these topics, the AAM solicits innovative approaches from the ASM educator community. The FAQ Series is available at the Academy website.

ASMCUE/asm2013 Joint Program – Opening Keynote Session and Reception
Saturday, May 18 at 5:00 pm-8:30 pm

Back by popular demand, the Saturday evening “field trip” to the Opening asm2013 Keynote Session and Reception features:

- Bacterial Cell Cycle Regulation: Location, Location, Location
  Christine Jacobs-Wagner; Yale University
- The Killers, the Cures, and the Limits of Life: Frontiers of Science in the Unseen World
  Nathan Wolfe; Metabiota
- Engineering by Evolution
  Frances H. Arnold; ASM Lecturer; California Institute of Technology

ASMCUE/asm2013 Joint Program - Complimentary Pass for Sunday Registration at asm2013
Sunday, May 19

Attend Sunday sessions planned at asm2013. Check the asm2013 preliminary program for schedule.

(Attendees must have registered in advance for both of these opportunities. On-site registration is not available. Transportation is provided on Saturday but NOT provided on Sunday. Please refer to pg. 9 for transportation information.)
Announcing the 2013 ASMCUE Textbook Travel Award Winner!

Drew Rholl, Ph.D., a professor at North Park University in Chicago, IL is the 2013 ASMCUE Textbook Travel Awardee. The award is targeted toward new microbiology faculty members and provides an opportunity for educators to become familiar with undergraduate education research and to learn new instructional pedagogies. Because Rholl’s Early-Career Faculty Travel Award application was considered particularly exceptional, the reviewers agreed that he should receive this year’s Textbook Travel Award.

Funding for the Textbook Travel Award derives from a special endowment created in 2008 by several textbook authors committed to faculty development and ASMCUE. The authors sponsoring this endowment include Robert Bauman at Amarillo College, Texas; Barry Chess at Pasadena City College, California; Marjorie Cowan at Miami University, Ohio; Jeffrey Pommerville at Glendale Community College, Arizona; Kathleen Talaro at Pasadena City College, California; and Christopher Woolverton at Kent State University, Ohio.

Faculty Enhancement Program Awardees
The Faculty Enhancement Program is sponsored by the ASM Committee on Minority Education and supports the ASMCUE participation of non-ASM members who teach microbiology and biology at institutions serving minority and underserved populations.

- William Coons, Victoria College, Victoria, TX
- Robin Hulbert, Mission College, Santa Clara, CA

Early-Career Travel Awardees
The Early-Career Travel Award supports the ASMCUE participation of early-career undergraduate faculty, postdoctoral scientists, or senior-level graduate students interested in teaching careers.

- Gaurav Arora, Georgetown University, Washington, DC
- Amy Beumer, Richard Bland College of the College of William and Mary, Petersburg, VA
- Maria Gabriela Bowden, University of Houston-Downtown, Houston, TX
- Bryan Dewsbury, Florida International University, Miami, FL
- Scott Gabriel, Viterbo University, La Crosse, WI
- Brittany Gasper, Florida Southern College, Lakeland, FL
- Barbara Juncosa, Citrus College, Glendora, CA
- Ashwini Kucknoor, Lamar University, Beaumont, TX
- Laura MacDonald, University of Arkansas for Medical Sciences, Little Rock, AK
- Dominic Salerno, Community College of Philadelphia, Glenside, PA
- Veronica Segarra, University of Miami Miller School of Medicine, Miami, FL
- Tanya Soule, Indiana-Purdue University, Fort Wayne, IN
- Scott Tanner, University of Alabama at Birmingham, Hoover, AL
- Regina Wilson, University of Medicine and Dentistry of New Jersey, Newark, NJ

ASM-NSF LINK Travel Awardees
The ASM-NSF LINK Travel Award supports the ASMCUE participation of active researchers with the commitment to connect with mid- or early-career and future faculty instrumental in student learning in undergraduate biology.

- Heike Bücking, South Dakota State University, Brookings, SD
- Michael Ibba, The Ohio State University, Columbus, OH
- Michael Polymenis, Texas A&M University, College Station, TX
- Joanne Willey, Hofstra University, Hempstead, NY
ASM Leadership Grant for International Educators
This program is sponsored by the ASM International Education Committee and has been developed to enable a select group of educators from resource-limited countries to attend the ASMCUE and a pre-conference workshop to provide international leaders in education with the resources to build innovative teaching modules that engage students and lead to enduring understandings in microbiology.

- Laura Alché, School of Natural and Exact Sciences, Buenos Aires, Argentina
- Nagi Alhaj, Sana’a University, Sana’a, Yemen
- Nydia Alejandra Castillo Martínez, Universidad Autonoma de Baja California, Tijuana, Mexico
- Hafizah Yousuf Chenia, University of Kwazulu-Natal, Durban, South Africa
- Gizachew Andualem Demessie, Haramaya University, Harar, Ethiopia
- Carmen Indira Espino, University of Panama, Panama City, Panama
- Shishir Gokhale, Manipal College of Medical Sciences, Pokhara, Nepal
- Sughra Hasan, Jinnah University for Women, Karachi, Pakistan
- Sayyada Ghufraana Nadeem, Jinnah University for Women, Karachi, Pakistan
- Oyetayo Victor Olusegun, Federal University of Technology, Akure, Nigeria
- Pamela Pennington, Universidad del Valle de Guatemala, Guatemala, Guatemala
- Asri Wulandari, Universitas Padjadjaran, Bandung, Indonesia

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**ASM Scavenger Hunt & Raffle**

The ASMCUE organizers invite you to participate in a scavenger hunt! In this game the clues you will gather will be other attendees. Check your attendee packet for a yellow handout of instructions. This will also serve as your raffle entry. Read the instructions below carefully and you could win fabulous prizes donated by our generous sponsors!

**Instructions:** Find ASMCUE participant whose role is described on the handout. Place their name next to the appropriate description. Each participant’s name may appear ONLY ONCE on this sheet (yours included!). To be considered for the raffle, you must have at least 20 names.

**Form submission and raffle drawing:** Forms must be placed in the raffle box at ASM registration table by Saturday by 12:15 pm. The raffle drawing will take place in the Exhibit Hall during Poster Session B. Be certain to put your name and institution on the form so we can award your prize. **You must be present to win!**

The American Society for Microbiology thanks the following sponsors and exhibitors for their generosity in donating raffle prizes.

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**Scavenger Raffle Prize Sponsors**

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- Morton Publishing Company
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Pearson  
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**Exhibitor Showcase**

*Friday, May 17, 6:00 PM – 8:00 PM and Saturday, May 18, 9:00 AM – 3:30 PM*  
*The Inverness Hotel and Conference Center - Summit Ballroom*

Exhibitors may set up on Friday 3:00 PM – 6:00 PM. Exhibits must be dismantled by 3:30 PM on Saturday.
Exhibitors

ASM Membership
Washington, DC
www.asm.org

As the oldest and largest single life science membership organization in the world the American Society for Microbiology provides a voice for the science of microbiology to over 34,000 members worldwide. Of particular importance is fostering and helping develop the scientists of tomorrow through products and programs for the student and postdoctoral community including: eligibility for travel awards; access to grants and fellowships; job resources through Career Connections; access to Microbe Magazine; member discounts on meetings; access to mentorship; grant writing facilitation; and more.

ASM Press
Washington, DC
estore.asm.org

ASM Press, the book publishing division of the American Society for Microbiology, is the premier publisher of microbiology titles. Dedicated to the science of microbiology, ASM Press publishes a broad selection of content, including textbooks, references, monographs, and general interest titles that are used as the foundational texts in colleges and universities and as reference materials in laboratories and governmental agencies worldwide. ASM Press also publishes EcoSal Plus and Microbiology Spectrum, periodicals that review focused microbiology topics. ASM Press content is subjected to a rigorous peer review and development process. These trusted resources are used globally and have been translated into multiple languages.

Sponsored Author Corner:

Featured Author: Joseph E. Peters

Saturday, May 18, 9:45 AM, ASM Press Exhibit Booth

Molecular Genetics of Bacteria, 4th edition

Join us for a discussion with Dr. Joseph E. Peters, a co-author of the widely-anticipated fourth edition of Molecular Genetics of Bacteria. During this author corner, Dr. Peters will discuss key changes in the fourth edition. While the same chapter order has been maintained to facilitate adoption of the new edition, many sections have been reorganized to reflect a more modern perspective and to make the material easier to understand. Dr. Peters will also provide information on creating an active learning classroom, including ways to engage students and teach concepts. Finally, Dr. Peters will also provide information on instituting new ASM Curricula Guidelines, and how Molecular Genetics of Bacteria fits within these guidelines.

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Hands-On Labs (HOL) revolutionized the migration of online science education through LabPaqs, meeting the challenge of achieving equal results to on-campus lab environments. As leaders in the industry, HOL is now proud to offer the next generation in distance education utilizing technology to increase learning opportunities for students, inspire and excite educators, and expand the learning horizon beyond the campus.

Sponsored Product Corner:

Featured Product: LabBridge Microbiology

Saturday, May 18, 9:45 AM, Conference Room C

Laboratories are a fundamental part of the educational experience in the sciences, integral to providing students the opportunity to combine their scientific knowledge with technical skills and critical thinking. With the increasing interest by students and institutions in online educational opportunities, a fundamental question arises as to how to provide a meaningful lab experience in the distance education (online) model. Enter LabBridge Solutions – the science laboratory solution for the 21st century! Faculty can integrate the LabBridge Solution that best works with their course curriculum, and students can complete safe, engaging, and meaningful laboratory experiences at home. Once adopted by the faculty, the LabBridge Solutions kits are sent directly to students with all the scientific materials needed to complete hands-on Microbiology experiments in a safe, effective, and meaningful manner. The experiments are written by Microbiology teaching faculty focused on providing the highest quality, educationally valid, and professionally appropriate skills and knowledge. The laboratory content models the process of science, so while students are learning science, they are practicing science. The laboratory experience is presented to students in guided learning modules to set students up for success in the distance learning environment. Pre-lab self-assessment and content review provides students the necessary knowledge to engage purposefully in the experiments; experiments require students to collect their own data and discuss their findings; evaluation assesses the skills
and knowledge students have gained. LabBridge Solutions complement instructor and institutional goals in offering the best distance education laboratory opportunity, while simultaneously providing an avenue for students to engage in meaningful Microbiology experiences!

Imagineering
Toronto, ON, Canada
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Imagineering operates a creative studio dedicated to the development, rendering and utilization of very high-end digital artwork, animations and simulations for the life and physical sciences community. We began as a small art house creating custom illustrations for medical textbook publishers in 1996. Since that date we have become known as the studio of choice for high quality, content intensive, life sciences based digital artwork. With the advent of various applications for mobile technology products, we are currently expanding our capabilities to enable us to deliver a full suite of composition, art and animation products suitable for delivering complete textbooks to any current output medium.

MEET MIKEY THE MICROBE!

Thank you to Imagineering for creating our first mascot for ASMCUE!
Inspired by David Westenberg, Chair, ASM K-12 Committee on Outreach

MICROBES ARE FUN 5K RUN
Sponsored Author Corner:

Featured Author: Jacquelyn Black

Saturday, May 18, 9:15 AM, Wiley Exhibit Booth

Microbiology: Principles and Explorations, 8th edition

Jacquelyn Black’s bestselling textbook delivers a student-friendly approach that provides readers with a thorough and accessible introduction to the study of microbiology. This new edition amplifies the core concepts, focuses on key details, and includes a more robust visual program to engage students in an interactive experience.

Sponsored Product Corner:

Featured Product: WileyPLUS and Kno Ebooks

Saturday, May 18, 9:45 AM, Conference Room B

See first-hand how WileyPLUS for Microbiology can enhance your course. WileyPLUS is a research-based, online environment for effective teaching and learning that integrates the digital textbook with effective resources to fit every learning style.

With dozens of free, interactive features, Kno makes learning more engaging, “hands-on”, and efficient. In addition to lower pricing, students can search content, take notes, highlight key materials, and have all their work in one place for more efficient studying. Instructors are given tools like Social Sharing, Smart Links, and Quiz Me. Students are also given tools such as Journal, Advanced Search, and Flashcards.

Sponsored Author Corner:

Featured Author: David Wessner

Saturday, May 18, 1:30 PM, Wiley Exhibit Booth

Microbiology, 1st edition

David’s Wessner’s Microbiology 1st edition helps to develop a meaningful connection with the material through the incorporation of primary literature, applications and examples. The text offers an ideal balance between comprehensive, in-depth coverage of core concepts, while employing a narrative style that incorporates many relevant applications and a unique focus on current research and experimentation. Rather than presenting material as discrete pieces, Wessner frames information around the three pillars of physiology, ecology and genetics; which highlights their interconnectedness and helps students see a bigger picture. Wessner presents microbiology as a fascinating field of exploration and experimentation-connecting students with science.
At ASMCUE, you be able to preview some of our valuable materials, enjoy refreshments at the Wiley booth, and go home with exciting resources. While you’re there, get to know your colleagues who share your passion for science and education as you enjoy everything Wiley has to offer.

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**Sponsored Author Corner:**

Featured Author: Jeffrey Pommerville

*Saturday, May 18, 2:00 PM, Jones & Bartlett Learning Exhibit Booth*

*Fundamentals of Microbiology, 10th edition*

Jeffrey Pommerville continues the success of his best-selling, award-winning classic text with a fully revised and updated tenth edition. Providing a firm foundation in microbiology, this edition features new and revised pedagogical elements throughout that encourage students to participate in the scientific investigation process and challenges them to apply the process of science and quantitative reasoning through related actual experiments.

**Journal of Microbiology & Biology Education**
Washington, DC
[JMBe.asm.org](http://JMBe.asm.org)

The *Journal of Microbiology & Biology Education (JMBE)* is sponsored by the American Society for Microbiology (ASM; [www.asm.org](http://www.asm.org)) a professional life science society with more than 39,000 members in the United States and abroad. JMBE publishes original, previously unpublished, peer-reviewed articles. The scientific scope of the journal is rooted in microbiology while branching out to biology. The educational scope of the journal is primarily undergraduate education; however, submissions that feature good pedagogy and good design used in kindergarten through high school education or graduate and professional (e.g., medical school) education will be considered for publication. JMBE is referenced in Directory of Open Access Journals and CrossRef and has been accepted for indexing in PubMed Central.

**Sponsored Product Corner:**

Featured Product: *Journal of Microbiology & Biology Education*

*Saturday, May 18, 1:30 PM, Conference Room B
Saturday, May 18, 2:00 PM, Conference Room B*

In 2010, the *Journal of Microbiology & Biology Education (JMBE)* moved to an open-access platform, expanded its scope to include various types of scholarly articles, doubled the number of issues per year to two, and subsequently saw submissions increase nearly 500%. After being accepted for indexing in PubMed Central in 2012, JMBE is taking the next step by providing instructional tutorials for authors and advertisement opportunities for sponsors. JMBE accepts articles that promote good pedagogy and design, foster scholarly teaching, and advance biology education research. The various sections of JMBE allow for the submission of
articles diverse in scope and focus. Attend this session to learn more about the Journal sections, creating an account at the \textit{JMBE} site, and the submission and review processes.

\textit{JMBE} welcomes submissions for the upcoming issues. Articles are reviewed on a rolling basis, and submissions are encouraged and accepted throughout the year. The final submission deadline to be considered for publication in volume 14, issue 2 (December 2013) is July 1, 2013 and for volume 15, issue 1 (May 2014) is December 1, 2013. For more information, please visit \url{http://jmbe.asm.org}.

\textbf{LI-COR Biosciences}

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LI-COR's new Science Undergraduate Research Grant (SURG) is a matching funds program designed for faculty researchers and their students to gain access to cutting edge life science technology and incorporate it into the classroom. LI-COR is awarding a limited number of matching fund grants to eligible academic institutions within the U.S. to be used toward the purchase of a LI-COR Odyssey® Fc Imaging System. The Odyssey Fc teaches students how to easily perform Western blots and DNA gel documentation without a darkroom or hazardous materials. Visit \url{www.licor.com/surg} to learn more.

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McGraw-Hill Education continues to help your students Connect, Learn, and Succeed in their microbiology courses. We are committed to helping students of all ages succeed with our proven solutions, and to providing superior customer service and solutions to meet every teaching and learning need.

McGraw-Hill Education is a leading innovator in the development of teaching and learning digital solutions for higher education. Through a comprehensive range of content and tools focused on improving student learning outcomes, MHE empowers and prepares professionals and students to succeed in the global economy.

\textbf{Sponsored Product Corner:}

Featured Product: LearnSmart Labs, LearnSmart Prep, LearnSmart, and SmartBook

\textit{Saturday, May 18, 9:15 AM, Conference Room A}

\textbf{Got data? Get adaptive!}

Join Professors Heidi Smith, Front Range Community College; Gabriel Guzman, Triton College; and John Bacheller, Hillsborough Community College as they discuss the successful use of adaptive technology in their classes and labs.

\textbf{LearnSmart Labs} is a super-adaptive simulated lab experience that brings meaningful scientific exploration to students. Through a series of adaptive questions, LearnSmart Labs identifies a student's knowledge gaps and provides resources to quickly and efficiently close those gaps. Once the student has mastered the necessary basic skills and concepts, they engage in a highly realistic simulated lab experience that allows for mistakes and the execution of the scientific method.

\textbf{LearnSmart Prep} is a super-adaptive tool that quickly and efficiently prepares students for a college level course. Prep uses a set of diagnostic questions to help identify what a student
knows and doesn’t know. It then provides a unique learning plan focused on helping the student master the basic skills and concepts he or she needs the most before entering the classroom.

**LearnSmart**, which started it all, is the only adaptive learning program proven to effectively assess a student's knowledge of basic course content and help them master it. By considering both confidence level and responses to actual content questions, LearnSmart identifies what an individual student knows and doesn’t know and builds an optimal learning path, so that they spend less time on concepts they already know and more time on those they don’t. LearnSmart also predicts when a student will forget concepts and introduces remedial content to prevent this. The result is that LearnSmart’s adaptive learning path helps students learn faster, study more efficiently, and retain more knowledge, allowing instructors to focus valuable class time on higher-level concepts.

**SmartBook** is the first and only adaptive reading experience available for the higher education market. Powered by an intelligent diagnostic and adaptive engine, SmartBook facilitates the reading process by identifying what content a student knows and doesn’t know through adaptive assessments. As the student reads, the reading material constantly adapts to ensure the student is focused on the content he or she needs the most to close any knowledge gaps.

**Sponsored Author Corner:**

Featured Authors: Joanne Willey, Linda Sherwood, and Chris Woolverton

*Saturday, May 18, 9:45 AM, McGraw-Hill Education Exhibit Booth*

**Prescott’s Microbiology, 9th edition**

Join authors Joanne Willey, Linda Sherwood and Chris Woolverton as they discuss the new, 9th edition of *Prescott’s Microbiology*. Highlights of the revision include separating the chapters on bacteria and archaea to recognize the importance and prevalence of archaea; significant updates to the molecular microbiology and immunology coverage, reflecting recent updated scientific thinking and a streamlined discussion of immunity; and updates to Laboratory Safety, reflecting new recommendations from the American Society for Microbiology.

Joanne M. Willey has been a professor at Hofstra University on Long Island, New York, since 1993, where she is Professor of Microbiology; she holds a joint appointment with the Hofstra University School of Medicine.

Linda M. Sherwood is a member of the Department of Microbiology at Montana State University. Dr. Sherwood has always had a keen interest in teaching, and her psychology training has helped her to understand current models of cognition and learning and their implications for teaching.

Christopher J. Woolverton is founding professor of Environmental Health Science, College of Public Health at Kent State University (Kent, OH), and is the Director of the Kent State University (KSU) Center for Public Health Preparedness, overseeing its BSL-3 Training Facility. Dr. Woolverton serves on the KSU graduate faculty of the College of Public Health, the School of Biomedical Sciences, and the Department of Biological Sciences. He holds a joint appointment at Akron Children’s Hospital (Akron, OH).
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Morton Publishing Company is a small, privately-owned college textbook company based in Englewood, CO. Since 1977, we have been dedicated to publishing high-quality textbooks and laboratory materials while keeping costs down so that our books are affordable for students. We do not want high prices to dissuade students from investing in their education.

National Science Foundation

Arlington, VA
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The NSF Directorate of Biological Sciences advances the molecular, cellular, and microbial biosciences. The joint NSF and ASM Leaders Inspiring Networks and Knowledge (www.asmlink.org) program seeks collaborations and participation of underrepresented minorities in STEM education and research. Learn about offerings from the NSF BIO directorate as well as effective approaches to advance our national goal to diversify the STEM workforce and sustain merit-based research. The mission of the Division of Education and Human Resources is to achieve excellence in U.S. science, technology, engineering, and mathematics (STEM) education at all levels and in all settings (both formal and informal) in order to support the development of a diverse and well-prepared workforce of scientists, technicians, engineers, mathematicians, and educators and a well-informed citizenry that have access to the ideas and tools of science and engineering. The Division of Undergraduate Education serves as the focal point for agency-wide support for undergraduate education.

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Pearson, the global leader in education and education technology, is committed to providing quality content, assessment tools, and educational services, for millions of students and their instructors. Pearson continues to transform education and change the way students learn by offering innovative online resources and learning applications, such as Mastering Microbiology®.

Sponsored Author Corner:

Featured Author: Robert Bauman

Saturday, May 18, 9:15 AM, Pearson Exhibit Booth

Microbiology with Diseases by Taxonomy, 4th edition

Join Pearson author Dr. Robert Bauman to learn about the Fourth Edition of Microbiology with Diseases by Taxonomy and Video Tutors! Video Tutors provide the perfect bridge between the textbook and MasteringMicrobiology®, walking students through key microbiology concepts and helping them visualize and understand important microbial processes on-the-go.

Sponsored Product Corner:

Featured Product: Dynamic Study Modules

Saturday, May 18, 1:30 PM, Conference Room A

NEW! Dynamic Study Modules in MasteringMicrobiology® help students quickly learn the information they need to know to achieve higher scores on tests and exams. Each module incorporates user engagement techniques adapted from the gaming industry, moving students into a learning cycle that allows them to gain confidence and improve quickly.
W.H. Freeman and Company was founded in 1946 by former Macmillan salesman and editor William H. Freeman. From its first book (General Chemistry by the late Nobel laureate Linus Pauling) to the present, Freeman titles have consistently offered impeccable authorship, superb production and design, and an emphasis on the real-world applications and pivotal scientific discoveries. Those values are exemplified in such bestsellers as David Moore’s The Basic Practice of Statistics, Lubert Stryer’s Biochemistry, James Watson’s Recombinant DNA, Peter Atkins’s Physical Chemistry, and Jon Rogawski’s Calculus. Freeman is also at the forefront of developing state-of-the-art media products for instructors and students.

**Sponsored Author Corner:**

Featured Author: Michèle Shuster

*Saturday, May 18, 1:30 PM, W.H. Freeman Exhibit Booth*

**Scientific American Biology for a Changing World**

Written by a team of two full-time college biology instructors and two science writers, this book wraps science concepts in the context of captivating stories. Connections between the science of biology and real, applicable situations are clearly drawn so students never ask “why do I have to learn this?...what does this have to do with me?” Instead, students will read and learn from this text. This book is sure to meet the different learning styles of the 21st century student.

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The oldest and largest publishing house owned wholly by its employees, W. W. Norton, Inc. publishes about 400 trade, college, and professional titles each year.

University of Colorado Denver
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The University of Colorado Denver | Anschutz Medical Campus provides a diverse body of students with opportunities to enhance their education, careers and futures. Part of the highly-reputed University of Colorado System, this dynamic institution enriches the Denver metro area and the state of Colorado through top-notch education, innovative research and powerful partnerships. The vibrant, urban location of our university provides our students with a diverse array of exciting programs and opportunities.

The Graduate School consists of nearly 60 programs – both Ph.D. and Masters – housed in the schools and colleges on both campuses of the UC Denver. These offerings include both department-based and interdisciplinary programs in architecture and planning, arts and media, biomedical sciences, business, education and human development, engineering and applied sciences, humanities, mathematics, nursing, public affairs, public health, sciences, and social sciences. Many of the programs are nationally ranked. The renowned faculty for these programs are drawn from all schools and colleges at the UC Denver.
THURSDAY, MAY 16

PRE-CONFERENCE WORKSHOP
9:00 AM - 3:00 PM
Summit Ballroom C & D

Science Case Network Pre-Conference Workshop
- By Invitation Only

REGISTRATION
2:00 PM - 8:00 PM
Lobby

WELCOME AND OPENING REMARKS
3:45 PM - 4:00 PM
Auditorium 1

Conference Planning Committee
Todd Primm, Sam Houston State University
Mary Mawn, SUNY Empire State College
Jennifer Herzog, Herkimer County Community College
Robyn Puffenbarger, Bridgewater College

Local Steering Committee Representatives
Aimee Bernard, University of Colorado, Denver
Timberley Roane, University of Colorado, Denver

OPENING PLENARY LECTURE
4:00 PM - 5:00 PM
Auditorium 1

Metagenomic Approaches for Microbiome Association and Disease Etiology Discovery
Joseph F. Petrosino, Baylor College of Medicine

The Alkek Center for Metagenomics and Microbiome Research (CMMR) is coordinating and leading research and development efforts in this area across the Texas Medical Center, and with collaborators from around the US and abroad. CMMR researchers are developing molecular and informatics tools and resources to advance diverse clinical and basic research projects pertaining to the organisms that comprise the microbiome, the genetic makeup of these bacteria, viruses and fungi, and how these commensal microorganisms interact with human cells and tissues during the course of life. We are also utilizing both bacterial and viral metagenomics strategies in an attempt to identify agents associated with diseases where an infectious agent is suspected. Among the numerous disease-microbiome associations currently being studied with collaborators are the role of oral microbiota in cardiovascular disease (identifying bacteria responsible for nitrate reduction), Type 1 Diabetes (examining >18,500 samples with the NIDDK TEDDY and JDRF nPOD cohorts), aseptic meningitis (where typical etiologic agents are not able to be detected using traditional diagnostics), Kawasaki Disease (where epidemiological evidence suggests viral agents may underlie disease onset), and unknown agents of sepsis in immunocompromised subjects (e.g. those with HIV or those undergoing chemotherapy). The intent is for these projects to lead to the development of new treatments and diagnostics for a variety of heritable and infectious diseases as well as the development of additional reagents having other biotech applications.

ASM GLOSSARY, TOOLS AND WHAT’S NEW
5:00 PM - 5:30 PM
Auditorium 1

Amy Chang, American Society for Microbiology

DINNER AND TRAVEL AWARD RECOGNITION
5:30 PM - 6:30 PM
Columbine Room

CONCURRENT RESOURCE SESSIONS
I OF II
6:45 PM - 7:45 PM
(7 sessions)

60-minute sessions dedicated to presenting topics and information to enhance participant's professional skill sets and scholarship. Presenters will provide background information to tools, resources, and references for advancing in the profession. These sessions are presented twice during the conference.

1. Crowdsourcing Science
Conference Room B

Nicole Garneau, Denver Museum of Nature and Science

“I think we should ask the public to help shape the research agenda, help them figure out with us, what we ought to be studying so we can solve real world problems. Researchers may not be accustomed to such public interaction, but it’s crucial to the science/society relationship.” Dr. Alan Leschner, AAAS.

Communicating science is not often an easy task. As scientists, we can find ourselves caught up in a very nuanced and niche world. The unintended consequences are the difficulties we create for the public around understanding discoveries and making scientific research personally relevant. The goal of the community-based genetics laboratory at the Denver Museum of Nature & Science is to address these issues in a novel way through Public Participation in
Scientific Research (PPSR). With the community at its center, our project directly connects people—using citizen-science, audience participation and distance learning—to science in a way that is personally relevant, while concurrently collecting valuable population data to better understand the role of genetics in taste and health. In this session, you will learn more about PPSR, our unique take on the model, evaluation and metrics on impact and successes, as well as lessons learned in how to put the AAAS vision about public engagement into practice.

2. Preparing Students for a Career in Clinical Microbiology
   Conference Room C

Janet Hindler, University of California at Los Angeles Medical Center

In many respects, clinical microbiology is the center point of the microbiology profession, a place where our science is applied. The 20% of ASM members who designate clinical microbiology as their primary focus are vital members of teams that diagnose and control infectious diseases. Most work with patient specimens. Others help develop diagnostics, investigate outbreaks and advise clinicians. All of us need to be committed to assisting students in gaining a better understanding of the opportunities in clinical microbiology and of the fact that a world full of persistent and emerging infectious agents translates into long-term job security. The goal of this session is to provide concise information that can raise students’ awareness of clinical microbiology career paths at the bachelors, masters, and doctoral levels. In addition, the session will explore ways to identify local clinical microbiologists who can explain their work and make themselves available as role models for students considering their careers choices. Finally, materials available through ASM’s New Clinical Microbiology Mentoring Program will be discussed.

3. The PULSE Community: Moving from “Vision” to "Change" in Undergraduate Life Science Education
   Conference Room A

Nitya Jacob, Oxford College of Emory University
Melanie Lee-Brown, Guilford College

What will it take to bring about the necessary transformation of STEM higher education described in Vision and Change? PULSE (Partnership for Undergraduate Life Sciences Education) is a joint effort by National Science Foundation (NSF), National Institutes of Health (NIH) and Howard Hughes Medical Institute (HHMI) to stimulate systemic change in biology departments of post-secondary educational institutions. The recommendations for change are based on the 2011 report, Vision and Change in Undergraduate Biology Education: A Call to Action. The PULSE Leadership Fellows are tasked with facilitating pathways to foster change in undergraduate life science education. This session will share the PULSE action agenda and the work to date, to facilitate communication with the broader scientific community and engage members of professional societies to incorporate their best teaching practices and their other efforts to implement change in life science education.

   Conference Room E

Jeff Olimpo, University of Maryland
Patty Shields, University of Maryland

Are you interested in developing new, active learning tools and activities for use in your course? Are you interested in infusing more technology into your teaching? Are sections of your course taught by undergraduate or graduate teaching assistants (UTAs/GTAs)? If you answered yes to any of these questions, this session is for you! We will provide evidence from an ongoing mixed methods study demonstrating both the effectiveness of an undergraduate teaching apprenticeship program on UTAs’ professional development, as well as the impact of apprentice-developed, active learning curricula on the learning outcomes of students enrolled in an introductory biology course at our campus. Session participants will also have an opportunity to network and brainstorm regarding how they might develop similar programs and curricula at their institution.

5. Service Learning: Incorporating Relevance, Purpose, and Learning into Your Courses
   Conference Room F

Laura Regassa, Georgia Southern University
Philip Mixter, Washington State University
Brian Hostetler, Denver Museum of Nature and Science

Service learning is a common pedagogical approach to engage students in relevant, purpose-driven activities. However, this approach can be daunting given the potential logistical issues and the need to align activities with learning outcomes. This session will begin with a brief overview of service learning that includes background information and examples of applications and outcomes for diverse audiences. Attendees will then have the opportunity to engage with panelists during a facilitated discussion structured around the major features/challenges involved in development of a successful service learning experience.
6. Future of Interdisciplinary Education  
*Conference Room G*

**Andrea Stith**, University of Colorado at Boulder

Interdisciplinary partnerships and interactions are viewed as increasingly critical to the understanding of complex biological problems. To meet this need the number of interdisciplinary education programs available around the country is growing. One of these programs, the IQ Biology Ph.D. certificate program at the University of Colorado BioFrontiers Institute seeks to educate its students in an interdisciplinary collaborative environment and is designed to provide students with disciplinary depth, multidisciplinary knowledge and transdisciplinary skills. The program integrates faculty from eight departments in two schools across the University of Colorado Boulder campus and focuses on finding solutions for biological challenges that require a broad view of science, math, engineering and technology. The program seeks applicants who demonstrate strong ability in one field and who exhibit interdisciplinary curiosity through solid experience in a secondary field. Considering the IQ Biology program as one model for preparing leaders in interdisciplinary research, the audience will be engaged in a discussion of how to best prepare undergraduates for such programs through coursework, laboratory experiences, and alternative educational opportunities.

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7. The Science Case Network: Resources for Case Studies and Problem-Based Learning  
*Conference Room D*

**Margaret Waterman**, Southeast Missouri State University  
**Deborah Allen**, University of Delaware  
**Mark Bergland**, University of Wisconsin-River Falls  
**Karen Klyczek**, University of Wisconsin-River Falls  
**Pat Marsteller**, Emory University  
**Aditi Pai**, Spellman College  
**Ethel Stanley**, BioQUEST Curriculum Consortium  
**Michelle Young**, Three Rivers College

The *Vision and Change* report calls for teaching and learning strategies that engage students and enable them to apply their knowledge in multidisciplinary contexts. Case Study and Problem Based Learning are two such strategies. The NSF funded RCN-UBE Science Case Network (SCN) brings together educators, developers and researchers to find, use and study these pedagogies. This session will be a sampler from SCN members showing examples of case methods and PBL, raising issues of using these pedagogies to better teach underrepresented students, and introducing the features of the Science Case Network.

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NEW IN 2013! CONCURRENT ASSESSMENT TOOLS SESSIONS  
I of II  
8:00 PM - 9:00 PM  
(4 Sessions)

60-minute sessions dedicated to presenting different assessment tools and techniques. Presenters will provide background information, their approach to the tool/technique, and how to use them effectively. These sessions are presented twice during the conference.

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1. Are You Testing What You Think You Are?  
Assessment of Student Learning Using Bloom’s Taxonomy  
*Conference Room A*

**Samantha Elliott**, Saint Mary’s College of Maryland

Assessment of student learning is important to ascertain the success of curricular design. While we spend many hours designing and grading quizzes, exams and projects, how often do we really step back to analyze the level at which these questions challenge our students? Bloom’s taxonomy is one way to classify assessment questions to ensure a proper balance of items that require lower- and higher-order thinking. After completion of this presentation, participants will have an understanding of Bloom’s taxonomy and how to rate questions based upon this method. By using Bloom’s taxonomy in the design of assessments, instructors will have a better understanding of student learning and more easily share their results for publication.

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2. Using Formative and Summative Assessments to Measure Student Learning and Adapt our Teaching  
*Conference Room B*

**Anne-Marie Hoskinson**, University of Colorado at Boulder

College instructors recognize that assessment of student learning, and of the effectiveness of curricular design, are important parts of teaching and learning. However, it can be difficult to design assessments aligned and properly targeted to course or unit learning goals. In this workshop, participants will follow a cycle of what we term “adaptive curricular design.” Participants will learn what formative and summative assessments are and how they can be used; how to turn course or unit learning goals into assessments that align with them, and how to use results of formative and summative assessments to modify instruction, both during and after course completion.

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3. Developing and Using Concept Assessments in Biology
*Conference Room C*

Jennifer Knight, University of Colorado at Boulder

Well-developed concept assessments have the potential to provide faculty, departments, and administrators with valuable information about student learning. If the assessments are aligned to learning objectives that biologists agree are critical for students to achieve, they can also provide insight into persistent incorrect ideas, and into possible problem points in a curriculum. This talk will review the ideal method for developing such assessments and how to use the data that emerges from student performance. In addition, different formats of assessments will be considered, and data provided to support their use.

4. Qualitative Data: I Collected It, Now What?
*Conference Room D*

Christine Maidl Pribbenow, Wisconsin Center for Education Research

This session defines qualitative methods, gives examples of sources of data that can be used to assess student learning, and provides participants an opportunity to “code” data using simple qualitative analysis techniques. This session is ideal for someone who has considered collecting or analyzing qualitative data, but is unsure of where to start (i.e., novice level).

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**FRIDAY, MAY 17**

**COLLEGE AND UNIVERSITY SPIRIT DAY**
Represent your college or university! Break out your school jacket, t-shirts, ties & polos and show us your school spirit!

**BREAKFAST BY TOPICAL AREAS**
*7:00 AM - 8:00 AM*  
*Columbine Room*

ASM facilitates the e-mail based discussion group, MICROEDU. Here, microbiology educators can learn from each other by exchanging ideas and communicating issues and challenges. Many informative and thoughtful conversations take place within this listserv community and we encourage attendees to revisit the issues face-to-face. Several topics have been identified by the Steering Committee and a complete list will be available on-site.

**ASMCUE REGISTRATION**
*7:00 AM - 8:00 PM*  
*Lobby*

**CONCURRENT PEDAGOGY SESSIONS**
*I of III*  
*8:00 AM - 9:00 AM*  
*(6 sessions)*

60-minute sessions dedicated to presenting practices and pedagogies that have been assessed for classroom effectiveness. Presenters will provide background information and their approach to the strategy, leaving time for participants to practice and reflect upon how they can implement the new practice or approach into their classrooms. These sessions are presented in two of three times slots during the conference.

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1. Interdisciplinary Communication Laboratory for Undergraduate Biology (iCLUB)
*Conference Room D*

Jennifer Alonzo, Old Dominion University

Sponsored by ASM and NSF Leaders Inspiring Networks and Knowledge (LINK) Program.

There is a growing awareness that major advances in research can be made through collaborations across traditional disciplines. Students and faculty involved in interdisciplinary research activities often confront obstacles to healthy collaboration. These obstacles may include:

- Differences in personal and research values.
- Differences in research practices.
- Overall discomfort with the close interpersonal communication that is critical to any collaboration.
The workshop provides a peek into the hands-on training developed by iCLUB to help students and researchers better communicate across disciplines.

Participants will be introduced to tools that iCLUB participants use to foster healthy communication. The workshop is action-oriented allowing participants to practice the communication and collaboration skills that they learn by exploring immediate problems in their research collaborations with students. Through the workshop participants will learn how iCLUB tools can help:

• Quickly build rapport
• Develop better listening skills.
• Identify areas of potential conflict
• Increase comfort in communicating with conflict.
• Establish agreed upon ways to communicate.
• Expand skills for identifying and communicating goals and values with potential collaborators.

The iCLUB Network is a NSF-Funded RCN-UBE incubator (DBI-1061935) which works to establish a community of faculty who regard healthy collaboration as essential to their research and teaching, especially in interdisciplinary and multidisciplinary efforts. iCLUB activities are open to scientific researchers and their collaborators.

2. Case It: Molecular Biology Simulations for Case-Based Learning
Conference Room A

Mark Bergland, University of Wisconsin-River Falls
Karen Klyczek, University of Wisconsin-River Falls

Case It! is a project providing molecular biology computer simulations and associated cases at no cost to educators. In this session, participants will see how the Case It simulation can be used to engage students in inquiry by analyzing existing cases or open-ended research questions. We will also include strategies for classroom implementation and assessment, creating new case scenarios using information from the literature and sequences from online repositories, and using the molecular biology simulation to extend and enhance cases from other sources in the Science Case Network (http://www.sciencecasenet.org). The simulation software and cases, video tutorials, and forums are available at http://www.caseitproject.org. Case It v6.06 will perform a variety of laboratory procedures on any DNA or protein sequence including electrophoresis, PCR, blotting, ELISA, and SNP and expression microarrays. The simulation can also be integrated with MEGA software for bioinformatics analyses. Many of the cases that are downloaded with the software focus on genetic and infectious diseases.

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3. Developing and Assessing Principle-Based, Scientific Reasoning in Your Students
Conference Room B

Laurel Hartley, University of Colorado, Denver

Although principle-based, scientific reasoning is an essential skill for scientific literacy, this skill is rarely learned, even by students at the college level. Instead, most college students rely mainly on informal reasoning based on their personal experiences when answering biological questions that require synthesis or application. For example, a student reasoning informally about weight loss will not trace matter out when it leaves the individual; this student might say that “fat melts away” or is “burned off”. In contrast, a student using principle-based reasoning would attempt to account for the matter being oxidized and is more likely to recognize that matter is exiting the body as CO2 and H2O. In this session, we’ll talk about the developmental transition from informal to scientific reasoning and discuss how teaching that emphasizes principle-based reasoning can 1) help students use principles to connect similar ideas that seem disparate to students, 2) efficiently target related misconceptions and 3) help students reason about a process across scales of biological organization from the molecular to the ecosystem. We’ll talk about what we can do as instructors to identify the relevant principles we want students to be able to use, what strategies we can use to help students develop principle-based reasoning, and how we can assess this type of reasoning in a way that separates students who can memorize from students who truly understand.

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4. Teaching and Learning Biology Online
Conference Room C

Jennifer Herzog, Herkimer County Community College
Mary Mawn, SUNY-Empire State College

There will be two stand-alone sessions related to online teaching and learning. Each session will be offered one time only. Although participants can enjoy any combination of these sessions, Session I will focus on introductory topics for new instructors. Session II will present more advanced pedagogical issues for more experienced online faculty. Please bring a laptop or computing device, this is a hands-on session.

SESSION I: Biology Online 101: The Nuts and Bolts of Designing an Online Science Course

There is a growing interest in offering courses in an online environment. However, designing an online course involves more than posting lecture notes on a learning management system. What does a typical online course look like? How can online discussions foster student engagement? What are some approaches for assessing student learning? How do students engage in laboratory experiences? During this introductory level session, the presenters will share real-world examples that highlight areas to consider when designing an online course. Additional areas will be identified and shared in an open discussion among the presenters and session attendees. Finally, attendees will enroll in a live online
course and experience this mode of instruction from a student’s viewpoint.

5. Doing the Classroom Flip: Are You Ready to Turn Your Classroom on Its Head?  

*Conference Room E*

Jeffrey Pommerville, Glendale Community College  
Aimee Bernard, University of Colorado, Denver  
Bethany Stone, University of Missouri  
Justin York, Glendale Community College

Many college educators are beginning to experiment with the idea of the flipped classroom where the typical order of teaching is inverted. Traditional in-class activities, such as lecture, are moved outside of the classroom period to be completed independently. This affords time in the classroom for active engagement in team formats with more conceptually difficult topics and under the guidance of the instructor. Because the flipped classroom frees up more face-to-face class time, it can open up new possibilities for active learning and strengthening students’ problem solving skills.

What are faculty doing to flip their classroom? What pedagogical tools and techniques are being used for teaching the inverted model? What are the pitfalls? In this 60-minute session, a brief summative overview of what a flipped classroom is will be presented. Then, each of the four panelists will give a short, 5-7 minute informal presentation on how they have constructed a flipped classroom (with successes and failures). This will be followed by an extensive discussion with the session attendees, who will come away with new ideas, best practices, and pedagogical strategies to help them decide if they want to turn their classroom on its head.

6. The Active Learning Classroom: A 6-Year Retrospective of Successful Strategies and Continuing Struggles in “Flipping” an Introductory Biology Course  

*Conference Room F*

Robin Wright, University of Minnesota

What would a classroom look like if we designed it purposefully to acknowledge the biology of learning? How do students respond to this design? What are the challenges? We’ve been teaching an introductory biology course for majors for the past 6 years in an Active Learning Classroom, which features round tables and lots of technology. Based on our experiences with thousands of students, we are even more convinced today than six years ago of the value of using class time differently. Instead of presenting information, we pose challenges that help students develop higher order skills such as critical thinking, problem solving, and evaluation. Interestingly, our relationship with students has evolved from that of teacher-student to that of “senior-junior colleagues.” We have time and space in which we can be by our students and learn from them. They accept the challenges that we offer them and go beyond our expectations. In this workshop, I’ll discuss how to adapt to active learning environments, including the struggles that we overcame and the ones that we are still wrestling with.

**CONCURRENT RESOURCE SESSIONS II OF II**  

*I OF II*  

9:15 AM - 10:15 AM  

(8 sessions)

60-minute sessions dedicated to presenting topics and information to enhance participant’s professional skill sets and scholarship. Presenters will provide background information to tools, resources, and references for advancing in the profession. These sessions are presented twice during the conference.

1. Crowdsourcing Science  

*Conference Room B*

Nicole Garneau, Denver Museum of Nature and Science

“I think we should ask the public to help shape the research agenda, help them figure out with us, what we ought to be studying so we can solve real world problems. Researchers may not be accustomed to such public interaction, but it’s crucial to the science/society relationship.” Dr. Alan Leschner, AAAS.

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2. Preparing Students for a Career in Clinical Microbiology  

*Conference Room C*

Janet Hindler, University of California at Los Angeles Medical Center

In many respects, clinical microbiology is the center point of the microbiology profession, a place where our science is applied. The 20% of ASM members who designate clinical microbiology as their primary
focus are vital members of teams that diagnose and control infectious diseases. Most work with patient specimens. Others help develop diagnostics, investigate outbreaks and advise clinicians. All of us need to be committed to assisting students in gaining a better understanding of the opportunities in clinical microbiology and of the fact that a world full of persistent and emerging infectious agents translates into long-term job security. The goal of this session is to provide concise information that can raise students’ awareness of clinical microbiology career paths at the bachelors, masters, and doctoral levels. In addition, the session will explore ways to identify local clinical microbiologists who can explain their work and make themselves available as role models for students considering their careers choices. Finally, materials available through ASM’s New Clinical Microbiology Mentoring Program will be discussed.

3. The PULSE Community: Moving from “Vision” to ”Change” in Undergraduate Life Science Education

Conference Room A

Nitya Jacob, Oxford College of Emory University
Melanie Lee-Brown, Guilford College

What will it take to bring about the necessary transformation of STEM higher education described in Vision and Change? PULSE (Partnership for Undergraduate Life Sciences Education) is a joint effort by National Science Foundation (NSF), National Institutes of Health (NIH) and Howard Hughes Medical Institute (HHMI) to stimulate systemic change in biology departments of post-secondary educational institutions. The recommendations for change are based on the 2011 report, Vision and Change in Undergraduate Biology Education: A Call to Action. The PULSE Leadership Fellows are tasked with facilitating pathways to foster change in undergraduate life science education. This session will share the PULSE action agenda and the work to date, to facilitate communication with the broader scientific community and engage members of professional societies to incorporate their best teaching practices and their other efforts to implement change in life science education.


Conference Room E

Jeff Olimpo, University of Maryland
Patty Shields, University of Maryland

Are you interested in developing new, active learning tools and activities for use in your course? Are you interested in infusing more technology into your teaching? Are sections of your course taught by undergraduate or graduate teaching assistants (UTAs/GTAs)? If you answered yes to any of these questions, this session is for you! We will provide evidence from an ongoing mixed methods study demonstrating both the effectiveness of an undergraduate teaching apprenticeship program on UTAs’ professional development, as well as the impact of apprentice-developed, active learning curricula on the learning outcomes of students enrolled in an introductory biology course at our campus. Session participants will also have an opportunity to network and brainstorm regarding how they might develop similar programs and curricula at their institution.

5. Service Learning: Incorporating Relevance, Purpose, and Learning into Your Courses

Conference Room F

Laura Regassa, Georgia Southern University
Philip Mixter, Washington State University
Brian Hostetler, Denver Museum of Nature and Science

Service learning is a common pedagogical approach to engage students in relevant, purpose-driven activities. However, this approach can be daunting given the potential logistical issues and the need to align activities with learning outcomes. This session will begin with a brief overview of service learning that includes background information and examples of applications and outcomes for diverse audiences. Attendees will then have the opportunity to engage with panelists during a facilitated discussion structured around the major features/challenges involved in development of a successful service learning experience.

6. Future of Interdisciplinary Education

Conference Room G

Andrea Stith, University of Colorado at Boulder

Interdisciplinary partnerships and interactions are viewed as increasingly critical to the understanding of complex biological problems. To meet this need the number of interdisciplinary education programs available around the country is growing. One of these programs, the IQ Biology Ph.D. certificate program at the University of Colorado BioFrontiers Institute seeks to educate its students in an interdisciplinary collaborative environment and is designed to provide students with disciplinary depth, multidisciplinary knowledge and transdisciplinary skills. The program integrates faculty from eight departments in two schools across the University of Colorado Boulder campus and focuses on finding solutions for biological challenges that require a broad view of science, math, engineering and technology. The program seeks applicants who demonstrate strong ability in one field and who exhibit interdisciplinary curiosity through solid experience in a secondary field. Considering the IQ Biology program as one model for preparing leaders in interdisciplinary research, the audience will be engaged in a discussion of how to best prepare undergraduates for such programs through coursework, laboratory experiences, and alternative educational opportunities.
The Vision and Change report calls for teaching and learning strategies that engage students and enable them to apply their knowledge in multidisciplinary contexts. Case Study and Problem-Based Learning are two such strategies. The NSF funded RCN-UBE Science Case Network (SCN) brings together educators, developers and researchers to find, use and study these pedagogies. This session will be a sampler from SCN members showing examples of case methods and PBL, raising issues of using these pedagogies to better teach underrepresented students, and introducing the features of the Science Case Network.

8. Opportunities at the National Science Foundation
Conference Room H

Susanne von Bodman, National Science Foundation
Terry Woodin, National Science Foundation

This forum provides participants an opportunity to learn about grant programs from two NSF program officers representing diverse areas:

• The Division of Molecular and Cellular Biosciences (MCB) in the Directorate of Biological Sciences supports research and related activities that contribute to a fundamental understanding of living systems at the molecular, subcellular, and cellular levels. The mission of the Division of Biological Sciences (BIO) is to enable discoveries for understanding life. BIO-supported research advances the frontiers of biological knowledge, increases our understanding of complex systems, and provides a theoretical basis for original research in many other scientific disciplines.

• The mission of the Division of Education and Human Resources is to achieve excellence in U.S. science, technology, engineering and mathematics (STEM) education at all levels and in all settings (both formal and informal) in order to support the development of a diverse and well-prepared workforce of scientists, technicians, engineers, mathematicians and educators and a well-informed citizenry that have access to the ideas and tools of science and engineering. The Division of Undergraduate Education serves as the focal point for agency-wide support for undergraduate education.

CONCURRENT SCIENTIFIC SESSIONS
I of II
10:30 AM - 11:30 AM
(8 sessions)

60-minute sessions dedicated to enhancing participant’s knowledge of current topics in biology and science education through lectures given by the leaders in these areas. Presenters are encouraged to actively engage participants in their presentations. These sessions are presented twice during the conference.

1. Where Are Those Microbes Now That Your Immune System Needs Them?
Conference Room A

J. John Cohen, University of Colorado, Denver

We evolved as hunter-gatherers, but that’s not where we are now. Most of us aren’t farmers, either, though we have easy access to food. So what happens? We eat a lot that we don’t have to work to produce, and we have—in the developed world—epidemic obesity, diabetes, and vascular disease. Less well known are the concurrent epidemics of asthma, autoimmunity, and chronic inflammatory diseases, with startling increases in incidence over the past half-century. The distribution is uneven: urban but not rural, rich but not poor, temperate but not equatorial… We’ll review the evidence and discuss the impact on our immune systems. The Old Friends Hypothesis suggests that as we improved our environment we made it so clean that we have lost certain microorganisms that used to be a major part of our microbiomes, as well as intestinal helminths. In their absence we do not adequately develop the regulatory T cells that instruct our inflammatory T cells to remain calm in the presence of harmless commensals. According to this model, the immune system loses the ability to distinguish between normal biota (and even pollens) and harmful pathogens. If that’s true, how do we fix it? Eat more worms?

2. Microbial Ecology of the Human Lung during HIV Infection
Conference Room B

Adela Cota-Gomez, University of Colorado, Denver

The microbial flora of human anatomical sites such as oral and intestinal cavities has been extensively studied in health and disease. However, the lungs have been traditionally described as “aseptic” and free of commensal microbes. Recently, some studies reported microorganisms in the lungs of “healthy” individuals, yet little is known about the lung microbiome in disease states. The lungs are one of the primary targets of infectious and non-infectious complications during chronic HIV infection. For example, innate and adaptive immune defects increase the risk for infectious pneumonia in HIV-infected individuals. Furthermore, HIV-infected patients also suffer higher rates of non-infectious,
chronic lung diseases such as pulmonary hypertension. At this time, it is unknown whether deterioration in lung function and development of chronic lung disease in HIV-infected patients is related to the immunodeficiency, to alterations in lung microbiome or the development of a chronic inflammatory state. The objectives of this seminar are to summarize our current understanding of the human lung microbiome and describe changes in the lung microbiome during HIV infection.

3. The Role of the Public Health Laboratory in Foodborne Surveillance and Outbreak Detection

Alicia Cronquist, Colorado Department of Public Health and Environment

The public health laboratory (PHL) plays a vital role in surveillance for foodborne pathogens and outbreak detection. Clinical laboratories routinely forward isolates of foodborne pathogens (e.g. Salmonella and E. coli O157) to PHLs for subtyping. PHLs can perform specialized testing not readily available in clinical laboratories that includes pulsed-field gel electrophoresis (PFGE), polymerase chain reaction (PCR), DNA sequencing and serotyping. PHLs also perform primary testing of clinical, environmental and food specimens when outbreaks are identified using a variety of methodologies. In this session we will describe the ways in which PHLs contribute to foodborne disease prevention and control and will cite outbreaks in which the PHL played an important role, such as the 2011 outbreak of listeriosis associated with cantaloupe, outbreaks of E. coli O157 associated with ground beef, and outbreaks of Campylobacter associated with unpasteurized milk.

4. Pertussis Resurgence in the U.S. and Colorado: Why Now?

Rachel Herlihy, Colorado Department of Public Health and Environment

During 2012, Colorado and many other states in the U.S. experienced rates of pertussis, or whooping cough, rarely seen since the pre-vaccine era. Until 2012, Colorado had not experience such high levels of pertussis since 1948. This presentation will review the pathophysiology of pertussis infection, pertussis epidemiology including current national and Colorado trends, and treatment and testing recommendations and challenges. Factors contributing to the resurgence of pertussis will be described, including the potential impact of under-vaccination and parental vaccine hesitancy, the national switch from the whole-cell DTP vaccine to the possibly less efficacious acellular (DTaP) vaccine in the late 1990s, and the cyclical nature of pertussis epidemics. Strategies used to mitigate the epidemic in Colorado will be reviewed, with a focus on efforts to prevent deaths among infants. Recently updated pertussis vaccination recommendations from the national Advisory Committee on Immunization Practices will be reviewed as will current vaccination rates for adults and children.

5. Forensic Microbiology

Donald Lehman, University of Delaware

Forensic microbiology is a relatively new field within forensic science. Forensic microbiologists deal with determining the cause of death and the identification of people who have committed crimes. Not only discovering if an infectious agent was involved in death, it is important to determine the “microbial signature” to aid in finding the source of the agent. In this session, I will discuss the role of microbiology as it relates to matters of law. Topics will include bioterror, biocrime, investigations in determining the cause of death in malpractice, sexual assaults, and drownings. In some cases it is just as important to rule out foul play by determining that the cause of death was due to a natural infection, such as cases of sudden infant death syndrome. I will conclude with a brief discussion on the forensic science profession.

6. Data-Driven Microbiology

Christopher Miller, University of Colorado, Denver

Hundreds of billions of DNA basepairs can now be determined for relatively little cost. Increasingly, this new economy demands that even modest research projects become data-driven. Here, I present examples of how genomics, transcriptomics, and proteomics can inform our understanding of microbial community function in situ, and discuss computational strategies for mining meaning from large integrated datasets. Application of these techniques has helped form hypotheses about how microbial communities respond to changing environmental conditions and stress. I present examples from fungal-dominated microbial communities living in metal-rich pH 1 acid mine drainage, and from communities enriched for growth on specific bioenergy-relevant substrates. Application of data-driven approaches has identified key microbes responsible for ecosystem function, and key pathways expressed in response to stress. For students to become comfortable with planning and critically evaluating data-driven experiments requires foundational in computation and biostatistics, rapidly changing technology, and basic microbiology. Far from abandoning the traditional scientific method, data-driven microbiology has the ability to rapidly generate unbiased hypotheses that can be tested at a systems-wide level.
8. Outbreak: West Nile Virus

Conference Room H

Sponsored by American Academy of Microbiology

Kenneth Tyler, University of Colorado, Denver

West Nile virus (WNV) emerged in the United States in 1999 and has now caused over 15,000 cases of neuroinvasive disease and infected millions of individuals. WNV is the most common identified cause of acute viral encephalitis in the U.S. The 2012 season was one of the worst on record, with 2734 cases of neuroinvasive disease and 243 deaths in 48 states.

WNV is a flavivirus whose transmission and life cycle depends on Culex mosquitoes. Humans are "dead-end" hosts, with birds serving as primary amplifying hosts and contributing to viral geographic dispersal.

Although the majority of WNV-infected individuals are asymptomatic, ~1% develop encephalitis, meningitis, or myelitis. Risk factors for neurological disease include older age, immunosuppression, and certain genetic polymorphisms. In animal models, innate, humoral and cell-mediated immunity all contribute to control of infection. Although there is no treatment of proven benefit, studies involving the use of IFN and passive transfer of WNV have begun clinical trials.

The complex lifecycle of WNV through its avian hosts and transmission via mosquitoes highlights aspects of virology from host specificity to epidemiology. This session will also focus on the clinical aspects of the disease, from diagnosis to pathogenesis, from treatment to prevention.

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ASM Curriculum Guidelines: The Next Generation

Susan Merkel, Cornell University
Jean A. Cardinale, Alfred College


Our vision is that the community of microbiology educators will use these guidelines to define their own course learning goals, and that students in introductory microbiology courses gain a universal understanding of these core concepts. The success of the guidelines rests on the ability and willingness of the community of microbiology educators to adapt their teaching methods to address these learning goals, and then plan assessments to assure that students have met those goals. We hope educators will relate the core concepts to authentic examples, and engage students in active learning.

This session will begin with an overview of the guidelines and goals, followed by a short training session in how to write learning objectives that can align with effective assessments. Attendees will then break out into groups representing the six core concepts and write learning objectives related to the fundamental statements. Participants will also produce a list of appropriate assessment tools that would allow evaluation of student learning towards each learning objective.

After this session, participants should be able to:

- Explain how the new curricular guidelines can be used to support the understanding of core concepts;
- Write learning objectives based on the fundamental statements in the curricular guidelines; and
- Choose and design types of assessments that support the learning objectives.

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LUNCH AND WRITING LEARNING OBJECTIVES ROUNDTABLE DISCUSSIONS
12:15 PM - 1:45 PM
Columbine Room
CONCURRENT SCIENTIFIC SESSIONS
II of II
2:00 PM - 3:00 PM
(8 sessions)

60-minute sessions dedicated to enhancing participant's knowledge of current topics in biology and science education through lectures given by the leaders in these areas. Presenters are encouraged to actively engage participants in their presentations.

1. Where Are Those Microbes Now That Your Immune System Needs Them?
   Conference Room A
   J. John Cohen, University of Colorado, Denver

   We evolved as hunter-gatherers, but that's not where we are now. Most of us aren't farmers, either, though we have easy access to food. So what happens? We eat a lot that we don't have to work to produce, and we have—in the developed world—epidemic obesity, diabetes, and vascular disease. Less well known are the concurrent epidemics of asthma, autoimmunity, and chronic inflammatory diseases, with startling increases in incidence over the past half-century. The distribution is uneven: urban but not rural, rich but not poor, temperate but not equatorial… We'll review the evidence and discuss the impact on our immune systems. The Old Friends Hypothesis suggests that as we improved our environment we made it so clean that we have lost certain microorganisms that used to be a major part of our microbiomes, as well as intestinal helminths. In their absence we do not adequately develop the regulatory T cells that instruct our inflammatory T cells to remain calm in the presence of harmless commensals. According to this model, the immune system loses the ability to distinguish between normal biota (and even pollens) and harmful pathogens. If that's true, how do we fix it? Eat more worms?

2. Microbial Ecology of the Human Lung during HIV Infection
   Conference Room B
   Adela Cota-Gomez, University of Colorado, Denver

   The microbial flora of human anatomical sites such as oral and intestinal cavities has been extensively studied in health and disease. However, the lungs have been traditionally described as "aseptic" and free of commensal microbes. Recently, some studies reported microorganisms in the lungs of "healthy" individuals, yet little is known about the lung microbiome in disease states. The lungs are one of the primary targets of infectious and non-infectious complications during chronic HIV infection. For example, innate and adaptive immune defects increase the risk for infectious pneumonia in HIV-infected individuals. Furthermore, HIV-infected patients also suffer higher rates of non-infectious, chronic lung diseases such as pulmonary hypertension. At this time, it is unknown whether deterioration in lung function and development of chronic lung disease in HIV-infected patients is related to the immunodeficiency, to alterations in lung microbiome or the development of a chronic inflammatory state. The objectives of this seminar are to summarize our current understanding of the human lung microbiome and describe changes in the lung microbiome during HIV infection.

3. The Role of the Public Health Laboratory in Foodborne Surveillance and Outbreak Detection
   Conference Room C
   Alicia Cronquist, Colorado Department of Public Health and Environment

   The public health laboratory (PHL) plays a vital role in surveillance for foodborne pathogens and outbreak detection. Clinical laboratories routinely forward isolates of foodborne pathogens (e.g. Salmonella and E. coli O157) to PHLs for subtyping. PHLs can perform specialized testing not readily available in clinical laboratories that includes pulsed-field gel electrophoresis (PFGE), polymerase chain reaction (PCR), DNA sequencing and serotyping. PHLs also perform primary testing of clinical, environmental and food specimens when outbreaks are identified using a variety of methodologies. In this session we will describe the ways in which PHLs contribute to foodborne disease prevention and control and will cite outbreaks in which the PHL played an important role, such as the 2011 outbreak of listeriosis associated with cantaloupe, outbreaks of E. coli O157 associated with ground beef, and outbreaks of Campylobacter associated with unpasteurized milk.

4. Pertussis Resurgence in the U.S. and Colorado: Why Now?
   Conference Room D
   Rachel Herlihy, Colorado Department of Public Health and Environment

   During 2012, Colorado and many other states in the U.S. experienced rates of pertussis, or whooping cough, rarely seen since the pre-vaccine era. Until 2012, Colorado had not experience such high levels of pertussis since 1948. This presentation will review the pathophysiology of pertussis infection, pertussis epidemiology including current national and Colorado trends, and treatment and testing recommendations and challenges. Factors contributing to the resurgence of pertussis will be described, including the potential impact of under-vaccination and parental vaccine hesitancy, the national switch from the whole-cell DTP vaccine to the possibly less efficacious acellular (DTaP) vaccine in the late 1990s, and the cyclical nature of pertussis epidemics. Strategies used to mitigate the epidemic in Colorado will be reviewed, with a focus on efforts to prevent deaths among infants. Recently updated pertussis vaccination recommendations from the national Advisory Committee on Immunization Practices will be reviewed as will current vaccination rates for adults and children.
5. Forensic Microbiology

*Conference Room E*

**Donald Lehman, University of Delaware**

Forensic microbiology is a relatively new field within forensic science. Forensic microbiologists deal with determining the cause of death and the identification of people who have committed crimes. Not only discovering if an infectious agent was involved in death, it is important to determine the “microbial signature” to aid in finding the source of the agent. In this session, I will discuss the role of microbiology as it relates to matters of law. Topics will include bioterror, biocrime, investigations in determining the cause of death in malpractice, sexual assaults, and drownings. In some cases it is just as important to rule out foul play by determining that the cause of death was due to a natural infection, such as cases of sudden infant death syndrome. I will conclude with a brief discussion on the forensic science profession.

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6. Data-Driven Microbiology

*Conference Room F*

**Christopher Miller, University of Colorado, Denver**

Hundreds of billions of DNA basepairs can now be determined for relatively little cost. Increasingly, this new economy demands that even modest research projects become data-driven. Here, I present examples of how genomics, transcriptomics, and proteomics can inform our understanding of microbial community function in situ, and discuss computational strategies for mining meaning from large integrated datasets. Application of these techniques has helped form hypotheses about how microbial communities respond to changing environmental conditions and stress. I present examples from fungal-dominated microbial communities living in metal-rich pH 1 acid mine drainage, and from communities enriched for growth on specific bioenergy-relevant substrates. Application of data-driven approaches has identified key microbes responsible for ecosystem function, and key pathways expressed in response to stress. For students to become comfortable with planning and critically evaluating data-driven experiments requires solid foundations in computation and biostatistics, rapidly changing technology, and basic microbiology. Far from abandoning the traditional scientific method, data-driven microbiology has the ability to rapidly generate unbiased hypotheses that can be tested at a systems-wide level.

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7. Microbial Electricity Production from Bioelectrochemical Systems

*Conference Room G*

**Zhiyong (Jason) Ren, University of Colorado, Denver**

Bioelectrochemical systems (BESs) are devices that use microorganisms as biocatalysts to oxidize biodegradable resources and generate direct current. This current can be harvested as direct electricity, or used for efficient chemical production, salt water desalination, and environmental remediation. With less than a decade of research effort, power densities from BESs have increased by several orders of magnitude, which makes the technology feasible for full-scale applications. BESs also offer unique environments for characterizing bacterial extracellular electron transfer mechanisms and electrochemical activities. This presentation will discuss the recent advances and remaining challenges for the technology, and how the technology was used as a platform for education in microbiology, electrochemistry, and engineering for high school students and college students.

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8. If Yeast Ain't Happy, Ain't Nobody Happy: The Microbiology of Beer

*Conference Room H*

**Sponsored by American Academy of Microbiology**

**Christopher White, White Labs Inc.**

Without yeast, there would be no beer. It’s that simple. *Saccharomyces cerevisiae* is a species of yeast that makes beer, wine, spirits, and is a popular organism for laboratory study. *S. cerevisiae* was the first organism to have its entire genome sequenced in 1996. Brewers yeast are special strains of *S. cerevisiae* that have been domesticated by brewers to make the desired flavors of beer. Brewers yeast consumes the sugar and metabolizes it to ethanol, CO2, and other important flavor compounds. These flavor compounds include acids, aldehydes, sulfur compounds, keytones, and esters. If the metabolism is inconsistent, or the yeast mutates, the resulting beer will be flawed. So brewers have gone to great lengths over the millennia to protect and care for their yeast strains. Wild yeast and bacteria, even in very small quantities, can spoil beer. Therefore brewers normally use pure strains of yeast. In fact, brewers yeast was the first microorganism to be purified in 1883. There are now several hundred different strains of brewers yeast used to make beers. This session will focus on the story of the microbiology of beer, highlight the role of brewers yeast, its metabolism, flavor, and fermentation technology.

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**EXHIBITOR SETUP**

*3:00 PM - 6:00 PM*

**Summit Ballroom**
60-minute sessions dedicated to presenting practices and pedagogies that have been assessed for classroom effectiveness. Presenters will provide background information and their approach to the strategy, leaving time for participants to practice and reflect upon how they can implement the new practice or approach into their classrooms. These sessions are presented in two of three times slots during the conference.

1. Interdisciplinary Communication Laboratory for Undergraduate Biology (iCLUB)
Conference Room D

Jenifer Alonzo, Old Dominion University

There is a growing awareness that major advances in research can be made through collaborations across traditional disciplines. Students and faculty involved in interdisciplinary research activities often confront obstacles to healthy collaboration. These obstacles may include:

• Differences in personal and research values.
• Differences in research practices.
• Overall discomfort with the close interpersonal communication that is critical to any collaboration.

The workshop provides a peek into the hands-on training developed by iCLUB to help students and researchers better communicate across disciplines. Participants will be introduced to tools that iCLUB participants use to foster healthy communication. The workshop is action-oriented allowing participants to practice the communication and collaboration skills that they learn by exploring immediate problems in their research collaborations with students. Through the workshop participants will learn how iCLUB tools can help:

• Quickly build rapport
• Develop better listening skills.
• Identify areas of potential conflict
• Increase comfort in communicating with conflict.
• Establish agreed upon ways to communicate.
• Expand skills for identifying and communicating goals and values with potential collaborators.

The iCLUB Network is a NSF-Funded RCN-UBE incubator (DBI-1061935) which works to establish a community of faculty who regard healthy collaboration as essential to their research and teaching, especially in interdisciplinary and multidisciplinary efforts. ICLUB activities are open to scientific researchers and their collaborators.

2. Development and Use of Interactive Group Case Studies in Microbiology Courses
Conference Room G

Linsey Donner, University of Nebraska Medical Center
Marnie Imhoff, University of Nebraska Medical Center

Laboratory sessions pose a unique opportunity to reinforce microbiology lecture information through collaborative learning. This session will focus on the development and use of microbiology group case work for microbiology and infections disease courses. The curriculum development, planning and implementation of case studies will be discussed. The case studies enhance learning through small group work to identify organisms and correlate patient clinical data. We will discuss the set up of the lab activities in a "wet lab" area and how to alter the session to take the activity into a clean classroom.

3. Facilitating Undergraduate Research: Trials, Tribulations, and Lessons Learned
Conference Room A

Rebecca Ferrell, Metropolitan State University of Denver

Undergraduate research experiences are increasingly important for students who want to continue into graduate and professional programs, and they can also serve as valuable professional development opportunities for teaching faculty. To remain scientists, we need to do science. Doing science with our students can be stimulating and rewarding in many ways, but it can also be frustrating and disappointing, as well as hazardous to our equipment, reagents and sanity. When we structure projects well, recruit students wisely and provide them with appropriate guidance and clear expectations, our students can have valuable experiences that prepare them to become independent researchers. This presentation will examine lessons learned from mentoring undergraduates in their first research efforts, including designing projects, selecting students, anticipating the sorts of "rookie mistakes" they are likely to make, initiating them into the culture as well as the practice of science, mediating interpersonal conflicts, and preparing them to present their work at scientific meetings. Examples to be discussed will include successes, failures, deep frustrations, astonishing errors, and very proud moments. Participants will have an opportunity to share their own experiences with helping students through this scientific rite of passage.
4. Teaching and Learning Biology Online

Conference Room C

Jennifer Herzog, Herkimer County Community College
Mary Mawn, SUNY-Empire State College

There will be two stand-alone sessions related to online teaching and learning. Each session will be offered one time only. Although participants can enjoy any combination of these sessions, Session I will focus on introductory topics for new instructors. Session II will present more advanced pedagogical issues for more experienced online faculty. Please bring a laptop or computing device, this is a hands-on session.

SESSION II: Biology Online 201: Maintaining an Effective Online Science Course

You have developed an online course but now are faced with additional hurdles unique to this educational format. How can I more effectively facilitate online discussions? What can be done to avoid plagiarism? In what ways can students engage in experimentation from a distance? How can I collect meaningful data from my online course? During this intermediate level session, the presenters will share real-world examples that highlight online teaching approaches that address these questions. Additional techniques will be identified and shared in an open discussion among the presenters and session attendees. Finally, examples of web-based tools that support online teaching and learning will be shared.

5. The Active Learning Classroom: A 6-Year Retrospective of Successful Strategies and Continuing Struggles in “Flipping” an Introductory Biology Course

Conference Room F

Robin Wright, University of Minnesota

What would a classroom look like if we designed it purposefully to acknowledge the biology of learning? How do students respond to this design? What are the challenges? We’ve been teaching an introductory biology course for majors for the past 6 years in an Active Learning Classroom, which features round tables and lots of technology. Based on our experiences with thousands of students, we are even more convinced today than six years ago of the value of using class time differently. Instead of presenting information, we pose challenges that help students develop higher order skills such as critical thinking, problem solving, and evaluation. Interestingly, our relationship with students has evolved from that of teacher-student to that of “senior-junior colleagues.” We have time and space in which we can be by our students and learn from them. They accept the challenges that we offer them and go beyond our expectations. In this workshop, I’ll discuss how to adapt to active learning environments, including the struggles that we overcame and the ones that we are still wrestling with.

POSTER SETUP

4:15 PM - 5:00 PM
Summit Ballroom

PLENARY LECTURE

5:00 PM - 6:00 PM
Auditorium 1

Intraterrestrial Life on Earth

Katrina J. Edwards, University of Southern California

Oceanic crust is a vast and hydrologically active potential habitat for microbial life, with large areas of oceanic crust exposed at the seafloor that serve as conduits of exchange for fluids, heat, solutes, and biological materials between the ocean and the lithosphere. Circulating fluids are not in thermodynamic equilibrium with chemically reduced basaltic crust, resulting in redox reactions that could support growth of microbes. However, the existence and functioning of a deep biosphere within exposed and deep oceanic crust are largely unknown and unconstrained.

We have been using novel microbial colonization experiments deployed within igneous ocean crust on the eastern flank of the Juan de Fuca Ridge, to examine crustal microbial communities in situ within young (3.5 Ma) oceanic crust. Polished rock chips have been used as colonization surfaces, and borehole fluids were collected using OsmoSamplers deployed directly below the microbial observatories, and temperature loggers were also deployed in tandem as well. Molecular biology, mineralogy, chemistry, microscopy, and thermodynamic modeling will be presented to describe these experiments.

ASM FACULTY PROGRAMS POSTER SESSION & RECEPTION - A WALK DOWN MEMORY LANE: 20+ YEARS OF PROGRESS

6:00 PM - 8:00 PM
Summit Ballroom

Join us to celebrate and reminisce about the past 20+ years of ASM faculty development programs, from the original movement to create an ASM membership category for educators, on to the birth of ASMCUE, the development of online education resources such as MicrobeLibrary and the Journal of Microbiology & Biology Education (JMBE) and faculty training institutes. Meet the volunteers who developed the vision for and helped to implement these resources. Have fun looking through historical photos and recollections. Most importantly, stop by the “Visioning Poster” and take time to dream about what the NEXT 20 years should look like and the role you would like to play in improving educational opportunities for faculty and developing students.
**Memory Walk Posters and ASM Leaders**

**The beginning...**

**Division W**
Robert Bauman, Division W Chair  
Laurie Castlake, Division W Chair Elect

In 1988, Robert Krasner proposed a new division to be focused on microbiology education. In 1993, the Division on Microbiology Education received full approval from the ASM Council as Division W, which guaranteed sessions about pedagogy at the ASM General Meeting. This same year saw the establishment of the Microbial Literacy Project and the Undergraduate Research Fellowship. Today, the division is a forum for members interested in microbiology education from K-12 to post-doctoral levels. Its 4,000 members form the backbone of ASM education programs and initiatives, such as the ASM Conference for Undergraduate Educators and the *Journal of Microbiology & Biology Education*.

**The conference....**

**ASM CUE - A National Leader in the Scholarship of Teaching and Learning in Biology**
Jacqueline Washington, 2012 ASM CUE Chair

Recognizing the unique needs of educators attending the ASM General Meeting, education sessions grew from two in 1988 to sixteen in 1993 with the desire for even more in depth discussions. From 1994-1996, a core group gathered prior to the ASM General Meeting to formulate guidelines for undergraduate microbiology education and the ASM Conference for Undergraduate Educators was born. Held annually, attendance to the interactive conference has tripled, with biology educators focused on educational reform through improved teaching techniques, assessment and scholarly research. Nationally recognized for the advancement of the scholarship of teaching and learning in biology, ASM CUE will continue to enhance faculty development.

**Publications....**

**MicrobeLibrary**
Susan Bagley, Chair, MicrobeLibrary Editorial Board

The ASM MicrobeLibrary (ML) 2.0 is a peer-reviewed collection of faculty resources that demonstrate the scholarship of teaching and learning. Its mission is to promote good pedagogy in microbiology, foster scholarly teaching, and enhance understanding about the microbial world. Started in 2001, the ML consisted of visual images, curriculum activities, a tri-annual educational newsletter, an annual educational journal, and reviews and resources. The Atlas Protocols started in 2005. The ML was revamped in 2011-2012 and currently contains: Gallery (from the Atlas Protocols); Visual Media Briefs (formerly the Visual Images Collection); Laboratory Protocols (from the Atlas Protocols); and Critical Thinking Question Bank.

**JMBE**
Christopher J. Woolvert, Chair, *JMBE* Editorial Board

Born as *Microbiology Education Journal* in 2000, the *Journal of Microbiology & Biology Education* (JMBE) was reinvented in 2008, with a mission to “promote good pedagogy and design, foster scholarly teaching, and advance biology education research.” In the 13 years since *Microbiology Education Journal* was conceived and launched, teaching and learning in the sciences have become well-respected scholarly disciplines. Today, faculty who’s microbiology and biology research focuses on student success, faculty development, and best pedagogical practices, have a forum to publish in the internationally indexed, completely on-line, rigorous, peer-reviewed *JMBE*. Complimenting ASM CUE, *JMBE* also serves to extend faculty research beyond the borders of the conference.

**Laboratory Biosafety Guidelines**
Neil Baker, Chair, ASM Education Board

Safety in the microbiology-teaching lab has been a frequent topic of discussion at the ASM CUE, but a clear, easy to follow set of guidelines was not available for educators. In 2010 the CDC linked an outbreak of *Salmonella* infections with exposures in teaching labs, prompting the formation of the ASM Task Committee on Laboratory Biosafety. Using the CDC *Biosafety in Microbiological and Biomedical Laboratories* manual as a reference, the committee developed a set of guidelines for the safe handling of microbes in teaching laboratories. Following extensive review and feedback from educators the guidelines were finalized and published on the ASM website. Further development will include practical tips that will assist educators in the application of the guidelines.

**Curriculum Guidelines - New Guidelines For Undergraduate Microbiology: Changing How We Teach to Fit How Students Learn**
Susan Merkel, Chair, ASM Committee on Undergraduate Education

In 2011, the ASM Education Board formed a Task Force to develop a curriculum that would embrace concept-based, student-centered learning. The new curriculum is based on the AAAS/NSF report, *Vision and Change in Undergraduate Biology Education*, which calls for teaching a deep understanding of overarching concepts in biology and mastery of key scientific skills. The task force wrote fundamental statements specific to microbiology for each core concept. Feedback was solicited through on-line surveys and focus groups, and used to develop the final version. The ASM Committee on Undergraduate
FRIDAY, MAY 17

Education is now working with the microbiology education community to develop learning objectives and critical thinking activities that exemplify the fundamental statements.

The outreach…

ASM Biology Scholars
Loretta Brancaccio-Taras, Member, BSP Research Residency Steering Committee

In 2005, the American Society for Microbiology began its Scholars-in-Residence (SiR) Program. Sixteen ASM members mentored by four microbiologists who were also Carnegie Scholars collaborated in designing studies examining questions about teaching and learning. The SiR program has evolved into a NSF-funded project known as the ASM Biology Scholars Program (BSP). BSP serves ASM members and members of eleven life sciences professional societies. In addition, BSP has expanded to offer three residencies: Assessment, Research, and Transitions. As a result of BSP, 190 biologists have systematically examined their classroom practices in an attempt to improve biology education and disseminate their findings.

PULSE Community
William Davis, PULSE Fellow

Vision and Change: A Call to Action provided recommendations for improving life science education. To implement these recommendations, a community, the Partnership for Undergraduate Life Science Education (PULSE), was formed through the collaboration of the Howard Hughes Medical Institute, National Institute of Health, and National Science Foundation. These groups selected forty department chairpersons and deans, to lead the PULSE community to implement departmental level change. Since October 2012, Vision and Change Leadership Fellows have been developing strategies so that life science educators can implement Vision and Change in departments and classrooms at all institutional types across the country.

ASM LINK
Beronda Montgomery, Member, ASM Committee on Undergraduate Education

ASM Leaders Inspiring Networks and Knowledge (LINK) is an initiative to build “links” between research investigators and early-career scientists, undergraduate faculty, and trainees. LINK supports individuals underrepresented in science, technology, engineering, and math (STEM). LINK highlights National Science Foundation (NSF)-sponsored research and promotes interactions between researchers, educators and trainees at three ASM conferences - the Annual Biomedical Research Conference for Minority Students (ABRCMS), the ASM Conference for Undergraduate Educators (ASMCUE), and the ASM General Meeting. LINK also sponsors awards to individuals connecting at these conferences to build sustainable collaborator networks and encourage effective mentoring practices. LINK is co-sponsored by NSF and NSF.

Science Case Network
Karen Klyczek, Member, ScienceCaseNet Steering Committee

The Science Case Network (SCN) is a community of faculty using, developing and assessing the effectiveness of case studies and problem based learning, facilitating collaborations and other opportunities. The SCN is funded by an NSF RCN-UBE grant and led by a team of national projects on cases, including the National Center for Case Study Teaching in Science, Case It!, BioQUEST/Investigative Case Based Learning, Cases Online at Emory Center for Science Education, and University of Delaware Problem Based Learning. SCN is based on more than 20 years of history and data, including many collaborations with ASM/ASMCUE. Join the network at http://sciencecasenet.org.

The future…

What’s your vision?
A blank poster(s) where participants will be asked to write their own vision for the future and tack them to the board. People may read them on-site and all information will be collected and shared with the community.
IDENTIFY YOUR COMMUNITY DAY
Wear your “community” colors and represent your institution type so you can identify and network with your colleagues.

Community College = BLUE
Primarily Undergraduate Institution = GREEN
Comprehensive University = ORANGE
Doctoral-Degree Granting University = RED
International = PURPLE

MICROBES ARE FUN 5K RUN - REGISTERED PARTICIPANTS ONLY
6:00 AM - 7:00 AM
Lobby

Registered participants will meet at 5:45 AM at the Inverness hotel entrance. Someone will be on hand to walk you to the race starting location. The race will start promptly at 6:00 AM. A map of the marked course is available: http://goo.gl/maps/n3bH3. Participants will receive a special “race swag bag” at the finish line which includes a t-shirt sponsored by John Wiley & Sons, Inc. and logo created by Imagineering, bottled water, snacks, and a surprise microbe! Prizes will be given for 1st, 2nd, and 3rd place finishers. The registration fee is not refundable and the 5K will be held rain or shine.

Although it is too late to register to run, ASMCUE attendees are welcome to come out and cheer their colleagues.

BREAKFAST BY LOCATION
7:00 AM - 8:00 AM
Columbine Room

ASM’s supports thirty-five Branches organized by geographical territories that are defined by one or more states and/or zip code areas. On site, attendees will receive information about their branch and region, be encouraged to meet others in the same vicinity, and plan branch activities. International attendees will have an opportunity to meet as well.

ASMCUE REGISTRATION
7:00 AM - 3:30 PM
Lobby

PLENARY LECTURE
8:00 AM - 9:00 AM
Auditorium 1

Leaders Inspiring Networks and Knowledge (LINK) - A Research and Educational Model for the Future

EXHIBITOR SHOWCASE
9:00 AM - 3:30 PM
Summit Ballroom

POSTER SESSION A
9:15 AM - 10:15 AM
Summit Ballroom

The 2013 abstracts are organized by both content and pedagogy to help participants navigate more easily through the poster session. The content themes are based upon the ASM Recommended Curriculum Guidelines for Undergraduate Microbiology Education (www.asm.org/educators). The guidelines identify six overarching concepts, which provide a framework for 22 key microbiological topics, and two key skills and are based on concepts put forth in the 2011 national report, Vision and Change in Undergraduate Biology: A Call to Action. The ASM concepts and topics were selected to promote deep understanding of core concepts that are deemed to be of lasting importance beyond the classroom. Likewise, students’ development of competency in the selected skills will have enduring and lasting value beyond both the classroom and laboratories.

Convener:
Beronda Montgomery, Michigan State University

Panelists:
Bruce A. Jackson, MassBay Community College
2011 Presidential Awards for Excellence in Science, Mathematics, and Engineering Mentoring Awardee
Jenifer Alonzo, Old Dominion University

The complex environmental and social problems that are facing us nationally and globally require collaborations from scientists and educators from a diversity of backgrounds, disciplinary knowledge, and experimental approaches. This session highlights undergraduate teacher-scholars who have made ordinary connections and nurtured extraordinary collaborations across disciplinary and global boundaries supporting interdisciplinary and multiethnic teams. The session kicks off a multiyear collaboration called the ASM and NSF Leaders Inspiring Networks and Knowledge (LINK) initiative. This kick-off session launches feedback opportunities for ASMCUE participants planned throughout the conference and afterwards about meaningful interactions between established investigators and undergraduate students, educators, faculty and future faculty. Through responding to a national need for structured mentoring, the ASM and NSF LINK aspires to cultivate diversity and competency in STEM fields.
In May 2012, a Perspectives article published in the Journal of Microbiology & Biology Education (JMBE) entitled, "The Development of Curricular Guidelines for Introductory Microbiology that Focus on Understanding," described the consensus-building process around the new, concept-based curriculum for Introductory Microbiology courses. For the purposes of ASM CUE, a seventh concept, advancing STEM education and research has been added to the abstract in order to identify authors working in this broader-scoped area.

The pedagogy themes are organized into five categories: course design, hands-on projects, student learning, teaching approaches, and teaching tools.

Each abstract is assigned to both content and pedagogy themes. These assignments, designated by the submitting author, are placed below the full abstract. See page 81 for Poster Abstract Content and Pedagogy Grid. Abstracts are found in the Journal of Microbiology & Biology Education, Volume 14, Issue 1.

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7-A  Expectations in an Introductory Science Course: Why Students don’t Study as Much as they Should  
L. Clement (1,2,3), D. Nathaniel (1), J. Lewis (1,2), B. Wong (1), E. Johnson (1,2). (1) City College of San Francisco, San Francisco, CA, (2) Bio-Link National ATE Center in Biotechnology and Life Sciences, San Francisco, CA, (3) The American Society for Cell Biology, Bethesda, MD

ASM Curriculum Guideline Concept(s): Advancing STEM education and research  
Pedagogical Category(ies): Student learning, Teaching approaches

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ASM Curriculum Guideline Concept(s): Advancing STEM education and research  
Pedagogical Category(ies): Student learning

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11-A Assessing the Efficacy of Whether a Graphing Activity in Which Students Connect Biological Concepts to Themselves in a Biology of Women Course Improves Student Learning and Knowledge Retention  
C.A. DeBoy. Trinity Washington University, Washington, DC

ASM Curriculum Guideline Concept(s): Information flow, Systems  
Pedagogical Category(ies): Student learning

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13-A A Sustained University and K-12 Educator Professional Development Partnership Enhancing Knowledge, Confidence, and Skills for Active Classroom Inquiry  

ASM Curriculum Guideline Concept(s): Advancing STEM education and research  
Pedagogical Category(ies): Hands-on projects

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15-A A Freshman Seminar Course on the History of Antibiotic Therapy Improves Scientific and Information Literacy  
M.J. Hanophy and L. Kehoe. St. Joseph’s College, Brooklyn, NY

ASM Curriculum Guideline Concept(s): Impact of microorganisms  
Pedagogical Category(ies): Course design
17-A
Design and Initial Implementation of a Vertically Integrated Biology Curriculum Incorporating Inquiry-based Modules

ASM Curriculum Guideline Concept(s): Advancing STEM education and research
Pedagogical Category(ies): Course design, Hands-on projects

19-A
Take-Home Active Learning Exercises may Result in Learning Gains Equivalent to In-Class Active Learning, with Both Superior to Traditional, Low-Structured Lecture in Introductory Biology
K.A. Lennon (1) and D.P. Puthoff (2). (1) Hagerstown Community College, Hagerstown, MD (2) Frostburg State University, Frostburg, MD

ASM Curriculum Guideline Concept(s): Advancing STEM education and research
Pedagogical Category(ies): Teaching approaches

21-A
An Alternative Approach to “Identification of Unknowns”: Designing a Protocol to Verify the Identities of Nitrogen-Fixing Bacteria
B.M. Martinez-Vaz. Hamline University, Saint Paul, MN

ASM Curriculum Guideline Concept(s): Structure and function
Pedagogical Category(ies): Hands-on projects, Teaching approach

23-A
Redesign of Multi-Section Introductory Laboratory Classes to Incorporate an Authentic Research Project in Comparative Genomics

ASM Curriculum Guideline Concept(s): Evolution, Pathways
Pedagogical Category(ies): Course design

25-A
Undergraduate and Graduate Students’ Perception on Virtual Education
J. Ortellado-Canese (1,2), J. Canese (1), and A. Galeano (2). (1) Universidad Nacional de Asuncion, Asuncion, Paraguay (2) Universidad Catolica de Asuncion, Asuncion, Paraguay

ASM Curriculum Guideline Concept(s): Impact of microorganisms
Pedagogical Category(ies): Course design, Teaching tools

27-A
Implementing Vision and Change: Bringing Undergraduate Research to a Non-research Biology Program through BioSOLVE Courses and Application-Based Service Learning (ABSL) Pedagogy
G.E. Rowe. La Roche College, Pittsburgh, PA

ASM Curriculum Guideline Concept(s): Advancing STEM education and research
Pedagogical Category(ies): Teaching approaches

29-A
Team Based Learning Enhances Course Content Retention in a Hybrid Classroom
H.M. Seitz. Johnson County Community College, Overland Park, KS

ASM Curriculum Guideline Concept(s): Advancing STEM education and research
Pedagogical Category(ies): Teaching approaches

31-A
Assessment of a Novel Group-Centered Testing Schema in an Upper-Level Undergraduate Molecular Biotechnology Course
M.C. Srougi (1), H.B. Miller (2), D.S. Witherow (3), and S. Carson (1). (1) North Carolina State University, Raleigh, NC (2) High Point University, High Point, NC (3) University of Tampa, Tampa, FL

ASM Curriculum Guideline Concept(s): Advancing STEM education and research
Pedagogical Category(ies): Course design, Student learning

33-A
Metacognitive Regulation Training to Improve Student Performance in Introductory Biology
J.D. Stanton and T.C. Byington. Washington State University, Pullman, WA

ASM Curriculum Guideline Concept(s): Advancing STEM education and research
Pedagogical Category(ies): Student learning

35-A
Refining Undergraduates’ Focus on Microscopy in the General Microbiology Lab
S.C. Wagner and J. Taylor. Stephen F. Austin State University, Nacogdoches, TX

ASM Curriculum Guideline Concept(s): Structure and function, Advancing STEM education and research
Pedagogical Category(ies): Hands-on projects
**AUTOR CORNER**

*9:15 AM - 9:45 AM*

_Summit Ballroom_

**Sponsored by Pearson**

Featured Author: Robert Bauman

*Microbiology with Diseases by Taxonomy, 4th edition*

Join Pearson author Dr. Robert Bauman to learn about the Fourth Edition of _Microbiology with Diseases by Taxonomy_ and Video Tutors! Video Tutors provide the perfect bridge between the textbook and MasteringMicrobiology®, walking students through key microbiology concepts and helping them visualize and understand important microbial processes on-the-go.

**PRODUCT CORNER**

*9:15 AM - 9:45 AM*

_Conference Room A_

**Sponsored by McGraw-Hill Education**

Featured Product: LearnSmart Labs, LearnSmart Prep, LearnSmart, and SmartBook

_Got data? Get adaptive!_

Join Professors Heidi Smith, Front Range Community College; Gabriel Guzman, Triton College; and John Bacheller, Hillsborough Community College as they discuss the successful use of adaptive technology in their classes and labs.

_LearnSmart Labs_ is a super-adaptive simulated lab experience that brings meaningful scientific exploration to students. Through a series of adaptive questions, LearnSmart Labs identifies a student's knowledge gaps and provides resources to quickly and efficiently close those gaps. Once the student has mastered the necessary basic skills and concepts, they engage in a highly realistic simulated lab experience that allows for mistakes and the execution of the scientific method.

_LearnSmart Prep_ is a super-adaptive tool that quickly and efficiently prepares students for a college level course. Prep uses a set of diagnostic questions to help identify what a student knows and doesn't know. It then provides a unique learning plan focused on helping the student master the basic skills and concepts he or she needs the most before entering the classroom.

_LearnSmart_, which started it all, is the only adaptive learning program proven to effectively assess a student's knowledge of basic course content and help them master it. By considering both confidence level and responses to actual content questions, LearnSmart identifies what an individual student knows and doesn't know and builds an optimal learning path, so that they spend less time on concepts they already know and more time on those they don't. LearnSmart also predicts when a student will forget concepts and introduces remedial content to prevent this. The result is that LearnSmart's adaptive learning path helps students learn faster, study more efficiently, and retain more knowledge, allowing instructors to focus valuable class time on higher-level concepts.

_SmartBook_ is the first and only adaptive reading experience available for the higher education market. Powered by an intelligent diagnostic and adaptive engine, SmartBook facilitates the reading process by identifying what content a student knows and doesn't know through adaptive assessments. As the student reads, the reading material constantly adapts to ensure the student is focused on the content he or she needs the most to close any knowledge gaps.

**COFFEE REFRESHMENT BREAK**

*9:45 AM - 10:15 AM*

_Summit Ballroom_

**Sponsored by Pearson**
concepts. Finally, Dr. Peters will also provide information on instituting new ASM Curricula Guidelines, and how Molecular Genetics of Bacteria fits within these guidelines.

**AUTHOR CORNER**

*9:45 AM - 10:15 AM*

*McGraw-Hill Booth*

**Sponsored by McGraw-Hill Education**

Featured Authors: Joanne Willey, Linda Sherwood, and Chris Woolverton

*Prescott’s Microbiology, 9th edition*

Join authors Joanne Willey, Linda Sherwood and Chris Woolverton as they discuss the new, 9th edition of *Prescott’s Microbiology*. Highlights of the revision include separating the chapters on bacteria and archaea to recognize the importance and prevalence of archaea; significant updates to the molecular microbiology and immunology coverage, reflecting recent updated scientific thinking and a streamlined discussion of immunity; and updates to Laboratory Safety, reflecting new recommendations from the American Society for Microbiology.

**PRODUCT CORNER**

*9:45 AM - 10:15 AM*

*Conference Room B*

**Sponsored by John Wiley & Sons, Inc.**

Featured Product: WileyPLUS and Kno Ebooks

See first-hand how WileyPLUS for Microbiology can enhance your course. WileyPLUS is a research-based, online environment for effective teaching and learning that integrates the digital textbook with effective resources to fit every learning style.

With dozens of free, interactive features, Kno makes learning more engaging, “hands-on”, and efficient. In addition to lowering pricing, students can search content, take notes, highlight key materials, and have all their work in one place for more efficient studying. Instructors are given tools like Social Sharing, Smart Links, and Quiz Me. Students are also given tools such as Journal, Advanced Search, and Flashcards.

**MICROBREW SESSIONS I of II**

*10:30 AM – 11:30 AM*  
*(8 sessions)*

These grassroots sessions, arranged by topics, provide a forum for sharing best practices and interesting activities used in laboratory and classroom teaching. Presentations are simple “chalk talks” (e.g., no PowerPoint) to facilitate informal discussion. Unlike the poster sessions, Microbrews do not require assessments.

Sessions will be facilitated by volunteer attendees in order to make certain each presentation stays within the 15-minute presentation (10-minute presentation and 5 minutes for discussion). Sessions must stay on time so attendees are able to move from room to room quickly to see their desired session.

**Session Room Facilitators:**

*Conference Room H*

Facilitator: Rod Anderson, Ohio Northern University

*Conference Room G*

Facilitator: Ned Barden, Massachusetts College of Pharmacy and Health Sciences

*Conference Room A*

Facilitator: Jennifer Herzog, Herkimer County Community College

*Conference Room D*

Facilitator: Gary Kaiser, The Community College of Baltimore County, Catonsville Campus
S. L. Bjerke. Washburn University, Topeka, KS

This is a “field trip” exercise in which introductory and general microbiology lab students get to collect samples from other buildings on campus and perform lab tests that identify resistant strains of *Staphylococcus*. This exercise reinforces general microbiology lab concepts (aseptic techniques, streaking for isolation, creating a lawn of bacteria, selective and differential media, Kirby Bauer test) and gives students the chance to apply microbiological principles to a real life situation. Over several semesters, students have been able to search for resistant bacteria in the student recreation center, student athlete workout facilities, classroom buildings, the library, the student union and the school cafeteria. Students use cotton swabs (moistened with water) to collect samples from surfaces. They swab mannitol salt plates (as well as a tryptic soy agar plate as a control) to select for bacteria that can tolerate high salt concentrations. If they are successful at isolating a colony that both grows on the mannitol salt plate and is able to ferment the mannitol and turn the media yellow, they then use a Kirby Bauer test to see if the bacteria are resistant to oxacillin. Once all of the results are in, the student results are compiled and sent across campus to people who run the various buildings. These experiments typically serve as an eye opener not only to the students (who find much more resistant bacteria than they would like) but also the people who work in the buildings. Students frequently cite this exercise as one of their favorites from the semester. In the future I would like to incorporate additional tests to better analyze the bacteria isolated from these locations.

ASM Curriculum Guideline Concept(s): Evolution, Impact of microorganisms

2. Adventures in Teaching in a Technologically Enhanced Classroom: First Forays into Flipping and Sampling a Smorgasbord of Active Learning Strategies to Engage Students in the Learning Process
Conference Room D

D.M. Becker. Northern Michigan University, Marquette, MI

As a participant in a National Science Foundation TUES (Transforming Undergraduate Education in Science) grant program, I am teaching in a classroom specifically designed to move away from the traditional ‘faculty-centered’ lecture format. Students sit at round tables with dedicated monitors and white boards for each table. Other technology in the room is available and all students use laptops in the course. Using the ASMCUE curriculum guidelines and the mantra that “less is more,” I have redesigned my course objectives and content for this upper-level microbiology course. My goal is to experiment with technology and assessment techniques, to use a variety of active-learning approaches (e.g., jigsaws, case-studies), and to ‘flip’ parts of my course to enhance students’ learning. In my Microbrew presentation, I will report on strategies that worked (and didn’t) and the payoffs (and costs) to flipping. In addition, I will discuss my perspective on the impact the technology-enhanced classroom and the teaching tactics had on student attitude, engagement, and comprehension of microbiology.

ASM Curriculum Guideline Concept(s): Evolution, Pathways

3. Searching for Methicillin-Resistant *Staphylococcus aureus* on the Washburn University Campus
Conference Room E

R. Austin. Farmingdale State College, Farmingdale, NY

People are by nature story tellers. The use of narratives in educating medical professionals is growing. To help the clinical laboratory science student have a better understanding of viral infections, the symptoms they cause and how they are detected by the clinical laboratory, the students are assigned a virus. They are directed to research the virus and present their new found knowledge as a first person narrative. They become the virus and tell their story. They are asked to narrate: 1) a replication cycle, 2) the symptoms they cause the host, 3) the interaction with the host immune system, and 4) how they are detected in clinical samples. Students are encouraged to be creative. A grading rubric is given. Completed narratives are shared and discussed in class.

ASM Curriculum Guideline Concept(s): Structure and function

1. Tell Me Your Story
Conference Room B

R. Austin. Farmingdale State College, Farmingdale, NY

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ASM Curriculum Guideline Concept(s): Structure and function

Facilitator: Suzanne Long, Monroe Community College

Facilitator: Mark Martin, University of Puget Sound

Facilitator: Philip Mixter, Washington State University

Facilitator: Jackie Reynolds, Richland College

MICROBREW SESSION A: 10:30 AM

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Conference Room B

R. Austin. Farmingdale State College, Farmingdale, NY

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ASM Curriculum Guideline Concept(s): Structure and function

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S.L. Bjerke. Washburn University, Topeka, KS

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ASM Curriculum Guideline Concept(s): Evolution, Impact of microorganisms

Conference Room D
4. Making the Pitch: Rewarding Passion through Cooperative and Accountable Group Presentations in Introductory Microbiology

J.M. Bradshaw and A.M. Lee. North Carolina State University, Raleigh, NC

Introductory Microbiology classes, with the breadth of material they are expected to cover and the wide variety of majors for which they are required courses, can be difficult places to emphasize personal discovery and to elicit student passion for the subject. Translational discussions are a time-honored mechanism of personalizing and adding value to abstract concepts, and the use of such discussions by microbiology textbooks as “asides” is common; these, however, are limited in their impact as textbooks age and may not fulfill personal student interests. To assist in this endeavor, we have developed a student presentation assignment based on venture capitalism. Groups of students, formed by a shared common interest in a subset of microbiological methodologies and advances, must convince the rest of the class to value a product of their own design, with suggestions inspired by companies making use of this technology currently or from personal innovation. Defined student roles within the presentation as well as peer assessment of effectiveness provide individual accountability, and the necessity of pulling the individual elements into a coherent whole facilitates positive interdependence and teamwork. We hypothesize that this assignment will be an opportunity to evaluate higher-order thinking skills such as the ability to synthesize previous information and to evaluate and question work by others on a variety of topics. This should translate into increased student retention of information and an improved ability to generalize concepts. Course outcomes were determined by measuring student performance on assessments, student satisfaction with the assignment and evaluation of presentations by students and faculty. Preliminary results demonstrate high student satisfaction for the assignment, as well as a significantly increased student opinion of how microbiology impacts their desired careers and their daily lives. This translational, learner-centered assessment design shows promise as an alternative method of increasing and subsequently rewarding student passion for microbiology.

ASM Curriculum Guideline Concept(s): Impact of microorganisms

5. Planning for the Next Epidemic: Using a Simulated Disease and Poster Session to Develop Epidemic Plans

A.M. Buchmann and L. Leesch. Chadron State College, Chadron, NE

We have designed an interdisciplinary freshman year course which examines the legal, societal, and biological aspects of infectious diseases. As a signature assignment in this course, students were instructed to respond to a simulated epidemic, the Mile High Fever, which had started in Denver, CO, and had rapidly advanced toward the small town of Chadron, NE, where our college is located. Groups of students were assigned to explore one aspect of the response to the epidemic—control of transportation, psychological support, isolation and quarantine of patients, maintaining law and order, maintaining and controlling access to essential supplies, and providing accurate information. Using interviews, the town’s emergency plan, and material from class, students developed plans to manage the local response to the simulated epidemic. To adequately develop plans, students needed to examine the biological aspects of the disease, the sociological and psychological effects of the epidemic, and the laws guiding governmental responses to emergencies. Students presented their proposed plans in a poster session that was open to the general public. While this activity was specifically designed for an interdisciplinary class, it can be easily adapted to any microbiology class that focuses on diseases, epidemiology, or public health.

ASM Curriculum Guideline Concept(s): Impact of microorganisms


N. Cheeptham, J. Peters, D. Kalynka, and N. Van Wagoner. Thompson Rivers University, Kamloops, BC, Canada

Higher education typically segregates the arts and sciences into separate streams, so it is very likely for students of the arts to graduate with no understanding of applied microbiology. However, communicating difficult concepts in scientific research through the fine arts is a novel way of bringing the general public closer to understanding and appreciating the importance of applied microbiology in everyday life. Also, the creative perspective of artistic expression provides a new way of visualizing microbiology and may help advance scientific discovery.

The proposed activity aims to engage the public in the excitement of the exploration of cave microorganisms, their identification and potential for new drug development, while developing new perspectives in the popular and scientific view of microorganisms, through Aboriginal students’ art work. While the work on the microbiology of the caves has been published in scientific peer-reviewed journals, it remains less-known to the general public. Dr. Cheeptham’s microbiology research team has produced a number of strikingly beautiful SEM images of cave microorganisms. These will be used as the basis of artwork by the Aboriginal students to promote an understanding of the role of these and other bacteria in treating diseases. Moreover, this project would also contribute pedagogically to enhancing student engagement and learning innovation. The project has been funded through the Society of Applied Microbiology (SIAM) Public Engagement Fund. It has also been accepted for an art exhibition at the

ASM Annual Conference for Undergraduate Educators, Englewood, Colorado
Kamloops Art Gallery from January 18 to March 22, 2014.

In summary, this project aims to create an example of bridging the gap between the arts and sciences in higher education, encouraging participation of Aboriginal people in applied microbiology, enhancing student engagement and in doing so create artwork that increases public awareness about the importance of applied microbiology and the human reliance on microscopic organisms.

ASM Curriculum Guideline Concept(s): Impact of microorganisms

7. Combined Service Learning Projects in General Microbiology and Urban Education Classes

P. Gulati and M. Bhattacharjee. University of Houston-Downtown, Houston, TX

For the past two semesters, I have been engaged in a service learning project with students in my General Microbiology class. Students in my class team up with students from an Urban Education class and design experiments to teach hands-on science to elementary school students. Although different experiments have been done, composting and gardening has become the most popular. Different combinations of organic materials such as fruit and vegetable peelings, coffee grinds, egg shells, and others are combined at the appropriate carbon to nitrogen ratio, and microbial action is used break them down to form enriched soil. The composted soils are compared by planting vegetables. The microbiology students assist the urban education students to understand the experiment both theoretically and practically, and advise them on any problems that arise during the experimentation. The urban education students learn how to teach science in the classrooms. Students from both classes learn to work together, providing an invaluable experience in working with people in other disciplines. The students also begin to understand how they can impact the community.

ASM Curriculum Guideline Concept(s): Impact of microorganisms, Advancing STEM education and research

8. Biology Theater — A Kinesthetic Approach to Illustrate Molecular and Cellular Concepts in Introductory and Upper Level Biology

A.M. Siegesmund. Pacific Lutheran University, Tacoma, WA

In both introductory and upper level biology courses, students frequently struggle to conceptualize and understand processes at the molecular level. Quite often, this lack of conceptualization limits students’ ability to integrate new knowledge into an existing framework and use that knowledge to solve problems targeting higher order cognitive skills. In Biology Theater, students take on the role of different molecules and structures and act out processes. Biology Theater has been used to illustrate a wide range of concepts—including cellular respiration, mitosis, competitive and non-competitive enzyme inhibition. In addition, students are able to act out and visualize what happens when “things go wrong.” Subsequent problem sets focused on higher order cognitive skills allow students the opportunity to apply concepts in a new context. Immediate student feedback as well as qualitative responses on teaching evaluations has been overwhelmingly positive. In response to a Student Assessment of their Learn Gains (SALG) question asking how much Biology Theater helped their learning, 60% of students responded “much or great help.” This kinesthetic approach to illustrate molecular and cellular concepts can be used effectively to not only increase student content knowledge, but to lay a foundation for higher order thinking. This Microbrew session will include a demonstration of a Biology Theater activity.

ASM Curriculum Guideline Concept(s): Pathways

MICROBREW SESSION B: 10:50 AM

1. Demonstrating the Evidence of Life in Extreme Conditions

K. Mani, B.B. Salgaonkar, Deepthi Das, and J.M. Braganca. BITS Pilani, Goa, India

Microbiology and ecology of the extremophilic microorganisms in particular archaea has been underscored in the laboratory courses for undergraduate students. This is because of difficulty in sampling due to their inaccessible habitat location and their requirement for specific culturable conditions. For undergraduate students we designed a specific module, demonstrating the microbiology of halophilic archaea, which is relatively easy to grow in laboratory conditions when compared with other extremophiles. Students were taken for a field trip to a natural coastal solar saltern, various sampling techniques were explained and water and sediment samples were collected and brought to the laboratory. Physico-chemical characteristics of the sampling site like salinity, pH and temperature were measured. Students prepared specific media for the isolation of halophilic archaea and plated out the water and sediment samples. After incubating the plates, distinct red/pink/orange colonies were picked and purified by repeated sub culturing. Morphological characteristic of the isolates was determined by Gram staining. The dependence on NaCl and Magnesium concentration was demonstrated by growing the isolates in various concentrations. Halarchaeal nature of the isolates were confirmed by performing viability assay after suspending the isolates in distilled water, by extracting pigments and characterising them spectrophotometrically and by performing Thin Layer Chromatography (TLC), detecting specific archaeal lipids. Last part of the module required students to
isolate the genomic DNA by suspending isolates in distilled water and carry out Polymerase Chain Reaction (PCR) using universal archaeal 16S rRNA primers. Then the isolates were grouped into specific phylotypes by performing Amplified Ribosomal DNA Restriction Analysis (ARDRA).

ASM Curriculum Guideline Concept(s): Impact of microorganisms, Laboratory competencies

2. iBiology Open Access Teaching Tools: Supporting Teachers in the Digital Media Age

S. Goodwin (1), K. Dell (1), and L. Clement (1), R. Vale (2). (1) ASCB, Bethesda, MD and (2) University of California at San Francisco, San Francisco, CA

The recent, widespread adoption of MOOCs (Massive Open Online Courses) by higher education institutions around the country has sparked a national discussion about blended learning and flipped classrooms. The flipping method, which involves having students watch lectures as homework, when used appropriately, could free up classroom time for active learning and group work, which have both been shown to improve deep learning.

However, flipping a classroom can require a significant amount of time, financial and technical resources, leaving many biology instructors out of the equation.

Supported by NSF and NIGMS funding, the iBiology project was started in 2007 to provide open access, video-based, biology seminars by renowned scientists under the name iBioSeminars. In 2010, iBiology launched iBioMagazine, which provides short behind-the-scene talks on topics related to science, including science careers, education, and famous discoveries.

Nineteen of the 80 iBioSeminars talks now include Teaching Tools, assessment and activity questions designed by the speakers themselves. Since 2009, 459 users from 56 countries have requested access to the Teaching Tools (TT) answer keys, 21% of these for teaching purposes. In addition, 45% of TT users are located outside of the United States. In the US, 32% of TT users are associated with High Schools, 46% with an Undergraduate program, and 21% with a Graduate or Professional program.

In April of this year, iBiology will launch iBioEducation, expanding its educational offerings to include assessments for short clips and research papers, talks in microscopy and scientific teaching, as well as the option to search for materials according to Vision and Change and AP Bio learning objectives. In this session, we will give an overview of the iBioeducation tools, including TT, ask for input on the iBiology tools, and discuss methods to best measure impact on student learning.

ASM Curriculum Guideline Concept(s): Evolution, Structure and Function, Pathways, Information flow, Systems, Impact of microorganisms, Advancing STEM education and research

3. A Formula for Increasing K-12 STEM Exposure Through Service-Learning

Conference Room H

M.E. Marks (1) and P.A. Marks (2). (1) Willamette University, Salem, OR (2) Reynolds School District, Portland, OR

Recruiting underrepresented groups into STEM fields requires support programs at the college level and outreach at the K-12 level. Due to budgetary constraints and national mandates, public schools spend the majority of their limited resources instituting essential programs for children performing below grade level. Consequently, enrichment programs for talented or motivated students are rare at schools that serve economically disadvantaged populations. A collaborative project led by a 4th grade teacher and a microbiologist brought students together in a mutually-beneficial service-learning experience that provided STEM exposure for a group of 10 and 11 year old English Language learners. The college volunteers adapted their lab experiments to teach the elementary students about investigative microbial ecology in an eight week &ldquo;Science Club.&rdquo; The college students came to the elementary school and taught the children about sterile techniques, bacterial strains, serial dilutions, and scientific writing; all topics that they were studying in their microbiology course. Melissa supported their work on campus: preparing supplies and planning experiments. Pam helped them adapt their teaching for a young audience and taught supplementary science lessons during the school day. At the end of the project, the children came to campus to tour the biology labs and present their work at the annual Science Expo. The collaboration was of great benefit to both sets of students. The college students strengthened their knowledge of microbiology through interpreting the concepts for a young audience. The elementary students engaged in experiments that would have been impossible in their classroom setting without the support of the college and all of them expressed interest in studying science in the future. This formula for a service-learning project is highly flexible, college students can adapt experiments from any course with technical support from a scientist and instructional support from a teacher.

ASM Curriculum Guideline Concept(s): Impact of microorganisms, Advancing STEM education and research

4. Biowarfare, Epidemiology and the Microbiology Student

Conference Room G

G.M. Marley. Oklahoma State University, Stillwater, OK

The topic of biological warfare is a sobering but neglected one for microbiology students committed to making their chosen discipline responsible to societal needs. It is no longer appropriate to postpone dissemination of public health and epidemiological methodology until graduate education. Our initial
interest was stimulated by an innovative Scientific American review [1]: In their landmark presentation, algorithms [2] derived by the Computer and Computational Sciences Division at Los Alamos National Laboratory (LANL) were adapted to predict biowarfare outcomes as a function of public health initiatives. Subsequently we began to inculcate epidemiological parameters in both upper-level undergraduate and introductory graduate courses.

Our didactic framework entailed three primary aspects:

1) algorithms that predict morbidity/mortality outcomes from biowarfare attacks; 2) an interactive web-based program [3] that permits users to input independent variables (from epidemiological parameters) and observe predicted outcomes; 3) interactive classroom exercises derived from the preceding two aspects. Such an interactive exercise (using only handouts) in biowarfare epidemiology will enlist the aid of attendees to propose appropriate public health responses to a simulated biological attack on an urban civilian population. Information in the form of independent variables to manipulate (e.g. antibiotic administration; vaccination; quarantine, etc.) will be distributed in an effort for participants to hypothesize a projected outcome (i.e., mortality rate.) Knowledge of the characteristics (virulence, pathogenicity, mode of transmission, etc.) of putative bacteriological and viral biowarfare agents will hone the participants’ abilities to strategize optimal public health responses.


ASM Curriculum Guideline Concept(s): Impact of microorganisms

5. Creative Ideas to Encourage Student Thinking About Your Topic
Conference Room F

T.L. McNealy, Clemson University, Clemson, SC

Students can have short attention spans, so every little bit you can make them think about your topic can be helpful. Attaching a serious topic such as microbiology to a ‘fun’ activity can increase time spent thinking about it and result in more learning. I have recently incorporated music, art and social media activities connected to microbiology topics into my class. For music we have a ‘song of the day.’ I play a YouTube video of a piece that relates in some way to our topic. The students then have two options: 1) email to me how the song relates to the topic and/or 2) email me another song that relates to the topic. In the seven classes we have had thus far this semester, I have had 47 responses. This equates to 47 times the student thought about the topic outside of class when normally they would not. Although our students are huge fans of the internet and social media, they are less likely to watch or read science news. To encourage staying current and allowing them to practice their favorite social media, part of their class participation involves finding current microbiology related news and posting it to a class Facebook page. Finally, art has been incorporated to encourage student thinking about microbiology in other contexts. All students like extra credit, so why not have it be something where they think outside the box. Students are asked to identify a piece of art and connect it to microbiology. All of these very time efficient tools result in students thinking, and in some cases thinking differently about the topic they are studying. And for the benefit of the instructor – they all require very little instructor time.

ASM Curriculum Guideline Concept(s): Impact of microorganisms, Advancing STEM education and research

6. Recording Student Presentations Promotes Active Learning in a Large Class
Conference Room B

University of Minnesota, Saint Paul, MN

We have introduced student presentations using Camtasia Relay, a screen capture technology, into our curriculum in order to promote active learning in a large undergraduate Microbiology class. This is a novel application of the software since the majority of our students report that they have never used screen capture technology. We challenged the students to create an educational video on specific topics in Microbiology that would be viewed by their classmates. Since we enroll upwards of 240 students, Camtasia Relay allows for small groups to record their projects, which are later viewed online by all students. We find that students learn best when given the responsibility of instructing others. By having students teach with this strategy, they not only educate their peers but also strengthen their skills in teamwork, communication, organization and problem solving. We have found several benefits to using screen capture technology in our course. Importantly, it provides students with an opportunity to practice the language of science and demonstrate their knowledge of a particular infectious disease. In a large classroom, students can be intimidated and often reluctant to speak. They are more apt to communicate freely using Camtasia Relay since they record their productions in a quiet, private room after practicing with a script. Another benefit to this technology is that, since they are recording their projects, students strive to present information in a complete, cohesive, and interesting manner. Course instructors and a well-defined rubric help guide students through the process of creating their videos. We find that students are motivated to prepare a high-quality presentation knowing that it may eventually come under the scrutiny of their peers. The use of Camtasia Relay has made it possible for students in our large classroom to learn from each other while discussing pertinent topics in Microbiology.
ASMCurriculum Guideline Concept(s): Impact of microorganisms

7. “Mission Evidence”—A Student Centered Solution for Scientific and Medical Misinformation Conference Room A

M.E. Vollertsen. Southeast Arkansas College, Pine Bluff, AR

As science educators, we all confront the scientific misinformation problem, but misinformation appears to be a mushrooming problem for our students and citizens. It is easy to find groups on the Internet masquerading as watch-dog organizations or research groups. They often make large claims with little evidence, and clearly have their own agenda. As scientists, we are aware that under-informed or misinformed voters, media, and politicians are hazardous to the scientific and medical progress of our nation. What if we could work with students in core courses, such as Microbiology for Health Sciences, to help them recognize questionable claims while simultaneously improving their research and presentation skills?

The goal of the “Mission Evidence” Project is to help students better identify scientific and medical misinformation, and to empower them as evidence seekers, evaluators, and communicators. To develop mystery and excitement about the “Mission Evidence” project, the students began the semester facing some true-false questions on their pretest regarding the use of vaccines, antibiotic usage, and disease transmission that could appear controversial. Not being given the “right answers,” students showed considerable interest, arguing with one another about these statements for several days. Later in the semester, the students will be divided into small groups. Each group will be given an envelope containing particular controversial statements and pertinent questions to help them plan their group’s unique “Secret Mission.” The students then will evaluate the evidence on both sides of the issue, create a bibliography of their sources and develop a short presentation to be given to the class. A final assessment of the project will occur on the post-test. Upon successful completion of their group’s mission, students will receive a card showing them as level one agent on the “Mission Evidence” Team.

ASMCurriculum Guideline Concept(s): Advancing STEM education and research

8. Combining Science and Literature: An Interdisciplinary Approach to Teaching about HIV/AIDS Conference Room C

D.R. Wessner and A.M. Fox. Davidson College, Davidson, NC

What happens when scientists and literary critics converse? This question forms the basis of our team-taught, interdisciplinary course — Representations of HIV/AIDS. In this course, cross-listed as a Biology and an English course, students from disparate academic backgrounds read and discuss texts of various genres related to HIV/AIDS. We read, for example, primary scientific journal articles, newspaper coverage, plays, poems, and short stories. We then discuss these readings with the students, emphasizing in each class and with each reading, how a scientist and a literary critic each might interpret the same material. We explore, for instance, the concept of ‘patient zero’ as it has been used in scientific and popular literatures. For the epidemiologist, identifying a patient zero may lead to a better understanding of how an infectious agent spreads. For the literary critic, ‘patient zero’ often is used to vilify a specific group – the foreign, the marginalized, or the different. Why, we ask our students, is it important that both the scientific and literary understandings of this concept be taken into account? By interpreting the various readings in this course through disparate lenses, our students begin to see the multi-layered issues associated with a complex topic like HIV/AIDS and the combined relevance of the scientific and social aspects of disease. This exploration, we believe, increases their critical thinking skills and helps them form more well-rounded understandings of complex topics.

In this session, we will explore the rationale behind developing this course, the types of readings that our students discussed, and the benefits of offering our students this type of interdisciplinary course. We also will discuss the logistics of offering a team-taught course, both in terms of day-to-day course planning and in terms of departmental and institutional support and recognition.

ASMCurriculum Guideline Concept(s): Impact of microorganisms, Advancing STEM education and research

MICROBREWSession C: 11:10 AM

1. Cheese Microbiology and Biochemistry: A Laboratory Activity Conference Room E

M.A. Furlong. Clayton State University, Morrow, GA

Applied microbiology laboratory activities are outstanding additions to undergraduate Introductory Microbiology courses since they encourage students to apply their knowledge of basic microbiology to an interesting topic that may be relevant to their everyday lives. I created a laboratory activity that engages students in the production of an aged cheese while applying their knowledge of fermentation pathways, enzyme catalysis, microbial growth and microbial community succession. Students work in teams to design an experiment to test various conditions that influence casein denaturation (or cheese curd production) and cheese characteristics such as flavor, aroma and texture of a cheddar cheese. Students involved in this activity demonstrated their ability to create an edible cheese, describe the microbiology and biochemistry involved
in cheese production, theorize the changes occurring in the cheese microbial community during aging and apply their knowledge of basic microbiology to evaluate results of their experiments.

ASM Curriculum Guideline Concept(s): Impact of microorganisms, Laboratory competencies

2. Using Blogs and Discussion Boards to Build a Learning Community
Conference Room D

J.K Krontiris-Litowitz. Youngstown State University, Youngstown, OH

Today online research collaborations between scientists at different geographical locations are a common event. In order for these collaborations to succeed, members must be able to communicate effectively to plan the project, distribute the workload, exchange information and learn from each other. In this session I will discuss a 2 year project where I attempted to build an online student collaborative community that mimicked a research collaboration. Students in a senior level neuroanatomy class used Blackboard discussions or blogs to design and execute a sleep study experiment. In the first year of the study online discussions were superficial with many students ‘echoing’ their classmates ideas rather than contributing their own. Also student proposals and statements in the online discussions lacked substantive scientific foundation. To address these problems a rubric was created and used to guide online discussion in the second year of the study. As a result of this rubric the number of ‘echo’ statements was significantly reduced and most students statements or ideas were supported with scientific reasoning derived from course readings. However, there was little evidence that students learned from each other in these discussion or that they brought new evidence or ideas to the discussion from validated outside sources.

In this session I would like to present the discussion rubric, talk about designing assignments that teach students how to bring new ideas into a discussion and converse about assessments that measure collaboration and collaborative learning.

ASM Curriculum Guideline Concept(s): Advancing STEM education and research, Laboratory competencies

3. Conceptual Targeting of Active Learning Methods
Conference Room G

T.P. Primm, A.M. Lynne, and S.B. Yung. Sam Houston State University, Huntsville, TX

Numerous published studies have demonstrated that active learning in higher education science can increase student learning over pure lecture. What is needed is the next stage of research, understanding the mechanisms behind these learning gains. There are numerous active learning methods, including think-pair-share, cooperative learning, problem-based learning, classroom response systems, etc. In addition, the concepts in biology vary in nature, from process to pattern to mathematical to spatial, and combinations. We hypothesize that the learning of different concepts will be most advanced by different methods, i.e. optimal learning will be generated by matching a particular method to a specific concept. We have begun a project to compare student attitudes and learning gains on particular concepts from various methods. The four concepts were are studying include prokaryotic cell envelope structures, germ theory, DNA replication, and the EMP glycolytic pathway. The learning methods include lecture, concept mapping, strip sequence, and think-pair-share. Each semester, three sections of two courses (general and nursing microbiology) taught by three instructors are included in the study (approximately 130 students/semester). Student attitudes will be measured by a survey, and learning gains by a pre-test/post-test design. Results should help guide instructors on selection of active learning methods according to their course content. This study has been approved under IRB protocol 2012-08-006.

ASM Curriculum Guideline Concept(s): Structure and function, Advancing STEM education and research

4. The Very Small World of Viruses: Conveying Concepts of Scale, Size and Structure to Different Audiences
Conference Room H

J. Verran and J. Redfern. Manchester Metropolitan University, Manchester, United Kingdom

Viruses differ from other microorganisms, yet the term ‘virus’ is common in the media, implying a presumption of audience understanding. Thus, in order to develop student communication skills, and to assist public understanding of virology, science and art undergraduates worked together to deliver an event entitled ‘The Very Small World of Viruses’ at a local museum.

The event comprised 5 activities, arranged in a horseshoe shape around a giant (3m x 3m) cell. Participants:
1. Drew themselves being ill with a virus infection (facilitated by discussion with a scientist, to ensure correct diseases were addressed).
2. Looked at their own cheek cells under a microscope and compared them with electron micrographs of cells infected with viruses (to address issues of scale).
3. Made viruses with modelling clay and placed them on the giant cell (to convey aspects of number and scale).
4. Watched animations of viruses infecting cells, and made viruses by decorating polystyrene balls with various antigens (to consider aspects of structure and function).
5. ‘Asked the Professor’ about virology. Alongside the
Professor, a poster presented key learning outcomes, on the value of antibiotics, importance of hand hygiene and immunisation.

Numerical evidence of engagement derived from self-portraits, model viruses in the infected cell, and polystyrene balls used. Qualitative evidence from conversation between participants, students and the Professor indicated successful achievement of intended learning outcomes: a board for written feedback was not used.

Over 200 participants took part over four hours, in a drop-in format. The creative hands-on interactions facilitated informal and relevant discussion. The activities are transferable to a range of different audiences, particularly schools. However, future iterations will include improved guidance for participants through the different activities, and more effective means of final evaluation of impact and learning.

**ASM Curriculum Guideline Concept(s):** Structure and function, Impact of microorganisms

5. Development of an Immunology Board Game as the Culminating Project in an Upper-Level Immunology Course

*Conference Room F*

S.S. Strand. The College of Wooster, Wooster, OH

Immunology is a fascinating topic because it brings together many scientific disciplines however, the density and detail of the immunological processes can be overwhelming to students, particularly in the context of a cumulative examination. Although I wanted my students to demonstrate an over-arching understanding of immunology, I wanted to avoid the superficial memorization that can accompany a traditional final exam. With the goal of encouraging student conversation to facilitate learning of course concepts in a low-pressure context, students worked in groups to develop knock-off board games (think "Immunopoly") using content from the lectures and assigned reading. For grading purposes, 75% of the grade was based on the depth and breadth of content coverage, 15% on the creativity and "playability" of the game, and 10% on participation (scores generated by anonymous peer evaluation within each group). The completed games were due at the scheduled final examination time, and students then spent the examination period playing each other's games. Students filled out an evaluation of the final project at the end of the examination period. With the exception of one group, all groups reported equivalent participation by group members. 100% of the respondents (n=23) indicated that development of the game reinforced the course content, with many indicating that the collaborative aspect of the question development process was particularly valuable. In evaluating whether the game project was more positive than a traditional final exam, 70% indicated the project was less stressful, yet 52% commented that they reviewed the course content more carefully they would have for a traditional exam. Student evaluations of the less positive aspects of the game development were variable, and more a reflection of individual opinion rather than consistent themes. The most frequently cited negative aspect was the time involved in preparation (17%). Based on student feedback, developing an immunology board game fostered student conversation over course material, which led to content learning in a less-pressured context than a traditional examination.

**ASM Curriculum Guideline Concept(s):** Systems

6. Case Study Teaching Modules for Middle and High School Biology Educators

*Conference Room A*

A.H. Williams. University of Tampa, Tampa, FL

University of Tampa faculty in partnership with a high school Biology teacher created teaching tools that are presented by UT faculty to high school Biology teachers at a professional development teacher workshop. The teaching tool is a module that is a case study based approach utilizing a modeling activity. The material reviewed in the teaching module is linked to The Next Generation Sunshine State Standards that high school teachers are expected to teach their students. The teaching module is created as an additional teaching tool for the teachers to use in their course and/or as a review of material already presented. Undergraduate students in any Biology course could be assigned to create these teaching modules and a corresponding modeling activity. The Biology education undergraduate majors could then further mold the module into an acceptable teaching tool. The Super Bowl Activity to be presented at the Microbrew session is a case study based modeling activity and will be used to stimulate ideas on other case studies that could be created. This specific activity addressed Florida science standards that included modes of inheritance, transcription and translation, DNA mutations, and evolution. A case study surrounding a football player with sickle cell trait was used to “hook” the students and a simple modeling activity of a part of the hemoglobin normal and mutated folded protein was performed and introduced. How the mutation alters amino acid polarity of the protein was highlighted. Development of these projects fosters community outreach between Universities and their surrounding communities, including students and educators at all levels from middle school to college level. A Science Math Masters grant funded by the Florida Department of Education and administered by University of Tampa faculty in partnership with K-12 educators and administrators in Florida was used to fund the project and teacher workshops.

**ASM Curriculum Guideline Concept(s):** Information flow, Advancing STEM education and research
SATURDAY, MAY 18

PLENARY SESSION
11:35 AM - 12:00 PM
Auditorium 1

The PULSE Community: Moving from "Vision" to "Change" in the Undergraduate Life Science Education
Loretta Brancaccio-Taras, Kingsborough Community College

What will it take to bring about the necessary transformation of STEM higher education described in Vision and Change? PULSE (Partnership for Undergraduate Life Sciences Education) is a joint effort by National Science Foundation (NSF), National Institutes of Health (NIH) and Howard Hughes Medical Institute (HHMI) to stimulate systemic change in biology departments of post-secondary educational institutions. The PULSE Leadership Fellows are tasked with facilitating pathways to foster change in undergraduate life science education. This session will share the PULSE action agenda and the work to date, to facilitate communication with the broader scientific community and engage members of professional societies to incorporate their best teaching practices and their other efforts to implement change in life science education. Over lunch, attendees will breakout into groups to discuss best practices in fostering departmental and institutional change and make recommendations for stimulating change.

LUNCH AND PULSE ROUNDTABLE DISCUSSIONS
12:00 PM - 1:15 PM
Columbine Room

POSTER SESSION B
1:30 PM - 2:30 PM
Summit Ballroom

The 2013 abstracts are organized by both content and pedagogy to help participants navigate more easily through the poster session. The content themes are based upon the ASM Recommended Curriculum Guidelines for Undergraduate Microbiology Education (www.asm.org/educators). The guidelines identify six overarching concepts, which provide a framework for 22 key microbiological topics, and two key skills and are based on concepts put forth in the 2011 national report, Vision and Change in Undergraduate Biology: A Call to Action. The ASM concepts and topics were selected to promote deep understanding of core concepts that are deemed to be of lasting importance beyond the classroom. Likewise, students' development of competency in the selected skills will have enduring and lasting value beyond both the classroom and laboratories.

In May 2012, a Perspectives article published in the Journal of Microbiology & Biology Education (JMBE) entitled, "The Development of Curricular Guidelines for Introductory Microbiology that Focus on Understanding," described the consensus-building process around the new, concept-based curriculum for Introductory Microbiology courses. For the purposes of ASMCUE, a seventh concept, advancing STEM education and research has been added to the abstract in order to identify authors working in this broader-scoped area.

The pedagogy themes are organized into five categories: course design, hands-on projects, student learning, teaching approaches, and teaching tools.

Each abstract is assigned to both content and pedagogy themes. These assignments, designated by the submitting author, are placed below the full abstract. See page 81 for Poster Abstract Content and Pedagogy Grid. Abstracts are found in the Journal of Microbiology & Biology Education, Volume 14, Issue 1.

2-B
The Impact of a Multidisciplinary Functional Genomics Project on the Biochemistry and Molecular Biology Curriculum at Otterbein University
J.A. Bennett, C.J. Hayes, and J.T. Tansey. Otterbein University, Westerville, OH
ASM Curriculum Guideline Concept(s): Systems, Advancing STEM education and research
Pedagogical Category(ies): Course design

4-B
Active Learning and Advising Strategies in Introductory Biology II – If You Click It, a Few More Will Come
S.M. Boomer, M.J. Baltzley, and K.L. Latham. Western Oregon University, Monmouth, OR
ASM Curriculum Guideline Concept(s): Advancing STEM education and research
Pedagogical Category(ies): Student learning

6-B
Research-Based Laboratory Promotes Students Learning and Enhances Undergraduate Research Experience
M. Choudhary, B. Myagmarjav, C. Trahan, Ashay Bavishi, and L. Severin. Sam Houston State University, Huntsville, TX
ASM Curriculum Guideline Concept(s): Evolution, Information flow
Pedagogical Category(ies): Teaching approaches
8-B
Teaching the Excitement of the Unknown in Science: Involving Students in Novel Research Questions
L.M. Cozy and S.M. Callahan. University of Hawaii, Honolulu, HI

ASM Curriculum Guideline Concept(s): Information flow, Advancing STEM education and research
Pedagogical Category(ies): Course design

10-B
Reaching for the STARS—The Impact of Fast-Track BS to Ph.D. Programs on Student Achievement and STEM Retention
W.B. Davis, L.M. Gloss, and M. Sanchez-Lanier. Washington State University, Pullman, WA

ASM Curriculum Guideline Concept(s): Advancing STEM education and research
Pedagogical Category(ies): Student learning

12-B
An Integration Approach to Increase Community and Scientific Reasoning Skills
B.M. Dewsbury, M.K. Lowenstein, and O.I. Weeks. Florida International University, Miami, FL

ASM Curriculum Guideline Concept(s): Advancing STEM education and research
Pedagogical Category(ies): Teaching approaches

14-B
Do iPads and/or Challenge Based Learning Affect the Level of Achievement in a Biochemistry Capstone Course?
S.E. Gabriel and G.L. Stock-Kupperman. Viterbo University, La Crosse, WI

ASM Curriculum Guideline Concept(s): Systems, Advancing STEM education and research
Pedagogical Category(ies): Teaching approaches

16-B
Teaching Research Laboratory Skills to Community College Students within the Framework of Phage Hunting
M.L. Burleson, R.H. Hale, and L.E. Hughes. University of North Texas, Denton, TX

ASM Curriculum Guideline Concept(s): Impact of microorganisms, Advancing STEM education and research
Pedagogical Category(ies): Hands-on projects

18-B
Use of MasteringMicrobiology Online Resources to Implement “Learn before Lecture” Strategy: A Comparative Analyses of Student Learning
A.S. Kucknoor. Lamar University, Beaumont, TX

ASM Curriculum Guideline Concept(s): Structure and function, Impact of microorganisms

20-B
Comparisons of Two Presentation Formats: Traditional PowerPoint and Pecha Kucha
M.-K. Liao. Furman University, Greenville, SC

ASM Curriculum Guideline Concept(s): Systems, Impact of microorganisms
Pedagogical Category(ies): Student learning

22-B
Stepping Back to Go Forward: Using Progressive Clinical Cases to Enhance Understanding of Neuroendocrine Concepts
L.J. Mauro and A. Contreras. University of Minnesota, St. Paul, MN

ASM Curriculum Guideline Concept(s): Systems
Pedagogical Category(ies): Teaching approaches

24-B
Using the Research-Based High School “Discover the Microbes Within: The Wolbachia Project” in the College Classroom
G.T. May and J.P. Odden. Metropolitan State University of Denver, Denver, CO

ASM Curriculum Guideline Concept(s): Impact of microorganisms
Pedagogical Category(ies): Hands-on projects

26-B
Use of an Immunology-based CREATE Module Improves Student Understanding of the Interconnectedness of the Immune System
H.R. Pelzel. University of Wisconsin-Whitewater, Whitewater, WI

ASM Curriculum Guideline Concept(s): Systems, Advancing STEM education and research
Pedagogical Category(ies): Teaching tools

28-B
Mixed-Methods Assessment Approach Reveals Learning Gains for Research Immersion Lab in Virology
E.R. Sanders, J. Moberg-Parker, C. Shapiro, C. Ayon, S. Toma, and M. Levis-Fitzgerald. University of California, Los Angeles, Los Angeles, CA

ASM Curriculum Guideline Concept(s): Impact of microorganisms, Advancing STEM education and research
Pedagogical Category(ies): Student learning
30-B
Course-Based Research is Effective in Engaging Students in ‘Real’ Science: Soil Bacterial Diversity Research in an Undergraduate Microbiology Course

ASM Curriculum Guideline Concept(s): Advancing STEM education and research
Pedagogical Category(ies): Hands-on projects

32-B
Student’s Behaviors and Attitudes In a Problem-Solving Exercise Leading to an Oral Mini-Test
W.J. Staddon. Eastern Kentucky University, Richmond, KY

ASM Curriculum Guideline Concept(s): Pathways, Information flow
Pedagogical Category(ies): Teaching approaches

34-B
Cooperative Assessment of Common Microbiology Student Misconceptions about Antibiotic Resistance
A.M. Stevens (1), G. Marbach-Ad (2) and A.C. Smith (2). (1) Virginia Tech, Blacksburg, VA (2) University of Maryland, College Park, MD

ASM Curriculum Guideline Concept(s): Evolution, Structure and function
Pedagogical Category(ies): Student learning

36-B
Microbiology Outreach in an AP Biology Classroom using Undergraduates as Facilitators Increases High School Student Knowledge and Appreciation for Microbiology Topics
A.H. Williams, C.R. Wood, D.K. Palamittam, S.E. Mathis, N.M. Jawahir, and A.R. Grotton. University of Tampa, Tampa, FL

ASM Curriculum Guideline Concept(s): Impact of microorganisms, Advancing STEM education and research
Pedagogical Category(ies): Hands-on projects

AUTHOR CORNER
1:30 PM - 2:00 PM
W.H. Freeman Booth

Sponsored by W.H. Freeman
Featured Author: Michèle Shuster

Scientific American Biology for a Changing World

Written by a team of two full-time college biology instructors and two science writers, this book wraps science concepts in the context of captivating stories. Connections between the science of biology and real, applicable situations are clearly drawn so students never ask “why do I have to learn this?...what does this have to do with me?”. Instead, students will read and learn from this text. This book is sure to meet the different learning styles of the 21st century student.

PRODUCT CORNER
1:30 PM - 2:00 PM
Conference Room B

Sponsored by ASM Education Board

Featured Product: Journal of Microbiology & Biology Education

In 2010, the Journal of Microbiology & Biology Education (JMBE) moved to an open-access platform, expanded its scope to include various types of scholarly articles, doubled the number of issues per year to two, and subsequently saw submissions increase nearly 500%. After being accepted for indexing in PubMed Central in 2012, JMBE is taking the next step by providing instructional tutorials for authors and advertisement opportunities for sponsors.

JMBE accepts articles that promote good pedagogy and design, foster scholarly teaching, and advance biology education research. The various sections of JMBE allow for the submission of articles diverse in scope and focus. Attend this session to learn more about the Journal sections, creating an account at the JMBE site, and the submission and review processes.

JMBE welcomes submissions for the upcoming issues. Articles are reviewed on a rolling basis, and submissions are encouraged and accepted.
throughout the year. The final submission deadline to be considered for publication in volume 14, issue 2 (December 2013) is July 1, 2013 and for volume 15, issue 1 (May 2014) is December 1, 2013. For more information, please visit http://jmbe.asm.org.

PRODUCT CORNER
1:30 PM - 2:00 PM
Conference Room A

Sponsored by Pearson

Featured Product: Dynamic Study Modules

NEW! Dynamic Study Modules in MasteringMicrobiology® help students quickly learn the information they need to know to achieve higher scores on tests and exams. Each module incorporates user engagement techniques adapted from the gaming industry, moving students into a learning cycle that allows them to gain confidence and improve quickly.

REFRESHMENT BREAK
2:00 PM - 3:00 PM
Summit Ballroom

Sponsored by John Wiley & Sons, Inc

AUTHOR CORNER
2:00 PM - 2:30 PM
Jones & Bartlett Learning Booth

Sponsored by Jones & Bartlett Learning

Featured Author: Jeffrey Pommerville

Fundamentals of Microbiology, 10th edition

Jeffrey Pommerville continues the success of his best-selling, award-winning classic text with a fully revised and updated tenth edition. Providing a firm foundation in microbiology, this edition features new and revised pedagogical elements throughout that encourage students to participate in the scientific investigation process and challenges them to apply the process of science and quantitative reasoning through related actual experiments.

PRODUCT CORNER
2:00 PM - 2:30 PM
Conference Room B

Sponsored by ASM Education Board

Featured Product: Journal of Microbiology & Biology Education

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MICROBREW SESSIONS II of II
2:30 PM - 3:30 PM
(8 sessions)

These grassroots sessions, arranged by topics, provide a forum for sharing best practices and interesting activities used in laboratory and classroom teaching. Presentations are simple “chalk talks” (e.g., no PowerPoint) to facilitate informal discussion. Unlike the poster sessions, Microbrews do not require assessments. Sessions will be facilitated by volunteer attendees in order to make certain each presentation stays within the 15-minute presentation (10-minute presentation and 5 minutes for discussion). Sessions must stay on time so attendees are able to move from room to room quickly to see their desired session.

Session Room Facilitators:

Conference Room G
Facilitator: Rebecca Buxton, University of Utah

Conference Room A
Facilitator: Michelle Furlong, Clayton State University

Conference Room F
Facilitator: Michael Hanophy, St. Joseph’s College

Conference Room D
Facilitator: Lucy Kluckhohn-Jones, Santa Monica College

Conference Room E
Facilitator: Rita Moyes, Texas A&M University

Conference Room C
Facilitator: Theodore Muth, CUNY Brooklyn College

Conference Room H
Facilitator: Amy Siegesmund, Pacific Lutheran University
Several introductory microbiology textbooks contain incorrect descriptions of the mechanism of bacterial chemotaxis. The authors present these misinterpretations as the most up-to-date explanations but leave students (and teachers) without a workable model for chemotaxis. Over the past 4 decades, bacterial flagellar structure, cell motility, and the chemotactic response to attractants and repellants have received considerable research attention. Many articles have been published with descriptions of the physiology of bacterial chemotactic behavior. These references describe the structure of flagella, the nature of their motors and reversible rotational movement, the receptor systems that detect changing concentrations of chemicals, signal transduction to the flagella, runs and tumbles, and the resulting “random, biased walk” of the cells toward attractants and away from repellents. Unfortunately, this basic information is not being conveyed correctly in some textbooks and, hence, is not presented correctly in the classroom. Eight different introductory microbiology texts in a range of 2nd to 11th editions, written by a total of 21 authors and offered by 5 different publishers have been examined. The majority of these texts present chemotaxis incorrectly, i.e. cells would not be able to respond properly to attractants and repellents if they actually behaved in the manner that the authors portray. For this classroom assignment, explanations of bacterial motility and cell behavior in chemical gradients from different introductory textbooks are made available for student review. Student pairs are assigned one of the passages to evaluate and compare to the accepted scientific description of chemotaxis. The assignment is to present to the class how the specified text portrays chemotaxis, how the bacteria would probably behave if they adhered to the specific explanation, and to re-write the assigned passage to correctly explain bacterial chemotaxis. What are your students learning about chemotaxis?

ASM Curriculum Guideline Concept(s): Structure and function, Systems
educationally licensed programs. The students are able to install the software on their own computers and retain the software when the course is complete. This presentation will examine: Staden package for DNA analysis and trace alignment, pDraw for basic analysis and presentation, Clustal for nucleic acid or protein alignment, BLAST for nucleic acid or protein database searches and MEGA for inference of phylogeny. These programs run on Windows XP through – Windows 7 OS’s and to some extent on Mac OS’s. The programs and further information can be obtained at the following locations: Staden (staden.sourceforge.net), pDraw (www.acaclone.com), Clustal (www.clustal.org), BLAST (blast.ncbi.nlm.nih.gov/Blast.cgi) and MEGA (www.megasoftware.net). Sample data sets will be available at www.earlwett.net. Uses of these programs in the classroom setting, uses in the laboratory and potential problems will be discussed.

**ASM Curriculum Guideline Concept(s):** Evolution, Information flow

4. Using “Microbe of the Day” Presentations as a Fun Method to Supplement Lecture Material in a General Microbiology Class

**Conference Room B**

**D.L. Crater,** High Point University, High Point, NC

Following the 9/11 attacks, students from “Generation X” quickly became aware of the violence involved in terrorist acts. However, they often forget the act of bioterrorism that occurred immediately following the physical attacks. In order to educate the class in an entertaining and collaborative manner, students in my General Microbiology course are required to present a short “Microbe of the Day” at the beginning of each class period. Each student randomly selects a specific bioterrorist agent from a list that can be found at www.cdc.gov. They are then required to create a 5 minute oral presentation and write a two (2) page report describing that organism and its characteristic features. They are to include a creative title, characteristic analysis of the organism, the disease/illness and transmission of the organism and why the organism is a potential bioterrorist threat. One goal of this exercise is for students to gain an appreciation for the types of agents (viral, bacterial or toxins) that are used for bioterrorism and how easily they can be transmitted. Based on student comments on an end-of-semester survey, they really enjoyed the experience of researching and presenting their findings, as well as listening to the other presentations. Several students indicated that they gained an appreciation for the magnitude by which microbes are normally beneficial, but can also cause harm to a population. Even though the students were not tested on this material, the topic was so engaging that they felt this was one of the most memorable aspects of the course. Participation in this type of exercise resulted in the students gaining new content knowledge of microbiology and a global perspective that enables them to continue to learn and comprehend the impact of microbiology on their individual and corporate lives in today’s world.

**ASM Curriculum Guideline Concept(s):** Impact of microorganisms

5. **Microbe Minute: Five Minutes that Make a Difference**

**Conference Room G**

**K.A. Feldman,** University of Connecticut, Storrs, CT

I teach an Introductory Microbiology class in a large lecture hall to between 200 - 350 students at 8 am. Students are pre-med, pre-pharm and other health-care related disciples, as well as molecular and cell biology majors. Several problems I face lecturing to these students is that after the first few weeks of classes many stop attending or struggle in late. I also noticed that my text book focuses on large concepts but spends very little time discussing interesting microorganisms, particularly pathogens.

To address these issues, I spend the first 5 minutes of every class focusing on an interesting microorganism. I start class exactly at 8am and don’t provide a copy of the slides to the students, they must be on-time to get the notes. Ten points of every exam (10% of their grade) are "Microbe Minute" questions, which rewards them for their attendance efforts.

I find that presenting the “Microbe Minute” gives me the opportunity to spend a few minutes introducing an organism that is in the news or of particular importance to the health care profession. At the end of the semester I ask students to evaluate this experience and how it relates to their understanding and interest of the field of Microbiology.

I want to share with the ASMCUE attendees my experience with this approach to learning and the positive impact it has on attendance, student learning, and enjoyment of a class they perhaps perceived as an uninteresting requirement.

**ASM Curriculum Guideline Concept(s):** Impact of microorganisms

6. **An Upper Level Microbial Diversity Laboratory Course That Focuses on Independent Research Projects & Combines Conventional Microbiological Methods with Metagenomics to Analyze Microbial Structure and Function in Environmental Samples**

**Conference Room F**

**K. Hogan,** E. Bassiri, and M. Pohlschroder. University of Pennsylvania, Philadelphia, PA

The role of microbiology in complex issues, such as the impact of the microbiome in human health, is extremely complex. Metagenomics has revolutionized the field, producing immense amounts of data and deepening our understanding of microbial diversity. The combination of DNA based technologies with conventional microbiological methods is key to developing a robust understanding of the role of microorganisms in nature. In this upper level laboratory course students use these two
approaches to address real-life microbiological questions. The format of this course provides students with the technical foundation necessary for a career in microbiology while also giving them an opportunity to participate in an independent research project that might otherwise be unavailable due to limited internships and positions in research laboratories. In the first part of the course students are taught basic techniques in microbiology and identify an "Unknown" bacterial species using culture based methods and 16S rDNA sequencing. These exercises prepare students to work independently for the second part of the semester when they work in pairs to examine the microbial diversity of a particular environment. Students generate research questions, formulate hypotheses, design experiments, analyze data, and present their research findings to the class. Two objectives structure the projects, namely students should 1) evaluate the bacterial diversity in their environmental samples and 2) identify and examine the function of several bacterial species within the community. In this presentation we will provide examples of successful projects developed by our students, including those that are directly related to cutting edge research conducted by faculty associated with the university. We will also discuss how we were able to incorporate Next Generation Sequencing technology in the course to analyze bacterial diversity.

**ASM Curriculum Guideline Concept(s):** Evolution, Impact of microorganisms

7. **B.E.E.R: Bioinformatics for an Extension Activity of Enzymes and Reactions**

**Conference Room H**

**C. MacKinnon** and A.C. Vallor, University of Incarnate Word, San Antonio, TX

Cellular respiration is usually the most challenging portion of an introductory biology course because a limited knowledge of chemistry can make the concepts of oxidation and reduction difficult to comprehend. Typically, students can memorize the names of intermediate compounds found in glycolysis, Krebs cycle, the proteins in the electron transport chain, and identify the reactions where ATP is produced. Students may recall that pathways of fermentation in yeast and animals result in alcohol and lactate, respectively, but frequently are not able to identify the reduced/oxidized components, nor the biological significance of pyruvate reduction. In our introductory cell and molecular biology course, we implement the “5 E” model of the learning cycle to promote understanding of energy transformation through redox and phosphorylation reactions. The engagement activity is often an animation of biochemical pathways of cellular respiration; the exploration phase is a laboratory on the effects of temperature on respiration and a puzzle about the structures and the phosphorylation, oxidation and reduction reactions found in the respiratory pathways; the explanation activity is a mixture of lecture and group discussion; evaluation consists of quizzes and exams. We are piloting a new extension activity that incorporates bioinformatics to study enzymes in pyruvate metabolism, especially alcohol dehydrogenase in fermentation. Students first access the Kyoto Encyclopedia of Genes and Genomes (KEGG) database to examine the glycolysis and gluconeogenesis pathways, determine the international enzyme code for enzymes involved in pyruvate metabolism including alcohol fermentation, and then access the Braunschweig Enzyme Database (BRENDA) to examine the chemistry behind the international enzyme codes. Students access the Protein Data Base (PDB) to examine the structural/functional similarities and differences of yeast and human alcohol dehydrogenase. Finally, students access the KEGG disease link and the Online Mendelian Inheritance in Man (OMIM) to assemble information about errors in pyruvate metabolism and human disease.

**ASM Curriculum Guideline Concept(s):** Pathways, Information flow

8. **A Lab Exercise that Tests a Fundamental Evolutionary Hypothesis**

**Conference Room D**


Students often have difficulty understanding evolutionary hypotheses, and Darwin’s theory of evolution by natural selection is commonly misunderstood. We have developed a lab exercise for Introductory Biology students that enhances understanding of a central evolutionary hypothesis by allowing the students to test this hypothesis themselves and analyze the results they obtain. The exercise is a modification of the classic Lederberg and Lederberg (1952) experiment that tested whether mutations in bacteria occur at random or are directed by the environment. In our version of the experiment, students study the resistance of bacteria to antibiotics. To test whether their bacteria acquire antibiotic resistance randomly (regardless of whether or not the antibiotic is present), or only in response to the antibiotic, students use the technique of replica plating. Students transfer a lawn of bacteria grown on a plate without antibiotics (a “master plate”) to two duplicate plates containing an antibiotic (the “replica plates”) in the same orientation. After the resistant bacteria grow on the replica plates, students line up the duplicate plates to determine if resistant colonies align. If the colonies align, mutations arose before the replica plating in the absence of the antibiotic, and the “random mutation” hypothesis is supported. However, if the colonies do not align, mutations arose after the replica plating in the presence of antibiotic, and the “acquired immunity” hypothesis is supported. Our modern understanding of evolution by natural selection predicts that the “random mutation” hypothesis will be supported, and student results most often support this hypothesis. Although this lab is one of the most conceptually difficult exercises in our Introductory Biology lab curriculum, it is the lab
Ithaca, NY

M.L. Hayes

Conference Room G

Pedagogy

STEM Classrooms Using Reacting to the Past™

over the Broad Street Pump: Role Playing in

2.

and

ASM Curriculum Guideline Concept(s):

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relatively easy to handle student issues when they

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students sign a "lab partner contract" including

classes to work in groups of three or four. The

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grammar, formatting), but these differences were not

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of lab report writing skills over time. It did cause

average lab grades, nor does it hinder improvement

of the graded paper did not incorporate his or her

additional points if he or she suspects that the author

and the edi

students did not just work together to write one report,

draft, so that the professor can be sure that the

students made not just work together to write one report,

and the editor of the graded paper can request

additional points if he or she suspects that the author

of the graded paper did not incorporate his or her

suggestions into the final draft. Preliminary data

collected in our classes indicate that the use of this

method does not cause any significant change in

average lab grades, nor does it hinder improvement

of lab report writing skills over time. It did cause

increases in grades in some areas (spelling and

grammar, formatting), but these differences were not

significant. Most students are very receptive to this

method because they like working with their peers,

and it can be modified to allow students in larger

classes to work in groups of three or four. The

students sign a "lab partner contract" including

contact information and requirements for the timing of

the peer review process along with a description of

potential penalties for violating the contract, so it is

relatively easy to handle student issues when they

arise.

ASM Curriculum Guideline Concept(s):

Structure and function, Information flow

2. London 1854 - Cesspits, Cholera and Conflict

over the Broad Street Pump: Role Playing in

STEM Classrooms Using Reacting to the Past™

Pedagogy

Conference Room G

M.L. Hayes and E.B. Nelson. Cornell University,

Ithaca, NY

As a means of creating more engaging classroom

environments and enhancing student learning, we are

investing in the use of elaborate, science-based role-

playing games, known formally as Reacting to the

Past™ (RTTP) pedagogy. Our efforts are part of a

multi-year project funded by the National Science

Foundation's Course Curriculum and Laboratory

Improvement program. Over the past two years, our

students of Biology of Infectious Disease: From

Molecules to Ecosystems (PLPA 2950) and Disease

Ecology (PLPA 4330) have "teleported" to London on

the evening of September 7, 1854 to reenact the

meeting of a local administrative body that was

debating responses to a deadly Cholera outbreak that

had claimed the lives of more than 500 residents in

little over a week. Historically, this meeting involved

the legendary Dr. John Snow and culminated in a

decision to remove the pump handle from the Broad

Street pump, a local water supply that had been

contaminated with the deadly bacterium, Vibrio

cholerae. This event is regarded as a significant

advance toward the universal acceptance of germ

theory and is an ideal case study for examining cause

and effect in epidemiology, for appreciating modern

achievements in the design of municipal water

systems and for understanding the management of

waterborne diseases. Students are given first-hand

access to historical data on the 1854 outbreak and

are immersed in an active exchange of ideas

regarding what was thought to cause disease in the

pre-germ theory era. In this Microbrew session, we

will discuss both the merits and challenges of using

RTTP in the science classroom, using the London

game as the historical backdrop.

ASM Curriculum Guideline Concept(s):

Impact of microorganisms, Advancing STEM education and

research

3. Isolation and Characterization of Halophiles

from Gourmet Salts: A Class Project

Conference Room F

D.S. Katz Amburn. Rogers State University,

Claremore, OK

This exercise is designed to give the students in our

BIOL 3525 course, Biology of Microorganisms, the

opportunity to isolate and characterize an organism

from the environment. Since no known pathogens

grow at 4M NaCl concentration, there is no fear that

the students will isolate pathogens. The class begins

working on this isolation project approximately

halfway through the 16 week semester, after they

learn basic observation, culture and cell counting

techniques. During the project, students first

resuscitate and then grow and characterize halophiles

from commercial salts. A variety of salts, including

smoked and flavored cooking salts are available in

the laboratory for the students to choose from. We

have observed that colonies grow from most, but not

all, of the commercial salts. A long incubation period

(2-3 weeks) may be required, hence this project

should not be started late in the semester. Students

who do not have an isolate are asked to select one

from one of the other student's plates to characterize.

They then characterize their isolate, using colony and

improvement program. Over the past two years, our

students of Biology of Infectious Disease: From

Molecules to Ecosystems (PLPA 2950) and Disease

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(2-3 weeks) may be required, hence this project

should not be started late in the semester. Students

who do not have an isolate are asked to select one

from one of the other student's plates to characterize.

They then characterize their isolate, using colony and
microscopic observations. The class selects two biochemical or growth characteristics to examine (for instance, motility, temperature and oxygen requirements), and develops the protocol and prepares the media for each protocol. Each student prepares DNA from their isolate and performs PCR with Domain-specific primers to determine the Domain of the organism. While the majority of the organisms isolated are Archaea, some Bacteria have also been isolated. As a result of this process, students not only learn to apply techniques to characterize organisms, but have the opportunity to work with their own unique isolate.

**ASM Curriculum Guideline Concept(s):** Systems, Impact of microorganisms

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**4. Effectively Teaching Gene Expression and Cloning Using Plain Colored Paper, Scissors and Tape: A Student-Centered and Interactive Learning Activity**

*Conference Room H*

**H.A. Makhluf. National University, La Jolla, CA**

In general biology as well as in introductory microbiology courses, students often struggle with key concepts such as gene expression and cloning. Herein is described a hands-on activity that is student-centered, fun, and interactive, and that can enhance student learning using colored paper, scissors and tape.

Different students are instructed to choose a DNA sequence, RNA codons and tRNA anticodons. The classroom is then transformed into a cell, one wall labeled nucleus while another the ribosomes. Students enact the process of transcription and translation using the genetic code. This activity is followed by a demonstration of recombinant DNA and restriction enzyme digestion. Using actual scissors, DNA is cut at palindromic sequences, and then recombined with tape to mimic the action of ligase. Next, students are 1) grouped into teams of 4-5, 2) instructed to formulate questions about gene expression and cloning and 3) then asked to pick another team to answer their questions. Not only does this activity foster effective teamwork through enhanced communication, but it also allows the instructor to assess student understanding and identify misconceptions.

This activity is always a great success, even helping students score better on examinations. In addition, students build on previous knowledge of the cell, make connections, and gain context for new course content such as understanding the significance of mutations in viruses such as West Nile and dengue virus. This activity will be demonstrated at the Microbrew session, where attendees will be playing the students role.

**ASM Curriculum Guideline Concept(s):** Information flow

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**5. The Use of Student Teams to Humanize Online Learning**

*Conference Room B*

**H.M. Seitz. Johnson County Community College, Overland Park, KS**

Interaction and engagement are difficult to attain in an online learning environment. The interaction among students as well as with the instructor is often the most valuable aspect of a face-to-face learning environment. In online learning there are traditionally far fewer opportunities for this interaction. One possible solution to this problem is forming student teams to solve course related problems. Students in an online allied health microbiology course were put randomly into student teams the first week of class. They remained in the teams throughout the semester and were given weekly team problem solving tasks to accomplish. A rubric was used to help assign both individual and team points for the assignment. A critical aspect of using teams online is ensuring students do not procrastinate on contributing to their teams work. In this session we will discuss using teams online, assessing team assignments, as well as developing effective team assignments.

The advantage of using teams in an online class is increased interaction between students. Further the problem solving tasks were very difficult for students to complete, requiring them to work together and often to seek help from the instructor. The instructor stepped into team discussions very much like in a face-to-face classroom to help guide and support the discussions going on.

The limitations of this approach are increased time spent monitoring team discussion boards. Further, students must coordinate their work asynchronously, which can be difficult. Come and discuss your positive and negative experience with teams in your classroom.

**ASM Curriculum Guideline Concept(s):** Advancing STEM education and research

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**6. “Real Lab” Experiences in the Changing Face of STEM Education: Safety, Rigor, and Outcomes in Distance Education Microbiology Labs (Online, Hybrid, and an Outreach Traveling-Lab Bus)**

*Conference Room D*

**B.L. Smith-Keiling. University of Maryland University College-Europe, Adelphi, MD**

With the face of education changing dramatically, institutions offer a variety of ‘real lab’ experiences. Students scattered afar seek science lab courses to meet pre-requisites for allied health, etc. Some drive long distances. In an extreme example, students fly in for weekend labs. In another, we take the lab class to them.

Different formats meet distance education needs: a hybrid f2f/DE with face-to-face labs; a weekend
college; and online at-home ‘real’ and virtual labs. A traveling lab bus takes the science to the students in remote locations while considering logistical practicalities—supplies, safety, shipping/transport legalities, and the learning. We have been designing labs to address the changing safety criteria while maintaining rigor and addressing learning outcomes. With a push toward online or hybrid science lab courses, we will discuss important questions for the current practices and the future of non-traditional labs. What do we mean by ‘real,’ and what are acceptable practices as we meet the needs of students at a distance?

With ASM biosafety guidelines, this interactive session will examine learning activities done at home and on the road ranging from food microbiology/beer brewing and microscopy, to some more complex labs with isolation and identification of unknowns. Some at-home labs could rival any traditional lab classroom, but should they?

Using the backward design, we will share ideas based on lab skill/learning outcomes, assessments, active learning inquiry-based learning activities, and methods for assuring safety and measured student learning. Topics include use of lab kits, isolating from environment vs. obtaining standard strains, disposal of lab materials at home, use of online learning modules/virtual labs, video proctoring knowledge/skills gained, and challenges with acceptance of course credit transfers. The goal includes a summary of concerns and recommended do’s and don’ts in the best practice of teaching in non-traditional microbiology lab formats.

**ASM Curriculum Guideline Concept(s):** Advancing STEM education and research, Laboratory competencies

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**7. How does a Fungus go Blind? Using Fungal Photoreceptors to Introduce Bioinformatics to Undergraduate Microbiologists**

*Conference Room C*

**D.S. Treves.** IU Southeast, New Albany, IN

As a participant in the 2012 ASM/JGI Bioinformatics Institute I was lucky to be exposed to numerous bioinformatics tools and activities to enhance undergraduate education. Described here is a first attempt to incorporate bioinformatics activities into an upper level microbiology course. Using fungal photoreceptors as model system, the objective was to introduce undergraduates to key concepts in bioinformatics such as motif discovery, database queries and phylogenetics. To begin, students were introduced to the influence of light on fungal development with the idea that fungi can indeed go “blind” if certain photoreceptors are disrupted. Students were then given a mystery protein sequence and two tasks to perform, 1) Using PFAM, determine if this protein has highly conserved motifs and 2) Using Genbank and BLAST, determine what closely matches this protein sequence. Both tasks are reasonably easy to perform but the results offer numerous class discussion points (e.g. specifics of the protein motifs, Genbank/BLAST issues, database limitations, meaning of E-values). The next part of the exercise required students to download protein sequences that closely match their mystery protein, align these sequences with MUSCLE and construct a phylogenetic tree (using Phylogeny.fr). The modular nature of the activities allowed students to report back on their progress/problems before proceeding to the next step. A summary of what worked well with this project and what didn’t will be presented.

**ASM Curriculum Guideline Concept(s):** Evolution, Systems, Advancing STEM education and research

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**8. From Microbes to Molecules: Crowd-Sourcing Antibiotic Discovery in a Freshman Research Course**

*Conference Room E*

**T.M. Tsang, J. Blum, C. Bascom-Slack, and J. Handelsman.** Yale University, New Haven, CT

Early research experiences boost retention of college students in STEM majors. Consequently, many expert panels have recommended making research experiences available to first- and second-year college students. Research courses provide the desired benefits and are more appropriate and feasible for most introductory students. Thus, we developed an introductory biology course, From Microbes to Molecules (M2M), in which students’ learning of biology is driven by their engagement in original research. The research projects focus on discovery of antibiotics from soil bacteria. The students are excited and motivated by the potential to address a global health crisis by enriching the already diminishing arsenal of antibiotics. This course teaches foundational biological concepts around the question “Why do antibiotics kill bacteria and not us?” and fluidly integrates lecture and laboratory activities. In Fall 2012, M2M was implemented, and all students conducted successful research by discovering and identifying antibiotic-producing bacteria. The semester culminated with a poster session for the Yale community that displayed the students’ knowledge and scientific thinking as well as intense pride in and ownership of their isolates. To facilitate widespread adoption of this unique and highly successful model, we are constructing a M2M resource package, which will be available to instructors worldwide. We aim to build a global network of instructors and students for antibiotic discovery. An expansive network will take advantage of diverse students and both the intellectual and biological resources they bring to “crowd-source” the discovery of antibiotics. This powerful network will contribute to previous evidence connecting undergraduate research experiences to student retention in science by gathering data from very broad and diverse audiences. Potential outcomes of this project are to: 1) provide an early research opportunity for first-year students; 2) introduce microbiology early in general biology curricula; 3) create a network of instructors and students; and 4) provide a new pipeline of candidate antibiotics.
SATURDAY, MAY 18

ASM Curriculum Guideline Concept(s): Structure and function, Impact of microorganisms

MICROBRREW SESSION F: 3:10 PM

1. “Bacterium Food Race”: An In-Class Activity for Demonstrating the Biased Random Walk
   Conference Room G

   L.E. Hughes. University of North Texas, Denton, TX

   The “Bacterium Food Race” is an in-class activity to assist students in understanding the concept of the biased random walk in chemotaxis. Teams of students compete to move their bacterium across a space to a food source by following simple rules using dice and rulers to approximate the biased random walk. Dice throws determine the direction of “tumbles,” and team members decide the length of “runs” within certain set parameters. The runs by the “bacterium” are marked on a blackboard, whiteboard, or poster board so that students may visualize the path that is followed. Once all or most of the teams have completed the race, the class can discuss the paths that were generated. This activity may follow or accompany a lesson on how bacterial flagella function, as well as a lesson how bacteria sense their environment. The activity is also adaptable between a small class in which all students may be part of a team and a large class where several teams are cheered on by classmates. The rules are relatively simple to follow and the entire activity can be accomplished in about 10 minutes. The primary audience for this activity is likely majors and non-majors microbiology classes, but it could be used in other biology classes that also teach the concepts of chemotaxis and bacterial flagellar function. The activity will be demonstrated, and rules and procedures will be provided.

ASM Curriculum Guideline Concept(s): Structure and function

2. Farm-to-Glass Microbial Research: Taking a Walk on the “Wild” Side
   Conference Room F

   K.L. Murad. The College of Saint Rose, Albany, NY

   The quest for engaging and authentic research at the undergraduate level is often limited at small liberal arts colleges due to time, space and funding. However, science education studies have shown that inquiry-based, investigative research improves undergraduate experience and outcomes. We found our solution down on the farm. As the second largest apple producing state in the US, New York has no shortage of family orchards, some of which have turned to expanding their markets through the production of apple-based alcohols. Most production distilleries use commercially available yeast during fermentation to ensure production quality and consistency. However, we know that nuance in bouquet and flavor often come from terroir and the unexpected in fermentation (think Lambic). We teamed up with two orchard distilleries and collected “wild yeast” from the fruits during apple harvest season. Initial undergraduate student research isolated five potentially viable strains from one of the orchards. These strains are being characterized further for their fermentation potential as well as their ester/ aromatic fermentation composition. This project not only allows undergraduate students to work in direct collaboration with regional farmers and distillers to gain a better understanding of the role of agricultural research in the farm-to-table food process, but also overlaps our existing student research project with the New York State Food Safety Laboratory. This presentation will include a discussion of laboratory methodology, reflective comments by undergraduate students and the community partners regarding project effectiveness, and lessons learned.

ASM Curriculum Guideline Concept(s): Systems, Impact of microorganisms, Advancing STEM education and research

3. A Course Without Textbook Borders: Reinvigorating Student Interest in, and Understanding of, Scientific Literature
   Conference Room A

   S.T. Parks. Georgia State University, Atlanta, GA

   Novel courses are developed to instruct, guide and promote student learning, yet there are often no suitable companion textbooks. Textbooks are wonderful sources of information, yet are often organized for specific academic goals and learning objectives. Such academic pursuits will not necessarily correspond to novel courses, and thus there may be difficulty in selecting a suitable textbook, without compromising the goals and spirit of the academic course. Reorganizing a Microbial Ecology course into discrete modules based upon environmental terrain and microbial communities recently satisfied this academic ‘struggle’. For each module, a specific example was chosen to highlight the academic goals and learning objectives. Students were encouraged to provide example topics that were of specific interest to their academic pursuits. Such examples provided the basis for lectures and discussions within the class. Reading assignments were selected based upon timeliness and correspondence to the academic examples per module and consisted of recent review articles, as well as related primary literature sources. Instead of having discrete lectures to teach reiterative basics and methods, background and experimental protocols were discussed as presented in the literature, and were thus presented in an academically meaningful manner. Assessments for the course were designed to assess higher-level thinking, hypothesis-driven proposals, scientific intent and research merit. This module and literature-based course provided for high levels of student involvement and interest, which engaging students in relevant, timely academic pursuits. Instead of teaching varied and diverse
topics, key examples were covered with depth, providing students with a strong foundation in microbial ecology, while still demonstrating the breadth of the discipline. Such learning provided students with great interest and the knowledge necessary for further exploration of other topics and examples within the field. This academic model is easily applied to other courses in general microbiology, allied health and advanced studies.

ASM Curriculum Guideline Concept(s): Systems, Impact of microorganisms

4. Building Models To Understand Cell Function
Conference Room H

K.B. Shannon. Missouri S&T, Rolla, MO

In my Cellular Biology course, students make a 3D model or website of a differentiated eukaryotic cell, and provide a short written description of their cell. Goals for the cell model project are: to give students a creative way to demonstrate mastery of the subject, to promote a greater understanding of the diversity of cells, to provide a means for students to study the relationship between cell structure and function, and for students to gain a better comprehension of the functions of cell organelles. I am in the processes of assessing student learning to determine if this project achieves the learning objectives. I will share my rubric for grading the projects, give examples of how this project has revealed student misconceptions, and present survey results about student attitudes about the activity. This project could be adapted in many ways, for example to model the structure of a bacterial flagellum, to compare diversity of prokaryotic structure and function, or to show evolution of mitochondria from aerobic bacteria.

ASM Curriculum Guideline Concept(s): Evolution, Structure and Function

5. A Low-Tech, Student-Centered Approach for Teaching Serial Dilutions
Conference Room D

W.J. Staddon. Eastern Kentucky University, Richmond, KY

Plate counting with serial dilutions is a commonly used approach in microbiology for quantifying bacteria in soil, aquatic and other samples. Consequently, this technique is found in many introductory microbiology laboratory manuals. This topic presents a particular challenge for students as they have difficulty relating what is happening in the procedure to the mathematics that follow. This presentation will discuss an approach I have used for a number of years in my majors microbiology class. Students are presented with dilution problems in a multiple choice format. They answer questions in groups using the Immediate Assessment Feedback Technique (IF AT®). Students, working in groups, scratch off their answer and find out right away if it is correct. If their choice is not correct, students keep scratching until they are successful. The approach allows dilution problems to be broken into multiple steps each addressing a potential source of misunderstanding. The IF AT® form ensures that students know the correct answer for one step before moving on to the next. Using this method, students are forced to think about and discuss the mathematics, as well as, what is actually happening during the procedure. The pros and cons of giving this exercise before or after having the students perform an actual plate count will be discussed. This approach has promise for addressing other complex topics that can be divided into smaller steps where it is desirable to have students reason out the problem for themselves.

ASM Curriculum Guideline Concept(s): Advancing STEM education and research, Laboratory competencies

6. Flipping your Lab to Increase Student Engagement
Conference Room B

D.J. Westenberg. Missouri S&T, Rolla, MO

“Flipped” classrooms move instruction out of the class using online lectures and videos and using class time for practical applications of the materials. This has been shown to be a powerful tool for engaging students in the classroom, why not also in the teaching laboratory? Flipping the teaching laboratory saves valuable laboratory time for a more student centered experience in the laboratory. This session will discuss what motivated me to explore the flipped classroom approach to improve student preparation and create more meaningful student engagement in the laboratory. We will discuss strategies for selecting or preparing short videos and creating pre-lab assessment to increase student engagement. The emphasis will be on selecting appropriate techniques for demonstration and how to use videos to free up time in the lab so students spend more time DOING microbiology.

ASM Curriculum Guideline Concept(s): Laboratory competencies

7. Safe, Low Cost Microscale Microbiology Makes Wet Labs Practical
Conference Room E

L.M. Young and V.A. Motz. Ohio Northern University, Ada, OH

Currently, most high school biology and many community college curricula eschew teaching microbiology wet labs due to cost and safety concerns. The technique presented here affords the opportunity to perform microbiological and metabolic hands-on microscale activities which are easily accessible. Miniaturized experiments using this protocol for producing "slant-minis (SLINs)" and "mini-deeps (MEEPs)" are effective and inexpensive. They promote scientific thinking, cultivate use of safe laboratory practices, communicate fundamental metabolic concepts, and teach basic microbiology lab skills. Students complete exercises using
nonpathogenic microorganisms (as identified by the ASM 2012 guidelines; available from most biological supply companies). They document color and growth pattern differences, and draw conclusions. When monitoring growth rather than colony morphology, slants and deeps of selective and/or differential media can be scaled down, decreasing costs to 15% of traditional methods. Furthermore, no expensive equipment is required. Adequate sterilization can be achieved with boiling water and specimens can be grown at room temperature. The principle non-academic benefits of this protocol beyond cost-saving, are decreased generation of biohazardous waste, and increased safety by switching from open glass tubes to closed non-breakable plastics. All experiments described herein have been successfully completed by high school students. Students were thoroughly engaged. They found the color changes fun, easy to interpret, and memorable. They reported ease in completing the activities using only the instruction sheets and demonstrated comprehension of metabolic concepts.

ASM Curriculum Guideline Concept(s): Pathways

EVENING FREE
3:30 PM

BUSES LOADED TO ASM2013 FIELD TRIP - REGISTERED PARTICIPANTS ONLY
3:45 PM - 4:00 PM

This is a ticketed event and badges will be marked with “asm2013 field trip” for registered attendees and serve as bus tickets.

ASM2013 KEYNOTE SESSION & RECEPTION
5:00 PM - 8:30 PM
Colorado Convention Center
Mile High Ballroom 1-4

Bacterial Cell Cycle Regulation: Location, Location, Location
Christine Jacobs-Wagner, Yale University

The Killers, the Cures, and the Limits of Life: Frontiers of Science in the Unseen World
Nathan Wolfe, Metabiota

Engineering by Evolution
Frances H. Arnold, ASM Lecturer, California Institute of Technology

BUSES LOADED TO THE INVERNESS HOTEL AND CONFERENCE CENTER
8:45 PM

SUNDAY, MAY 19

NETWORKING BREAKFAST - FREE FOR ALL!
7:00 AM - 8:00 AM
Columbine Room

You are on your own! Take a chance. Sit at a table where you recognize no one. Experienced faculty, introduce yourself to a first-timer. First-timers, hobnob with a speaker or ASM leader. Go outside your comfort zone! You never know, you may meet a collaborator or a friend for life. Many close friendships were born and nurtured at an ASM CUE meeting.

CLOSING PLENARY LECTURE
8:00 AM - 9:00 AM
Auditorium 1

Bacteriophage Discovery and Genomics: A Broadly Applicable Platform for Introducing Novice Scientists to Authentic Research

Graham F. Hatfull, University of Pittsburgh
2013 Carski Foundation Distinguished Undergraduate Teaching Awardee and Division W Lecturer

The selection of students that are afforded an opportunity to engage in authentic scientific discovery too often involves screening for ‘giftedness’ or ‘academic excellence’, constraining the rich and diverse population of students who are curious, creative, and have potential to contribute significantly to the research endeavor. The call at the national level to promote research and inquiry early into the undergraduate curriculum presents a challenge to identify research activities that are replete with opportunities for important discoveries while being openly accessible to the full diversity of freshmen undergraduates as they embark on their college careers. Bacteriophage discovery and genomics provides such an opportunity, and is being implemented at many institutions across the US as the Howard Hughes Medical Institute Science Education Alliance Phage Hunters Advancing Genomics and Evolutionary Science (HHMI SEA-PHAGES) program. This two-term, year long course emerged from the Phage Hunters Integrating Research and Education at the University of Pittsburgh, and takes advantage of the vast, old, and dynamic population of phages in the biosphere, and their enormous genetic diversity as revealed through comparative genomics. The initial steps of phage isolation are technically and conceptually accessible, and progression through purification, DNA isolation, genomic sequencing, annotation, and comparative genomic analysis facilitates an educational progression from concrete concepts to more abstract and representational data analysis. The growing collection of completely sequenced mycobacteriophage genomes is providing valuable insights into viral diversity and evolution, while introducing freshman students to research methods and approaches.

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In summary, the ASM Conference for Undergraduate Educators is an excellent opportunity for educators to engage with students and other educators in various aspects of scientific education and research. The events held at the conference, such as keynotes, workshops, and field trips, provide valuable learning experiences that can be integrated into undergraduate curricula. The conference aims to promote research and inquiry early into the undergraduate curriculum, thereby providing students with the opportunity to engage in authentic scientific discovery.
CONFERENCE WRAP-UP  
9:00 AM - 9:30 AM  
Auditorium 1

Here is your chance to contribute and give us feedback about the conference.

CONCURRENT PEDAGOGY SESSIONS  
III of III  
9:45 AM - 10:45 AM  
(5 sessions)

60-minute sessions dedicated to presenting practices and pedagogies that have been assessed for classroom effectiveness. Presenters will provide background information and their approach to the strategy, leaving time for participants to practice and reflect upon how they can implement the new practice or approach into their classrooms. These sessions are presented in two of three time slots during the conference.

1. Case It: Molecular Biology Simulations for Case-Based Learning  
Conference Room A

Mark Bergland, University of Wisconsin-River Falls  
Karen Klyczek, University of Wisconsin-River Falls

Case It! is a project providing molecular biology computer simulations and associated cases at no cost to educators. In this session, participants will see how the Case It simulation can be used to engage students in inquiry by analyzing existing cases or open-ended research questions. We will also include strategies for classroom implementation and assessment, creating new case scenarios using information from the literature and sequences from online repositories, and using the molecular biology simulation to extend and enhance cases from other sources in the Science Case Network (http://www.sciencecasenet.org). The simulation software and cases, video tutorials, and forums are available at http://www.caseitproject.org. Case It v6.06 will perform a variety of laboratory procedures on any DNA or protein sequence including electrophoresis, PCR, blotting, ELISA, and SNP and expression microarrays. The simulation can also be integrated with MEGA software for bioinformatics analyses. Many of the cases that are downloaded with the software focus on genetic and infectious diseases.

2. Development and Use of Interactive Group Case Studies in Microbiology Courses  
Conference Room G

Linsey Donner, University of Nebraska Medical Center  
Marnie Imhoff, University of Nebraska Medical Center

Laboratory sessions pose a unique opportunity to reinforce microbiology lecture information through collaborative learning. This session will focus on the development and use of microbiology group case work for microbiology and infections disease courses. The curriculum development, planning and implementation of case studies will be discussed. The case studies enhance learning through small group work to identify organisms and correlate patient clinical data. We will discuss the set up of the lab activities in a "wet lab" area and how to alter the session to take the activity into a clean classroom.

3. Facilitating Undergraduate Research: Trials, Tribulations, and Lessons Learned  
Conference Room C

Rebecca Ferrell, Metropolitan State University of Denver

Undergraduate research experiences are increasingly important for students who want to continue into graduate and professional programs, and they can also serve as valuable professional development opportunities for teaching faculty. To remain scientists, we need to do science. Doing science with our students can be stimulating and rewarding in many ways, but it can also be frustrating and disappointing, as well as hazardous to our equipment, reagents and sanity. When we structure projects well, recruit students wisely and provide them with appropriate guidance and clear expectations, our students can have valuable experiences that prepare them to become independent researchers. This presentation will examine lessons learned from mentoring undergraduates in their first research efforts, including designing projects, selecting students, anticipating the sorts of "rookie mistakes" they are likely to make, initiating them into the culture as well as the practice of science, mediating interpersonal conflicts, and preparing them to present their work at scientific meetings. Examples to be discussed will include successes, failures, deep frustrations, astonishing errors, and very proud moments. Participants will have an opportunity to share their own experiences with helping students through this scientific rite of passage.

4. Developing and Assessing Principle-Based, Scientific Reasoning in Your Students  
Conference Room B

Laurel Hartley, University of Colorado, Denver

Although principle-based, scientific reasoning is an essential skill for scientific literacy, this skill is rarely learned, even by students at the college level. Instead, most college students rely mainly on informal reasoning based on their personal experiences when answering biological questions that require synthesis or application. For example, a student reasoning informally about weight loss will not trace matter once it leaves the individual; this student might say that "fat melts away" or is "burned off." In contrast, a student using principle-based reasoning would attempt to account for the matter being oxidized and is more likely to recognize that matter is exiting the body as CO2 and H2O. In this session, we'll talk about the developmental transition from informal to scientific...
reasoning and discuss how teaching that emphasizes principle-based reasoning can 1) help students use principles to connect similar ideas that seem disparate to students, 2) efficiently target related misconceptions and 3) help students reason about a process across scales of biological organization from the molecular to the ecosystem. We’ll talk about what we can do as instructors to identify the relevant principles we want students to be able to use, what strategies we can use to help students develop principle-based reasoning, and how we can assess this type of reasoning in a way that separates students who can memorize from students who truly understand.

5. Doing the Classroom Flip: Are You Ready to Turn Your Classroom on Its Head?  
*Conference Room E*

**Jeffrey Pommerville,** Glendale Community College  
**Aimee Bernard,** University of Colorado, Denver  
**Bethany Stone,** University of Missouri  
**Justin York,** Glendale Community College

Many college educators are beginning to experiment with the idea of the flipped classroom where the typical order of teaching is inverted. Traditional in-class activities, such as lecture, are moved outside of the classroom period to be completed independently. This affords time in the classroom for active engagement in team formats with more conceptually difficult topics and under the guidance of the instructor. Because the flipped classroom frees up more face-to-face class time, it can open up new possibilities for active learning and strengthening students’ problem solving skills.

What are faculty doing to flip their classroom? What pedagogical tools and techniques are being used for teaching the inverted model? What are the pitfalls? In this 60-minute session, a brief summative overview of what a flipped classroom is will be presented. Then, each of the four panelists will give a short, 5-7 minute informal presentation on how they have constructed a flipped classroom (with successes and failures). This will be followed by an extensive discussion with the session attendees, who will come away with new ideas, best practices, and pedagogical strategies to help them decide if they want to turn their classroom on its head.

NEW IN 2013! CONCURRENT ASSESSMENT TOOLS SESSIONS II of II  
11:00 AM - 12:00 PM  
(4 Sessions)

60-minute sessions dedicated to presenting different assessment tools and techniques. Presenters will provide background information, their approach to the tool/technique, and how to use them effectively. These sessions are presented twice during the conference.

1. Are You Testing What You Think You Are? Assessment of Student Learning Using Bloom’s Taxonomy  
*Conference Room A*

**Samantha Elliott,** Saint Mary’s College of Maryland

Assessment of student learning is important to ascertain the success of curricular design. While we spend many hours designing and grading quizzes, exams and projects, how often do we really step back to analyze the level at which these questions challenge our students? Bloom’s taxonomy is one way to classify assessment questions to ensure a proper balance of items that require lower- and higher-order thinking. After completion of this presentation, participants will have an understanding of Bloom’s taxonomy and how to rate questions based upon this method. By using Bloom’s taxonomy in the design of assessments, instructors will have a better understanding of student learning and more easily share their results for publication.

2. Using Formative and Summative Assessments to Measure Student Learning and Adapt our Teaching  
*Conference Room B*

**Anne-Marie Hoskinson,** University of Colorado at Boulder

College instructors recognize that assessment of student learning, and of the effectiveness of curricular design, are important parts of teaching and learning. However, it can be difficult to design assessments aligned and properly targeted to course or unit learning goals. In this workshop, participants will follow a cycle of what we term “adaptive curricular design.” Participants will learn what formative and summative assessments are and how they can be used; how to turn course or unit learning goals into assessments that align with them, and how to use results of formative and summative assessments to modify instruction, both during and after course completion.

3. Developing and Using Concept Assessments in Biology  
*Conference Room C*

**Jennifer Knight,** University of Colorado at Boulder

Well-developed concept assessments have the potential to provide faculty, departments, and administrators with valuable information about student learning. If the assessments are aligned to learning objectives that biologists agree are critical for students to achieve, they can also provide insight into persistent incorrect ideas, and into possible problem points in a curriculum. This talk will review the ideal method for developing such assessments and how to use the data that emerges from student performance. In addition, different formats of assessments will be considered, and data provided to support their use.
4. Qualitative Data: I Collected It, Now What?

Christine Maidl Pribbenow, Wisconsin Center for Education Research

This session defines qualitative methods, gives examples of sources of data that can be used to assess student learning, and provides participants an opportunity to “code” data using simple qualitative analysis techniques. This session is ideal for someone who has considered collecting or analyzing qualitative data, but is unsure of where to start (i.e., novice level).

END OF CONFERENCE
12:00 PM

Thank you for celebrating the 20th Anniversary!

Through the years...
Invited Presenter Biographies

Deborah Allen is an associate professor of biological sciences at the University of Delaware (UD). After a 3-year leave of absence serving as a program director for the National Science Foundation’s Division of Undergraduate Education, she recently returned to UD to direct the campus-wide Center for Teaching & Assessment of Learning. In the mid-1990s, Allen joined a multidisciplinary team of scientists and science education researchers to design and assess problem-based learning (PBL) curricula for introductory science courses, including interdisciplinary science courses for pre-service K-8 teachers. Her most recent project entails a longitudinal research study of the development of these aspiring teachers’ beliefs and practices about teaching and learning science as they progress through a reform-based science curriculum. Allen is a co-founding member of the editorial board of CBE-Life Sciences Education and has authored or co-authored regularly-featured columns on teaching strategies and recent research in biology education for that journal. She is co-author or co-editor of several books that describe PBL and other active, inquiry-based and team-based instructional strategies, curriculum design, and assessment. A winner of her university’s excellence in teaching award, Allen co-founded a professional development institute that attracts visitors from around the world who are interested in learning more about PBL.

Jenifer Alonzo is an assistant professor of communication and theatre arts with an M.F.A. in theatre, the terminal degree for that discipline and she has a long-standing interest in collaborative work. In the theatre world, where scholarship is measured by performance rather than publication, Ms. Alonzo’s extensive production track record spans the last ten years. The focus of her thesis was collaboration in a non-hierarchical setting, and many of her productions involve group collaboration in some way. She is a skilled facilitator, with the ability to quickly assess a training audience and present an activity appropriate to its needs. Ms. Alonzo has a passion for science and has developed projects that focused on including under-represented populations, such as women and people with disabilities.

Mark Bergland is Chair of the Biology Department at the University of Wisconsin-River Falls. He has been PI for five NSF grants to develop educational software, primarily via the Case It! project (http://www.caseitproject.org). Molecular biology simulations that he has authored have been disseminated via the BioQUEST Library and the Internet, and he and Karen Klyczek have presented project results at numerous professional meetings and workshops. The Case It project was awarded a AAAS Science Prize for Inquiry-Based Instruction in 2012. Dr. Bergland received the 1990 and 2003 Outstanding Faculty Member of the Year Awards, the 2004 Scholarship Award for the College of Arts and Sciences, and the 2012 Advisor of the Year award. Dr. Bergland received a B.S. in wildlife biology from Colorado State University and a M.S. and Ph.D. in wildlife management from the University of Michigan. In addition to administrative duties, he teaches ornithology at UWRF.

Aimee Bernard is a senior instructor in the Department of Integrative Biology at the University of Colorado Denver. Dr. Bernard earned her Ph.D. in immunology at the University of Rochester in 2001. She pursued postdoctoral studies at the Barbara Davis Center for Childhood Diabetes from 2001-2002 in a lab focused on the developmental biology of the pancreas and gastrointestinal system and at National Jewish Health from 2002-2006 in a lab focused on B cell biology and signaling. For the past six years she has taught immunology, molecular biology, virology, and general genetics to biology majors. In addition, Dr. Bernard has been the sole faculty member responsible for oversight of the for-credit biology internship course offered at UC Denver. In 2010, Dr. Bernard won the non-tenure track University of Colorado Denver College of Liberal Arts & Sciences Excellence in Teaching Award. In the summer of 2011 Dr. Bernard attended the HHMI/NAS Mountain West Summer Institute on Undergraduate Education in Biology as a participant and returned the following summer (2012) as a facilitator. During the 2013 ASMCUE, Dr. Bernard will co-present, “Doing the Classroom Flip: Are You Ready to Turn Your Classroom on its Head?,” sharing her experience using this pedagogical method in her current courses.

Loretta Brancaccio-Taras is a Professor and Chairperson of the Department of Biological Sciences at Kingsborough Community College (KCC) of the City University of New York in Brooklyn. She has a doctorate in microbiology from St. John’s University. As a result of participating in ASM’s Scholars-in-Residence program in 2005, she conducted a research study on using group writing assignments to improve student learning in microbiology courses. Through KCC’s Center for Teaching and Learning, Brancaccio-Taras has worked with over forty faculty members to develop and publish discipline-based education research projects. She currently serves as PI on a NSF funded Advanced Technological Education grant involving training high school teachers, pre-service and in-service teachers to incorporate biotechnology experiences into their curricula. Brancaccio-Taras was recently selected as one of the forty national leadership fellows to serve as part of the Partnership for Life Science Education (PULSE). PULSE is tasked with implementing the recommendations made in the report Vision and Change In Undergraduate Biology Education: A Call to Action. Brancaccio-Taras is an active member of the American Society for Microbiology, serving as section editor for The Journal of Microbiology & Biology Education, a member of the Biology Scholars Program Research Residency Steering Committee and as an Education Board member.
Jean A. Cardinale is chair and professor of biology and professor of biomaterials engineering at Alfred University, where she teaches a range of courses mostly focused on 'the small': microbiology, molecular cell biology, immunology and others. Dr. Cardinale received her B.S. in cell and developmental biology and M.S. and Ph.D. in microbiology and immunology from the University of Rochester. She is currently the Curriculum Section Editor of the Journal of Microbiology & Biology Education.

J. John Cohen is Professor of Immunology and Medicine at the University of Colorado School of Medicine in Aurora, CO. He attended McGill University, obtaining B.Sc., M.Sc., Ph.D., and M.D. degrees. After postdoctoral training in Montréal, Denver, and London, he returned to Colorado for a temporary stint which turned out to be permanent. He really loves teaching, and the medical students at Colorado have given him their Excellence in Teaching Award every year since 1982; he has 5 times been Teacher of the Year. In 2001 he was elected Fellow of the American Association for the Advancement of Science (AAAS), and in 2002 he received the national Alpha Omega Alpha Glaser Award as outstanding teacher of medicine. You can access his graduate immunology course at http://immuno4ever.org

In 1989 J.J. founded the “Mini Med School” for the general public, a concept now being developed in over 100 schools in America, Canada, and Europe. For his work in research and public education he has received honorary doctorates from Sherbrooke and McGill Universities. He was given the 2010 AAAS Award for Public Engagement with Science. Dr. Cohen started the Colorado Café Scientifique, where ordinary people meet in a pub to talk science, and he and Helen Macfarlane launched the CU “Art in Science | Science in Art” competition and exhibition. J.J. has held many honorary lectureships. His research group was the first to show that cells have a genetic “suicide program” by which they can be eliminated from the body, in a paper that has been cited 2000 times. He is currently working on a paper entitled “Lecture 3.0: A Hack for Overclocked Wetware.”

Adela Cota-Gomez, Ph.D. is an assistant professor in the Department of Medicine at the University of Colorado Anschutz Medical Campus. She received her Ph.D. in molecular biology from the University of Colorado Health Sciences Center where she studied molecular mechanisms of Pseudomonas aeruginosa pathogenesis. Her post-doctoral work carried her into the world of HIV pathogenesis where she has been for the past 12 years. Her work has spanned the gamut of HIV pathogenesis models from cultured cells to mice to monkeys. But her most recent studies on the human lung microbiome are focused on chronically-infected HIV patients. Dr. Cota-Gomez also has a deep passion for teaching and mentoring undergraduates. Since 2007 she has been either a full-time or part-time professor of microbiology at the nearby Metropolitan State University of Denver (MSU-Denver). Most recently, she re-structured her senior experience microbial ecology course to a completely student-driven, literature-based course that exposes MSU-Denver’s senior biology students to current discoveries in microbial ecology. Dr. Cota-Gomez’s passion for undergraduate education goes beyond the classroom. For the past 10 years she has been the coordinator for the summer undergraduate research program, GEMS, at the University of Colorado School of Medicine. In her capacity as GEMS coordinator, Dr. Cota-Gomez has been responsible for turning scores of undergraduate students toward Biomedical research careers. As many in today’s audience would agree, Dr. Cota-Gomez feels that of all the hats that undergraduate educators are forced to wear, aiding students to find their way is by far the most rewarding of all.

Alicia Cronquist has been the Foodborne and Enteric Disease Epidemiologist at the Colorado Department of Public Health and Environment since 2003. In this capacity she directs the FoodNet project in Colorado and coordinates surveillance, investigation and control of enteric pathogens across the state. Before that she served as a CDC Epidemic Intelligence Service Officer stationed in Colorado and worked as an infection control practitioner in New York City.

Linsey Donner joined the University of Nebraska Medical Center faculty in 2008 where she teaches medical microbiology and infectious disease courses. She is currently the microbiology curriculum coordinator/developer for the Clinical Laboratory Science Program at UNMC. She is involved in inter-professional education teaching microbiology to clinical laboratory science, pharmacy, and health care focused high school students. Linsey received her Bachelor of Science Degree in medical technology in 2004 and her Master of Public Health Degree in 2011. As junior faculty at UNMC it is her goal for her microbiology students to understand the implications of their role in understanding clinical microbiology and the impact they will have on patients’ lives by detecting and/or treating infectious disease. She utilizes interactive classroom learning through case studies, peer lectures, skit presentations, journal activities, and the clicker response systems to engage students in the learning process. She believes that showing students how to answer their own questions by utilizing resources around them will foster them to become lifelong learners and they will be able to thrive in this ever-changing world of microbiology.
Katrina J. Edwards is a professor of biological sciences and Earth sciences in USC College. She is also the Director of the National Science Foundation supported Center for Dark Energy Biosphere Investigations in Los Angeles. Team members along with several other major research institutions are drilling holes in the ocean floor in three locations under the Atlantic ocean—the North Pond, Juan de Fuca and South Pacific Gyre—in order to study how life thrives in sediments and rock below the bottom of the ocean. Her research interests include geomicrobiology and microbial life at or below the sea floor, and the interaction of microbes and rock. The cornerstone of Professor Edwards’ lab research is in the development of a mechanistic understanding of the microbial processes and controls on rock, mineral and organic matter transformations, and the establishment of means to delineate their influences.

Samantha Elliott has been an assistant professor in the Department of Biology at St. Mary’s College of Maryland (SMCM), a public liberal arts college and Maryland’s designated honors college, since 2006. She graduated with a Ph.D. in immunology from the University of North Carolina at Chapel Hill in 2004, where she studied murine CD8+ T cell activation requirements. She began studying C. elegans immune responses during postdoctoral studies at Duke University, and continues this research with her students at SMCM. She also collaborates with colleagues to study nematode-bacteria interactions that affect soil microbial ecology, and the use of catalytic azide compounds to label sub-cellular structures. Her education research currently focuses on retention of under-represented groups in the sciences, and the dynamics of group work (group quizzes, peer instruction, role-play) in the learning process. She was a 2008-2009 Resident in the Biology Scholars Research Program, and currently works with the Faculty Institutes for Reforming Science Teaching IV (FIRST IV) as a reviewer, the Journal of Microbiology & Biology Education as a Curriculum Section Editor, and on the Committee of Examiners for the Graduate Record Examination in biochemistry, cell and molecular biology.

Rebecca Ferrell received her B.S. and M.S. in biology from Missouri State University, and a Ph.D. in microbial genetics from the University of Missouri School of Medicine. In 1991 she joined the faculty of Metropolitan State University of Denver, where she teaches courses in microbial genetics, virology, microbial ecology and women's studies, and supervises undergraduate research in the microbiology of nitrification. Her other interests include the history of science, family history and genealogy, knitting, and pinball.

Nicole Garneau is an geneticist at the Denver Museum of Nature & Science and takes an active role in public engagement with science in both her research and her community outreach. As a result, she promotes an interactive dialogue between the public, citizen-scientists, and career scientists and was recently selected as a finalist for the 2012 AAAS early Career Award for Public Engagement with Science. She is the director of the highly successful public participation in scientific research (PPSR) study Genetics of Taste, and oversees over 60 volunteer citizen-scientists whom she has trained to be paraprofessional molecular biologists in the successful community-based research program.

Laurel Hartley is an assistant professor in the Department of Integrative Biology at the University of Colorado Denver. She studies how introductory college biology students’ reason about matter and energy in carbon-transforming processes (e.g. photosynthesis and cellular respiration). She is interested in how the use of undergraduate Learning Assistants in large introductory courses can promote faculty transformation and increase learning and networking among students in the course. She is also developing K-12 learning progressions related to ecology and evolution. Learning progressions are empirically derived descriptions of how students develop understanding of a certain topic over several years. Dr. Hartley’s ecological research focuses on how the introduction of plague to North America has influenced the role of prairie dogs in shaping plant communities and nutrient cycling on Colorado grasslands.

Graham F. Hatfull is Professor of Biological Sciences at the University of Pittsburgh. He received a B.Sc. (Hons) degree in biological sciences from Westfield College, University of London in 1978, and a Ph.D. in molecular biology from Edinburgh University in 1981. He did postdoctoral work at Yale University in the Department of Molecular Biophysics and Biochemistry with Dr. Nigel Grindley, and at the Medical Research Council at Cambridge University, with Drs. Fred Sanger and Bart Barrell. He has been at the University of Pittsburgh since 1988 and served as Chair of the Department of Biological Sciences from 2003 to 2011.

Dr. Hatfull’s research focuses on the molecular genetics of the mycobacteria and their bacteriophages. These studies take advantage of the intimacy of phage-host interactions to gain insights into the genetics and physiology of Mycobacterium tuberculosis, the causative agent of human TB. Through integrated research-education programs such as the PHIRE and SEA-PHAGES programs, the large collection of completely sequenced mycobacteriophage genomes provides insights into viral diversity and evolution, and represents a rich toolbox of new approaches to understanding M. tuberculosis. Development of vector systems, selectable markers, recombineering approaches, expression tools, and insights into mycobacterial biofilms reflect some of the useful applications of this genomic resource.
Highlights of Dr. Hatfull’s research accomplishments include publication of more than 130 peer-reviewed research articles, 30 book chapters or reviews, and two books. He has mentored 19 Ph.D. students, over 100 undergraduate student researchers, and 16 postdoctoral associates. Dr. Hatfull has received the University of Pittsburgh Chancellor’s Distinguished Research Award at both the junior and senior level, the University of Pittsburgh Chancellor’s Distinguished Teaching Award, and is the Eberly Family Professor of Biotechnology. He is a fellow of the American Academy of Microbiology, a fellow of the American Association for the Advancement of Science, and a teaching fellow of the National Academy of Science. He has been a Howard Hughes Medical Institute Professor since 2002.

Rachel Herlihy is the Interim Deputy Director for the Division of Disease Control and Environmental Epidemiology at Colorado Department of Public Health & Environment (CDPHE). In her current role, Dr. Herlihy oversees the Department’s Programs on communicable disease epidemiology, tuberculosis, refugee health, and immunizations. Dr. Herlihy is a preventive medicine trained physician with public health experience at the local, state, and federal level. Prior to joining CDPHE, Dr. Herlihy served as the Deputy State Epidemiologist for Utah and worked for a National Institute of Health & Department of Defense Infectious Diseases Clinical Trial Network. Dr. Herlihy is married and the mother of a healthy, happy, fully vaccinated toddler.

Jennifer Herzog is an assistant professor at Herkimer County Community College in Upstate NY. She received her graduate degrees at the Yale University School of Medicine, where she studied the pathogenesis of Kaposi’s Sarcoma Herpesvirus (KSHV). Jen currently teaches microbiology and non-majors general biology at HCCC, and has developed nearly 10 online or hybrid science courses. She has a strong interest in developing novel teaching strategies for science education and has developed programs for K-career microbiology education. Professionally, Jen has been an active member of the American Society for Microbiology for nearly 20 years, most recently serving at Section Chair for MicrobeLibrary and a regular contributor to ASM’s Journal of Microbiology & Biology Education. She currently serves as the digital author on two of McGraw-Hill's top selling microbiology textbooks. Jen's only hobby these days is spending time with her two children and drinking vast amounts of coffee.

Janet Hindler is a clinical laboratory scientist with a Masters Degree from the University of California, San Francisco. She is a Sr. Specialist and manages the R&D section of the clinical microbiology laboratory at UCLA Health System, Los Angeles, CA and is a consultant for the Association of Public Health Laboratories. She has written and taught extensively in the area of antimicrobial susceptibility testing. From 2000-2004 she held a contract with the CDC where her focus was to develop and conduct training programs in antimicrobial susceptibility testing. She has served as a consultant to the World Health Organization and assisted teaching individuals in developing countries about antimicrobial susceptibility testing and antimicrobial resistance. Ms. Hindler is a fellow in the American Academy of Microbiology, member of the Clinical and Laboratory Standards Institute Subcommittee on Antimicrobial Susceptibility testing, consultant to CAP’s Microbiology Resource Committee, Past Chair of ASM Division C and Past President of the Southern California Branch of ASM. Ms. Hindler is currently chair of ASM's Clinical Microbiology Mentoring Committee. Ms. Hindler was the 2006 recipient of ASM’s bioMerieux Sonnenwirth award for leadership in clinical microbiology. She has received several other awards and in 2012, she was awarded an honorary doctoral degree from Albright College, her alma mater.

Anne-Marie Hoskinson is a science teaching fellow in the science education initiative at the University of Colorado Boulder, housed in the Department of Ecology and Evolutionary Biology. She was a 2008-2009 Biology Research Scholar. She works with faculty to assist them in designing and implementing evidence-based teaching and student-centered learning practices across the undergraduate curriculum. She also developed and teaches a course in mathematical modeling in biology. Her research interests including complex problem-solving in biology, teaching biology as a model-building enterprise, and the role of metacognition in both biology classrooms and professional development.

Brian Hostetler has been the Educator/Coordinator for Health Gallery Programs at the Denver Museum of Nature and Science for the past 3 years. In this role he develops cart demonstrations, stage shows, and other educational programs to create dynamic and interactive learning environments within Expedition Health. The Visitor Programs Department at the Museum fields dozens of requests for collaboration from academic and community-based groups each year. Before coming to the Museum, Brian was the Physics Gallery Leader at the St. Louis Science Center, and a before and after school facilitator with the University of Missouri. Brian has a Bachelor of Science degree in elementary education from the University of Missouri-St. Louis and a Masters of Education Degree in science education from the University of Missouri-Columbia.

Marnie Imhoff is an assistant professor and associate program director with the Clinical Laboratory Science program at the University of Nebraska Medical Center. Marnie teaches clinical immunology, clinical molecular diagnostics and select topics in clinical microbiology. She participates in teaching medical microbiology to other health professions,
fostering an environment of interprofessional care. Marnie’s focus is on effectively transitioning students from the traditional classroom into the medical laboratory setting during clinical rotations.

**Bruce Jackson** received his Bachelor of Science Degree in biology from the University of Houston; his Master of Science Degree in genetics from the University of California, Davis; a Master of Science Degree in cell and molecular biology from Brandeis University, and his Doctorate in biochemistry from the University of Massachusetts Lowell. He did his post-doctoral training in the Department of Biochemistry at Boston University School of Medicine and was appointed to the Research Faculty there in 1993. Also in 1993 Dr. Jackson also received an appointment as Head of the Biotechnology Programs at Massachusetts Bay Community College. In the ensuing eighteen years, the Biotechnology Program under Dr. Jackson has become one of the most celebrated undergraduate science programs in the nation and has produced more Goldwater Scholars (America’s highest undergraduate science Award) than all of the community colleges in the United States combined; and most-four-year institutions.

Dr. Jackson is also a member of the Research Faculty in Biomedical Engineering and Biotechnology at the University of Massachusetts Lowell. There Dr. Jackson’s research team traces the paternal and maternal lineages of African-Americans and American Jews using DNA. Dr. Jackson is also a world-renowned forensic DNA scientist and conducts criminal and missing-person cases for the FBI and police departments worldwide as well as serves as scientific consultant for defense attorneys in the United States. His DNA research has been featured widely in the world media including Good Morning America, CBS Evening News, CNN, Washington Post, NPR, Fox Television, New York Times, Chicago Tribune, La Express (Paris, France), and PBS.

Dr. Jackson has won numerous awards for his achievements for his work as a scientist and science educator including a 1995 National Science Foundation CAREER Award, a 2008 Fulbright Award and 2009 The Presidential Awards for Excellence in Science, Mathematics, Engineering Mentoring that was awarded to him at the White House by President Obama in January 2011.

**Nitya Jacob** is Associate Professor of Biology at Oxford College, an undergraduate division of Emory University, located in Oxford, Georgia at the historic original campus of the university. She received her B.A. in biology from Agnes Scott College in 1995 and her Ph.D. in horticulture and crop science from The Ohio State University in 2000. Her teaching focus is at the introductory and intermediate levels in cell biology, genetics, molecular biology, and applied biology. Dr. Jacob’s research involves the study of microbial communities associated with granite outcrop plants and the regulation of nodule-expressed genes in *Rhizobium*-alfalfa symbiosis. She designed a laboratory teaching module which won the 2011 Inquiry-Based Instruction (IBI) Prize awarded by AAAS and Science. She received several teaching awards in her tenure at Oxford College of Emory University including the Emory Williams Distinguished Teaching Award (2011). She is a Co-Principal Investigator for Emory University’s NSF-STEP grant. She currently serves as a Councillor in the Biology Division of the Council on Undergraduate Research (CUR) and is an alumna of the ASM Biology Scholars Program Assessment Residency (2011). From 2006-2012 she was the Director of the Summer Undergraduate Research at Emory (SURE) - Oxford College program. She is one of 40 Partnerships in Life Sciences Education (PULSE) Leadership Fellows selected to lead the joint initiative of HHMI, NSF, and NIH of national transformation in undergraduate biology education.

**Karen Klyczek** is a professor of biology at the University of Wisconsin-River Falls, where she teaches general biology, immunology, and virology. She has been involved with undergraduate research and integrating research into courses, and is one of the faculty coordinating the HHMI Science Education Alliance PHAGES program for first year biology students at UWRF. She has been co-PI with Mark Bergland on several NSF grants to develop educational software (Case It) and is on the steering committee for the Science Case Network, funded by an NSF RCN-UBE grant. In 2012 she was named a PULSE Vision and Change Leadership Fellow and is working on strategies for facilitating biology education reform at the department level. Dr. Klyczek received her B.A. in biology and chemistry from Augustan

**Jennifer Knight** has a Ph.D. in neuroscience from the University of Michigan, and completed postdoctoral work at the University of Colorado in developmental genetics. She has been teaching undergraduates at all levels in the department of molecular cellular and developmental biology at the University of Colorado for thirteen years. Dr. Knight’s research focuses on developing meaningful concept assessments for student learning in biology, and studying the impact of in-class discussions on student learning. She and colleagues have developed two concept assessments, the Genetics Concept Assessment (GCA) and the Introductory Molecular Biology Assessment (IMCA), and are currently working on a capstone level assessment, all designed to diagnose student misunderstandings and measure learning gains in typical undergraduate biology classrooms. Her studies on the use and benefits of clicker questions in large lecture environments have shown that students learn from each other during peer discussions of questions, and that peer discussion coupled with an instructor explanation is superior to an instructor explanation alone. Dr. Knight is the coordinator of the MCDB Science Education Initiative, and is also a leader for several
Melanie Lee-Brown received a B.S. in biology with a minor in teaching from N.C.A&T State University, NC in 1993. She received her Ph.D. in microbiology, with an emphasis in genetics, from N.C. State University in 1998. Melanie was also a post-doctoral research fellow in the Department of Neurobiology and Anatomy at Wake Forest University School of Medicine under the direction of Ron Oppenheim. She has research experience in the fields of phospholipid dynamics, reproductive immunology, microbial genetics, and developmental/molecular neurobiology.

Melanie is an associate professor in the Department of Biology and Director of Undergraduate Research at Guilford College. The focus of her undergraduate research program is microbial molecular genetics; specifically looking at the evolutionary relationships between nitrogen-fixing Azotobacteria and related pseudomonads as determined through rRNA and RNase P phylogenetic analysis, Multi-Locus-Sequence-Typing (MLST), genome structure and metabolic profiling. She is also investigating the role of riboswitches on the growth of bacteria, and affect of mutagenesis on the virulence of pathogenic relatives. Melanie is the Past-President of the North Carolina Branch of the American Society for Microbiology and currently serves on the Annual Meeting Committee. For the North Carolina Academy of Science she has served as Chair of the Strategic Planning Committee, Vice President, President-Elect, President, Past President and is currently the Co-Editor of the *Journal of the North Carolina Academy of Science* (JNCAS). Melanie is also one of 40 Partnership for Undergraduate Life Science Education (PULSE) Fellows sponsored by HHMI, NIH and NSF. The PULSE Fellows are developing ways to effect national change in undergraduate biology education at the departmental level.

Donald Lehman is an associate professor in the Department of Medical Laboratory Sciences at the University of Delaware. He earned a Doctorate of Education in leadership with a concentration in technology from the University of Delaware and has a Bachelor of Science degree in medical technology and a Master’s of Science in microbiology & immunology. He has about 30 years of university teaching experience and currently teaches courses on medical/clinical microbiology, immunology, virology, forensic science, medical terminology, and statistics. Dr. Lehman uses his background in education technology to incorporate innovative strategies into his courses including simulated laboratories and online courses. He is also a co-editor of the *Textbook of Diagnostic Microbiology* and has published articles on educational assessment, forensic science, and clinical microbiology.

Pat Marsteller directs the Emory College Center for Science Education, is Director of the Emory HHMI initiative and is a professor of practice in the department of biology. She studied evolution of animal behavior for her M.S. degree at University of South Carolina and quantitative genetics and evolution of life history patterns for her Ph.D. at the University of Florida. The Center for Science Education (CSE) promotes access, interest and participation in science careers. CSE programs bolster science literacy and provide hands-on research and curriculum development experiences for students and teachers at the precollege, college and postgraduate levels. Through student and curriculum development activities, CSE integrates research and education and help students explore the vast array of careers open to individuals with a solid background in science. CSE particularly focuses on attracting and retaining underrepresented students, women and minorities in careers in science. Our work in these areas includes special programs for undergraduates, outreach efforts with metro Atlanta Public School teachers and students.

Dr. Marsteller has used cases and PBL since she began teaching and has run workshops for faculty at all kinds of colleges and universities from community colleges to research universities and from all science and math departments to public health and nursing. Her workshops focus on sources of problems and cases, adapting existing cases and writing new one. She also works with pre-college faculty on developing case based curriculum materials and on using active learning strategies in the teaching of science and mathematics.

Mary Mawn is an assistant professor and academic area coordinator in science, mathematics, and technology at the Center for Distance Learning, SUNY Empire State College, Saratoga Springs, NY, where she teaches courses in microbiology, genetics, molecular and cellular biology, and science education. Dr. Mawn earned a B.S. in biochemistry from the College of Mount Saint Vincent, Riverdale, NY, and an M.Ed. in educational technology and Ph.D. in molecular and cellular biology from the University of Massachusetts Amherst, where she studied ribosome structure and function in *Escherichia coli* and *Saccharomyces cerevisiae*. Her current research interests focus on identifying ways to teach scientific process skills in online undergraduate science courses, and promoting the professional development of science teachers through distance learning. She is a 2009-2010 ASM Biology Research Scholar.

Susan Merkel obtained her M.S. in microbiology from Cornell University in 1988. As a senior lecturer, Sue has been teaching introductory microbiology courses (first lecture, now the laboratory course) at Cornell University for over 20 years. She is currently developing a “flipped” course in public health microbiology. In addition, she trains teaching assistants and teaches a graduate level course in microbiology education, in which students develop and evaluate
new teaching activities. She is involved with the assessment of the biology and microbiology curricula. She has been active in the Education Division of the American Society for Microbiology, most recently as chair of the ASM Task Force to develop new Curriculum Guidelines for Undergraduate Microbiology and as chair of the Committee on Undergraduate Education. Her approach to teaching includes 3 goals: 1) to bring critical thinking and active learning into the classroom; 2) to use technology as a tool and 3) to convert others to the philosophy of student-centered learning.

Christopher Miller is an assistant professor in the Department of Integrative Biology at the University of Colorado Denver. He is also core faculty in the University’s Computational Bioscience Program. He received his Ph.D. in molecular biology from the University of California, Los Angeles, and did postdoctoral training at the University of California, Berkeley. Dr. Miller’s laboratory develops and applies bioinformatic and genome-enabled experimental approaches to study microbial communities in the environment at a systems level. He teaches courses in genomics, bioinformatics, and biotechnology.

Philip Mixter is an associate clinical research professor in the School of Molecular Biosciences at Washington State University (WSU). His instructional duties include an online introductory microbiology course for non-scientists, half of a junior level lecture course in microbiology for pre-professionals, an elective course in microbial ecology, a senior-level microbiology-virology laboratory for microbiology majors, an immunology course for first year medical students and an immunology journal discussion course for graduate students. He completed his assessment residency year as a Biology Scholar in 2011-12. Phil is part of the steering committee for his college’s Teaching Academy and was named one of three WSU Distinguished Instructors for 2012.

Beronda Montgomery completed doctoral studies at the University of California, Davis, and a three-year postdoctoral fellowship at Indiana University. She is currently an associate professor in the MSU-DOE Plant Research Laboratory and the Department of Biochemistry & Molecular Biology at Michigan State University. Montgomery’s laboratory studies the molecular mechanisms used by photosynthetic organisms for photomorphogenesis, or light-regulated, adaptive changes in growth, development, and metabolisms. Montgomery’s scholarly efforts have been recognized by a National Science Foundation CAREER Award, the highest award given by the foundation to support junior faculty within the context of their overall career development. Montgomery has been active in her own research group and in broader efforts to support and mentor individuals from groups underrepresented in the sciences. She is a member of the editorial board for the Journal of Biological Chemistry.

Jeff Olimpo a graduate student in the department of teaching, learning, policy, & leadership at the University of Maryland, College Park, with a focus in science education, teacher education, and educational psychology. During his time at UMD, he has had the pleasure to teach a number of lower- and upper-level biology courses, as well as courses in science education for Biology majors. His research interests include exploring students’ understanding of visualizations in chemistry and biology courses and their perceptions of teaching and learning in science disciplines, as well as, broadly, curriculum and assessment development for introductory biology courses on campus.

Aditi Pai is an evolutionary biologist who has been a faculty member at Spelman College since 2006. Prior to coming to Atlanta, she was a post-doctoral research fellow at State University of New York at Buffalo. At Spelman she teaches the introductory biology class on ecology, evolution and biodiversity, advanced electives on evolutionary biology and research methods as well the capstone course in Biology. Her lab studies sexual selection using the red flour beetle as a model system. She has been the vice chair of the Biology department since 2010 and on the editorial board of The Scientific World Journal since 2011.

Dr. Pai earned her Bachelor’s from St. Joseph’s College of Arts and Science in Bangalore, India; her Master’s degree from Pondicherry University in Pondicherry, India; and her Ph.D. from State University of New York at Buffalo.

Joseph F. Petrosino obtained his undergraduate degree in microbiology and immunology with a distinction in research from the University of Rochester in 1993 followed by a Ph.D. degree in microbiology and immunology from Baylor College of Medicine in 1998 in the laboratory of Dr. Timothy Palzkill. He completed postdoctoral fellowship training in genetics at Baylor College of Medicine from 1999-2002 with Dr. Susan Rosenberg, and from 2003-2005 he spent time as a research associate in the Human Genome Sequencing Center working on the functional genomics of biodefense and emerging infectious disease agents in the laboratory of Dr. George Weinstock.

He was hired as a tenure-track faculty member at BCM in 2006 with a National Institute of Allergies and Infectious Diseases funded Career Development Award Project from the Western Regional Center of Excellence for Biodefense and Emerging Infectious Disease. His ongoing comparative genomics studies of Francisella tularensis, a pathogenic bacterium with the potential to pose a severe threat to public health and safety, have helped move the field closer to the goal of creating new rationally-designed attenuated and/or subunit vaccines for this Category A select
In 2007, Dr. Petrosino and his colleagues obtained funding through the NIH Common Fund for the Human Microbiome Project (HMP). As a large-scale sequencing center Principal Investigator for the HMP, Dr. Petrosino assisted in the lead of consortium efforts for standardized clinical sample preparation, sequencing, and analysis. This allowed microbial communities from diverse body sites and niches to be compared with minimal technical bias and has led to study design standards that are being implemented internationally.

As a result of the success of his efforts and to extend metagenomics and microbiome studies at BCM, the Alkek Center for Metagenomics and Microbiome Research (CMMR) was established in January 2011 with Dr. Petrosino serving as its Director. Currently, the CMMR is pursuing over 100 metagenomics projects in humans and model systems with the goal to improve human health through detection and modulation of the microbes that reside on and in us and to translate these efforts into new diagnostics and therapeutics. Among the latest CMMR projects initiated is an $11.8M microbiome analysis of 18,000+ Type 1 Diabetes samples from the NIH/NIDDK TEDDY (The Environmental Determinants of Diabetes in the Young) study.

**Jeffrey Pommerville** is Professor of Biology and Microbiology at Glendale Community College (GCC) where he teaches microbiology and introductory biology and serves as the Course Assessment Coordinator for the Biology Department. Previous to coming to GCC, he was on the biology faculty at Texas A&M University. Dr. Pommerville received his B.S. and Ph.D. from the University of California-Santa Barbara. Since coming to GCC, Dr. Pommerville has served as principal investigator on several NSF grants, including SyRIS that developed a strategy to reform and integrate the introductory sciences. He is the author of more than 50 research and education research papers, and currently is the Perspectives Editor for ASM’s *Journal of Microbiology & Biology Education* and the author of two microbiology textbooks. He has received numerous professional honors, including the 2008 Carski Foundation Distinguished Undergraduate Teaching Award from ASM, the Golden Microscope Award from the Leukemia and Lymphoma Society, the Ohaus Award for Innovations in Science Teaching from the National Science Teachers Association, and was one of the first recipients of a Faculty Distinguished Teaching Award from his home institution. He is a member of AAAS, NSTA, NABT, and, of course ASM. Dr. Pommerville is a past co-chair of Division W of ASM.

**Christine Maidl Pribbenow**, Ph.D., is an associate scientist in the Evaluation Resources Group at the Wisconsin Center for Education Research at UW-Madison. As a professional evaluator, she uses mixed methodology to assess student and faculty learning, and to evaluate educational programming at various institutions and organizations. She has been the Evaluation Director on a variety of programs to increase the number of underrepresented minorities in STEM, including the Women in Science and Engineering Leadership Institute (NSF-ADVANCE), the “Fair Play” project (NIH-Pathfinder award), and the Wisconsin Alliance for Minority Participation (NSF-LSAMP) all at UW-Madison. She has also served as the External Evaluator for ASM’s Biology Scholars Program and the Annual Biomedical Research Conference for Minority Students (ABRCMS).

**Laura Regassa** is the director of the Molecular Biology Initiative and a professor in the Department of Biology at Georgia Southern University. She has a Ph.D. in bacteriology from the University of Wisconsin-Madison, with research interests in bacterial biodiversity and systematics. Laura first started pursuing educational research after joining the inaugural Biology Scholars Program cohort. Her educational research has focused on the impact of inquiry-based learning in high school (students and in-service teachers) and university environments (undergraduate and graduate students), with much of her current work focused on the NSF-funded Molecular Biology Initiative. Laura is the recipient of the University System of Georgia Regents’ SoTL Award, a regional ASM teaching award, and university teaching and SoTL awards.

**Zhiyong (Jason) Ren** is an assistant professor in environmental and sustainability engineering at University of Colorado and Director of the Center for Sustainable Infrastructure Systems. His research and teaching focus on environmental biotechnology, renewable energy and chemical production during waste treatment, remediation, and water desalination processes. His lab works on developing novel microbial electrochemical approaches to transform current environmental infrastructure from simple treatment processes to integrated energy and chemical recovery systems. In the past 4 years, he has published more than 20 peer-reviewed articles and directed more than $2 million dollars in research projects for NSF, ONR, EPA, Gates Foundation, and industrial sponsors. He recently received 2012 University Award for Faculty Research and Creative Activities. Ren obtained his Ph.D. from The Pennsylvania State University in 2008.

**Patty Shields** is a senior lecturer at the University of Maryland, College Park. She graduated from Catholic University with a bachelor's degree in biology and then attended the University of Florida in Gainesville where she received both an M.S. and a Ph.D. in environmental virology. Her postdoctoral work at the University of North Carolina School of Public Health centered on the role of Hepatitis A in environmental samples. Prior to teaching full-time, Dr. Shields
Ethel Stanley is actively committed to transformative education in which learners pose problems, develop and use multidisciplinary approaches to solve problems, and engage in peer review of their products. She has worked as director of BioQUEST, past president of ACUBE, past editor of the Bioscience: Journal of College Biology Teaching, past chair of the BSA Teaching Section, and a consultant on numerous undergraduate NSF and HHMI projects. She has focused her efforts on undergraduate science curricula, faculty development, and national community college outreach to include modeling and simulation (The BioQUEST Library), bioinformatics (BEDROCK), quantitative biology (NUMBERS COUNT), cyberlearning for community college faculty (C3 Cyberlearning), and extensive development of investigative case based learning (ICBL) with co-developer Margaret Waterman both here and abroad (LifeLines, ScienceCaseNet, IUBS BioED, and Singapore’s NiE) through both funded projects and publications. Dr. Stanley received her Ed.D. in curriculum and instruction at Illinois State University.

Andrea Stith is the assistant director for interdisciplinary education at the BioFrontiers Institute, University of Colorado at Boulder. Her professional interests include graduate and postdoctoral education, interdisciplinary science, broadening participation in STEM, and the internationalization of higher education. Prior to joining BioFrontiers, she served as a research fellow at the Graduate School of Education of Shanghai Jiao Tong University in Shanghai, China. While in Shanghai, her research focused on national and institutional policies that impact the career prospects of postdoctoral researchers. Previously, she studied science/technology and higher education policies as a German Chancellor Fellow at Humboldt University in Berlin and Ludwig Maximilians University in Munich. Dr. Stith has held program management positions at non-profit organizations in the Washington, DC area, including the Howard Hughes Medical Institute and the Federation of American Societies for Experimental Biology. In 2002-2003 she was an AAAS/NSF Science and Technology Policy Fellow in the Office of Legislative Affairs at the National Science Foundation. Dr. Stith received her doctorate in biophysics from the University of Virginia; and, she received her bachelor’s degree in physics from the University of Delaware in 1995. She has been a long-time member of and served as a councilor on the national board of the Association for Women in Science.

Bethany Stone earned her Ph.D. in biological sciences from the University of Missouri – Columbia. Her Ph.D. and Post-doc research areas were plant physiology, genetics and molecular biology. She is now an associate teaching professor in the Division of Biological Sciences at the University of Missouri – Columbia where she teaches primarily non-major undergraduate biology courses including general biology, botany, genetic diseases and infectious diseases. After completing two of the Biology Scholars Residency programs through the American Society for Microbiology, Bethany has focused on researching what’s happening in her classroom. Her research interests include student misconceptions in biology and student learning and attitudes in a flipped college classroom.

Kenneth Tyler graduated from Harvard College, received his M.D. degree from Johns Hopkins, and then trained in internal medicine (Brigham) and neurology (MGH) before completing a fellowship in microbiology and molecular genetics with the late Dr. Bernard Fields at Harvard Medical School. He is currently the Reuler-Lewin Family Professor & Chair of the Department of Neurology at the University of Colorado School of Medicine and Co-Director of the Center for Neuroscience. He is a member of the editorial boards of Virology, Microbial Pathogenesis, Journal of Infectious Diseases and several neurological journals, and also serves as an Associate Editor for the Journal of Neurovirology. His laboratory is funded by NIAID, NINDS, and the VA for research related to then pathogenesis if CNS viral infections. His laboratory uses a variety of viral systems including reoviruses and more recently flaviviruses (WNV, JEV) to examine virus-host interactions in the CNS including the effects of viral infection on host cell gene expression and transcription, apoptotic, and kinase signaling. The laboratory also studies the effects of viral infection on CNS innate immune responses including glial activation, and cytokine and chemokine production. Experimental systems utilized range from primary CNS cell culture, to ex vivo brain and spinal cord slice systems, to whole mouse studies. As a clinician, Dr. Tyler is a recognized authority on viral CNS infections and has written widely on the diagnosis and clinical features of herpesvirus infections, PML, and WNV.

Susanne von Bodman is a program director at the National Science Foundation (NSF) in the BIO Division of Molecular and Cellular Biosciences (MCB). She leads the systems and synthetic biology cluster that considers proposals focusing on emergent properties of biological systems that are guided by mathematical and physical principles and facilitated through the use of novel tools in systems and synthetic biology. Prior to becoming a permanent Program Director at NSF, Dr. von Bodman was a professor of plant science and molecular and cellular biology at the University of Connecticut (UCONN) in Storrs CT. She received her Ph.D. and post-doctoral training from the University of Illinois at Urbana-Champaign (UIUC) in the area of microbiology related to plant pathogenesis,
and in biophysics focusing on protein structure function. Her research at the UCONN examined the role of microbial cell-cell communication (quorum sensing) and biofilm development and their role plant-microbe interactions. One of Dr. von Bodman’s missions at NSF is to convey, in particular to young investigators, and students in microbiology and molecular biology, the necessity to employ predictive mathematics and computational simulation to study complex biological systems. The cluster also considers proposals in the emerging field of synthetic biology, a discipline that relies on engineering principles to develop circuits, devices and systems for useful purposes.

Margaret Waterman is a professor of biology at Southeast Missouri State University where she teaches biology and courses for pre-service teachers as well as graduate courses in science education. She also co-developed and led the university’s Scholarship in Teaching and Learning Fellows program. Her microbiology interest is in plant diseases, and she earned the M.S. in plant pathology at Cornell University, and then a Ph.D. in science education. Her work on Investigative Case Based Learning over the last 15 years with collaborator Ethel Stanley, has led to the publication of Biological Inqury: A Workbook of Investigative Cases, as well as numerous journal articles, speaking engagements and opportunities to consult with instructors around the world. She is a co-PI on the NSF-funded RCN-UBE “Science Case Network” which brings together case learning projects and faculty interested in using and researching cases and PBL.

Christopher White is President, CEO, and founder of White Labs Inc. White Labs produces yeast cultures and provides fermentation services to the brewing, wine, and distilling industries. Chris previously worked at Genentech Inc, the worlds first biotechnology company, and he holds a Ph.D. in biochemistry from the University of California San Diego and a B.S. in biochemistry from the University of California Davis. White is coauthor of Yeast: The Practical Guide To Beer Fermentation, co-designer of BrewMaster: The Craft Beer Game, and has published numerous articles on yeast, beer, and fermentation. Chris White was a lecturer in the Chemistry and Biochemistry Department at the University of California San Diego from 1999-2007, and is currently a faculty member of the Siebel Institute of Technology in Chicago.

Terry Woodin is currently a program officer in the Division of Undergraduate Education of the Directorate for Education and Human Resources at the National Science Foundation. She is part of the four agency (NIH, NSF, HHMI, USDA) effort to improve undergraduate education in biology; an effort resulting in Vision and Change in Undergraduate Biology Education: A Call to Action a publication reflecting input by more than 600 biologists across the nation. She has served at NSF since 1992. During that time she has had assignments to Japan as a Fellow of the Japanese Society for the Advancement of Science, in Portugal (both Lisbon and the Azores) as a State Department Science Fellow, and as a Brookings Fellow in the United States Senate where she worked on education issues. She earned her Masters and Ph.D. in biochemistry at the University of California, Davis and began her professional career in the Biochemistry Department at the University of Nevada, Reno where she has held positions as associate professor of biochemistry in both the School of Agriculture and the College of Medicine as well as associate director of the Honors Program. She has held faculty positions at the Universidad Catolica de Puerto Rico and Humboldt State University in Arcata, California. She is a life time member of SACNAS, a Fellow of the American Association for the Advancement of Science and is on the Editorial Board of the Journal of Biochemistry and Molecular Biology.

Robin Wright earned a Bachelor of Science degree from the University of Georgia and a Ph.D. from Carnegie-Mellon University. After postdoctoral training at UC, Berkeley, she was on the faculty of the University of Washington (Zoology Department) for nearly 13 years. She moved to Minnesota in 2003, and is currently Associate Dean for Faculty and Academic Affairs in the College of Biological Sciences (CBS) and professor of genetics, cell biology, and development.

Prior to focusing exclusively on undergraduate education, her lab used genetic, cell biological, ecological, and evolutionary approaches to explore cold adaptation. In addition, her laboratory was well known as a great place for undergraduates to pursue research. Over the past 21 years, she has mentored nearly 100 undergraduate researchers.

In terms of classroom instruction, Prof. Wright has experience teaching both large and small classes, including freshman seminars, large introductory biology courses, and skill-oriented courses for honors students. The University of Washington, her previous institution, recognized her teaching innovations with a university-wide Distinguished Teaching Award. Her major goal as Associate Dean is to catalyze the development of the nation’s best biology curriculum, including biology courses that apply principles of active learning, research, and engagement. In this regard, she helped to develop and co-teaches in the Nature of Life and has been a leader in development of Foundations of Biology, an innovative, team-based introductory biology course for biological sciences majors.

Prof. Wright has served on the Education Committee of the American Society for Cell Biology and was as chair of the Education Committee for the Genetics Society of America. In addition, she was a senior editor of the Journal, Life Science Education and is the founding Editor-in-Chief of a new biology curriculum journal called CourseSource. She
Michelle Young received her Master of Natural Science degree from Southeast Missouri State University in 1998 and has been an instructor in biological sciences for 13 years at Three Rivers College in Poplar Bluff, MO. She has been teaching online biology classes for the past 9 years. She has been active in reviewing for several textbooks for McGraw-Hill and other publishing companies. Michelle is an experienced case study author and user and is a member of The Science Case Network Steering Committee.
STAY IN TOUCH
- Sign up for ASM Division W and join the ASM educator community
- Sign up for EduAlert and receive announcements and updates from ASM Education
- Sign up for Microedu listserv and discuss issues around teaching, learning, & career development
- Sign up for electronic table of contents (eTOC), Journal of Microbiology & Biology Education (JMBE)
- Sign up for electronic table of contents (eTOC), MicrobeLibrary (ML)

SHARE YOUR WORK – Submit
- Abstracts and presentations to:
  - ASM Conference for Undergraduate Educators
  - ASM Branch or ASM Regional Branch Meeting
  - Division W Poster Sessions, asm2014
- Manuscripts to Journal of Microbiology & Biology Education
- Resources to MicrobeLibrary.org:
  - Questions to Critical Thinking Question Database
  - Visuals to Gallery, Visual Media Brief and Protocol Collections
- Learning activities to the K-12 Classroom and Outreach Collection
- Applications to the NSF/ASM Biology Scholars Program (ASM BSP), ASM Undergraduate Research Fellowship (ASM URF), NSF/ASM Leaders Inspiring Networks and Knowledge (ASM LINK)

REVIEW - Serve as a reviewer for:
- Manuscripts, Journal of Microbiology & Biology Education and resources, MicrobeLibrary
- Abstracts and travel grants, ASM Conference for Undergraduate Educators
- Abstracts and travel grants, Annual Biomedical Research Conference for Minority Students (ABRCMS)
- Applications, ASM undergraduate student research fellowships (ASM URF)

MENTOR – Lend your expertise and support:
- A first time attendee, graduate student, fellow or pre-tenured faculty member at ASMCUE
- Another faculty member at a 2- or 4-year institution in your area
- A new or prospective ASM Biology Scholar
- An undergraduate student interested in the
  - ASM Undergraduate Research Fellowship
  - Annual Biomedical Research Conference for Minority Students
- A prospective member in your department or from a former workplace who’s interested in teaching
- A graduate student interested in ASM student professional development opportunities
  - ASM Science Teaching Career Program
  - ASM Kadner Institute in Preparation for Careers in Microbiology
  - ASM Scientific Writing and Publishing Institute

LEAD – Every member a mentor; every CUE attendee a leader
- Encourage and support colleagues to participate in ASM Education
- Sponsor a brown bag lunch for graduate students, fellows and faculty on best educational practices
- Sponsor a career day, research symposium and ASM student chapter for students
- Sponsor a session and represent ASM at a biology teacher and/or student meeting
- Sponsor education topics at science meetings, blending science and education
  - ASM regional branch meetings
  - Scientific conferences
  - Annual Biomedical Research Conference for Minority Students (ABRCMS)
  - asm2014 in Boston, Massachusetts
- Build a collaborative team of diverse expertise and resources such as undergraduate educators (pedagogy and students) and scientific researchers (science, trainees, facilities and equipment)
  - ASM/NSF Leader Inspiring Networks and Knowledge (ASM LINK)
  - ASM/NSF Biology Scholars Program
  - ASM Undergraduate and Graduate Research Fellowships

SHOW APPRECIATION
- Have coffee with your dean and show appreciating of his/her support in ASMCUE and education reform
- Be certain to describe best ideas, plans to incorporate new thinking, and lead colleagues and students

Contact education@asmusa.org for more information
### Aligning ASMCUE Abstracts to Biological Concepts

The 2013 abstracts are organized by both content and pedagogy to help participants navigate more easily through the poster session. The content themes are based upon the ASM Recommended Curriculum Guidelines for Undergraduate Microbiology Education (www.asm.org/educators). The guidelines identify six overarching concepts, which provide a framework for 22 key microbiological topics, and two key skills and are based on concepts put forth in the 2011 national report, Vision and Change in Undergraduate Biology: A Call to Action. The ASM concepts and topics were selected to promote deep understanding of core concepts that are deemed to be of lasting importance beyond the classroom. Likewise, students’ development of competency in the selected skills will have enduring and lasting value beyond both the classroom and laboratories.

In May 2012, a Perspectives article published in the Journal of Microbiology & Biology Education (JMBE) entitled, “The Development of Curricular Guidelines for Introductory Microbiology that Focus on Understanding,” described the consensus-building process around the new, concept-based curriculum for Introductory Microbiology courses.

For the purposes of ASMCUE, a seventh concept, advancing STEM education and research has been added to the abstract in order to identify authors working in this broader-scoped area. The pedagogy themes are organized into five categories: course design, hands-on projects, student learning, teaching approaches, and teaching tools. Each abstract is assigned to both content and pedagogy themes. These assignments, designated by the submitting author, are placed below the full abstract.

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# Microbrew Abstract

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- Neuroscience - 188 (10.4%)
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- Microbiology - 179 (9.9%)
- Immunology - 81 (4.4%)
- Developmental Biology and Genetics - 183 (9.9%)
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Elizabeth A.B. Emmert and the ASM Task Committee on Laboratory Biosafety

Curriculum Section
An Undergraduate Laboratory Activity Demonstrating Bacteriophage Specificity
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- Influenza Virus Entry into a Cell
- Influenza Virus Replication
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