Association of College & University Biology Educators

56th Annual Meeting – October 19-20, 2012

# "Active Learning and How to Assess for It"

Hosted by

LAKELAND COLLEGE

# ACUBE 56th Annual Meeting – Program Overview

Thursday October 18th

| | |
|---|---|
| 5:00-7:00 p.m. | Steering Committee Meeting (Laun 210) |

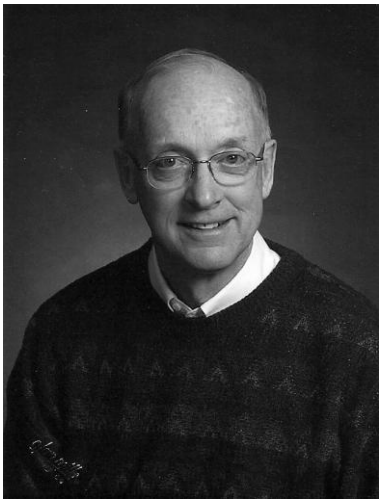
Friday October 19th

| | |
|---|---|
| 7:00-8:30 a.m. | Registration (Coffee, Juice and Danish)-Sponsored by 3D Molecular Designs |
| 8:30-9:50 a.m. | Opening Session and Invited Speaker **Ethel Stanley** |
| 10:00-10:20 a.m. | ACUBE Website Presentation: ACUBE's Latest Website Development: The Members Only Portal |
| 10:30-10:55 a.m. | Session 1 (25 minute presentations) |
| 11:00 am -12:20 pm | Session 2 (80 minute workshops) |
| 12:20-1:20 pm | Luncheon<br>BioScene Editorial Board Meeting |
| 1:30-2:20 p.m. | Session 3 (50 minute roundtables/presentations) |
| 2:30-3:50 p.m. | Session 4 (80 minute workshops) |
| 5:00-6:00 p.m. | Poster Session and Social Hour (Cash Bar) |
| 6:00-8:00 p.m. | Dinner and Awards |

Saturday October 20th

| | |
|---|---|
| 8:00 a.m.-12:00 p.m. | Field trips |
| 12:00-1:00 a.m. | Luncheon and Business Meeting |
| 1:00-1:25 p.m. | Session 5 (25 minute presentations) |
| 1:35-2:00 p.m. | Session 6 (25 minute presentations) |
| 2:00-3:30 p.m. | Steering Committee Meeting |

# ACUBE's 56th Annual Meeting Dedicated to Dr. Neil Baird



Neil Baird joined ACUBE in the early seventies soon after he began teaching at Millikin University in Decatur, Illinois. He enjoyed being a member of ACUBE because of our emphasis on teaching. He served as program chairman in 1982 and president in 1984, and in 2000 he was given an honorary life membership. He seldom missed an annual meeting during his teaching career and gave many presentations during the 30 plus years he was a member of ACUBE.

Neil received his undergraduate degree from Millikin University in 1965, and his Ph.D. from the Anatomy Department of the University of Minnesota Medical School in 1971. In 1970 he returned to Millikin to teach in the Biology Department where he taught for 35 years until his retirement in 2005. He taught mainly pre-med courses (comparative anatomy, histology, developmental anatomy, and neuroanatomy) in addition to some introductory biology courses. He was always proud of his many students who went on to work in various medical fields, and he was always pleased to hear later that Millikin had prepared these students very well for their professional schools. When Neil's death was announced in the Millikin Quarterly, they also published a letter from one of Neil's former students, Jennifer Ross Wolff, who now teaches in the Biology Department at Carleton College in Northfield MN. Her letter that follows was a wonderful tribute to Neil.

> *"Dr. Baird is one of my professors who has crossed my mind often since leaving Millikin. I have ended up following a path not so different from Dr. Baird's – like his, my Ph.D. is from the University of Minnesota, and I used to walk past the old anatomy department from which he received his Ph.D. on my way to class. Also like Dr. Baird, I teach developmental biology at a small liberal arts college.*
>
> *The only undergraduate notebook that gets pulled off my shelf year after year is the one that has my notes from Dr. Baird's developmental anatomy course. It's getting a little faded and dog-eared, but it's still full of FANTASTIC information and diagrams. Dr. Baird taught this course without a textbook but managed to paint an incredibly vivid picture of how an embryo develops from a single cell to a complex, thinking, living organism. His course was rigorous and detailed, and I found myself thankful that I had learned embryonic anatomy well under his patient guidance.*

*The descriptions and diagrams I took away from Dr. Baird's class are the same ones that I draw for my students today – I really haven't found any better. In some ways, my students' excitement about seeing life unfold follows directly from my excitement about what I learned in Dr. Baird's clear, well-taught and enthusiastically delivered lectures. I feel like I can draw a direct line from Dr. Baird to my students who are now in developmental biology graduate school – they are in some ways his "academic grandchildren," I suppose.*

*More important than the science I learned at Millikin, though, was what I learned about how to be a professor who takes time to get to know each student as an individual. I am extremely fortunate to have had several such dedicated and caring professors, and Dr. Baird certainly exemplifies this. He was always willing to listen and talk to his students about courses, graduate school, what it was like to be a professor, or any common interest--he was just a really thoughtful, kind man. I am lucky to have been his student."*

Jennifer Ross Wolff '95, Ph.D.
Assistant Professor of Biology
Carleton College

One of Neil's interests throughout his career and even into retirement was helping students and the general public understand what a scientific theory really is and how the theory of evolution does not necessarily have to conflict with their religious belief.

Neil was diagnosed with carcinoid cancer (neuroendocrine tumors) in 1996. For 15 years until spring of 2011, he was in excellent health. He and Norm Jensen used to bike 30 or 40 miles after they retired. Although he had been sick for several months, his sudden death was probably due to a pulmonary embolism. No autopsy was performed because, always the anatomy professor, he had donated his body to a Chicago medical school. As a graduate student, he had taken gross anatomy and then as a graduate teaching assistant, he had taught gross anatomy labs. He always said that med students greatly preferred thinner cadavers.

# Lakeland College

Lakeland College is a liberal arts college related to the United Church of Christ. It is committed to educating men and women of diverse backgrounds enabling them to earn a living, to make ethical decisions, and to lead purposeful and fulfilling lives distinguished by intellectual, moral and spiritual growth.

Lakeland traces its beginnings to German immigrants who, fleeing from religious controversy in Europe, traveled to North America and eventually to the Sheboygan area where they settled in 1847. Even as they struggled for food and shelter, these pioneers thought in terms of higher education for their children.

In 1862, they built Missionshaus (Mission House), a combined academy-college-seminary. The school provided training in the liberal arts followed by a traditional seminary curriculum, as most of the early students were destined to become ministers. As the needs of its students changed, Mission House gradually broadened its purpose. By the end of the century, enrollment was no longer limited to pre-theological students and the college had developed strong programs of study in a wider number of disciplines. A talented, scholarly faculty set high standards for the college early in its existence; standards which have been maintained to this day. Known simply as Mission House for 95 years, the college adopted the name Lakeland in 1956 and the seminary moved to Minneapolis/St. Paul in 1962 to become United Theological Seminary of the Twin Cities. The era of Mission House had ended, but Lakeland became heir to its campus, tradition and educational mission.

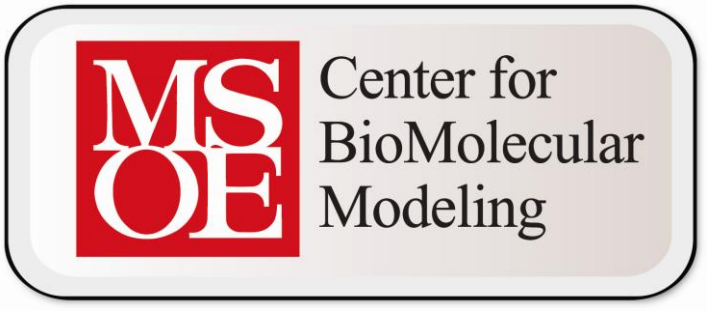
# Dr. Ethel Stanley

Ethel is actively committed to biology education in which learners pose problems, develop and use interdisciplinary approaches to solve problems, and engage in peer review of their own and others' products. She believes that students must be more than consumers of silo-based biology and that we have a responsibility to recognize that 21st century learners need to navigate knowledge in a highly networked and global society.

Ethel 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.

Ethel has also worked as director of the BioQUEST Curriculum Consortium, past president of ACUBE, past editor of the BioScene: Journal of College Biology Teaching, past chair of the BSA Teaching Section, and a consultant on numerous undergraduate NSF and HHMI projects.

ACUBE wants to thank

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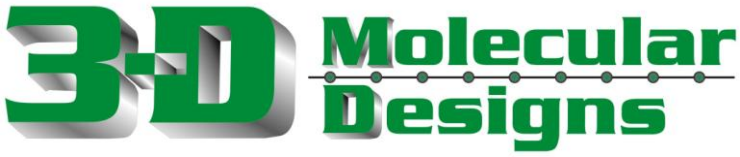


For sponsoring our coffee hour

# ACUBE Governance 2012

Board Members:

President, Tara Maginnis, *University of Portland*
past-President, Laura Salem, *Rockhurst University*
Executive Secretary of Finance, Greg Smith, *Lakeland College*
Executive Secretary of Membership, Christina Wills, Rockhurst University
Secretary, Aggy Vanderpool,
Local Arrangements Chair, Greg Smith, Lakeland College
Program Chair, Debbie Meuler, *Cardinal Stritch University*
Editor of BioScene, Jim Clack, *Indiana University-Purdue University*

Steering Committee Members:

Melissa Daggett, *Missouri Western State University*
Cori Fata-Hartley, *Michigan State University*
Chiron Graves, *Eastern Michigan University*
Paul Pickhardt, *Lakeland College*
Karen Sirum, *Bowling Green State University*
Kristen Walton, *Missouri Western State University*

## ACUBE Mission Statement

The Association of College and University Biology Educators (ACUBE) focuses on undergraduate and graduate biology education. Members of ACUBE share their ideas, concerns, and course innovations; present their work at the annual meeting; publish their work in Bioscene, our peer-reviewed journal; and participate in the friendly collegiality of the organization.

The objectives of ACUBE are to:

1) Further the teaching of the biological sciences at the college and other levels of educational experience.
2) Bring to light common problems involving biological curricula at the college level and by the free interchange of ideas; endeavor to resolve these problems.
3) Encourage active participation in biological research by teachers and students in the belief that such participation is an invaluable adjunct to effective teaching.
4) Create a voice that will be effective in bringing the collective views of the college and university teachers of the biological sciences to the attention of college and civil government administrations.

# ACUBE 56th Annual Meeting

**Lakeland College – Sheboygan, WI**

## Thursday, Oct. 18th

5:00-7:00 Steering Committee Meeting **Laun 210**

## Friday, Oct. 19th

7:00 – 8:30 a.m. **Registration – Laun Center Lobby**
Coffee, Juice and Danish – Sponsored by 3D Molecular Designs
Registration will remain open all day

**8:30 – 9:50 OPENING SESSION** **Laun 209**

Welcome to our 56th Annual Meeting: ACUBE President Tara Maginnis, University of Portland
Welcome to Lakeland College: Dr. Michael A. Grandillo, President of Lakeland College
Greetings from Conference Chairpersons:
Local Arrangements Chair: Greg Smith, *Lakeland College*
Program Chair: Debbie Meuler, *Cardinal Stritch University*
BioScene Editor: Jim Clack, *Indiana University-Purdue University*

Invited Speaker: **Ethel Stanley, Senior Consultant BioQUEST Consortium**

Navigating Science in a Networked and Global Society: Active Learning for 21st Century Science

9:50 – 10:00 Break -- Sponsored by 3D Molecular Designs

**10:00– 10:20 Presentation (20 min)** **Laun 209**

**ACUBE's Latest Website Development: The Members Only Portal**
Tara Maginnis, *University of Portland*

**10:30– 10:55 SESSION 1 (25 min presentations)** **Laun Center**

- **What Do Students Really Want in the Classroom?** Laun 210
  Kathryn E. Lowrey, *Jefferson Community and Technical College* **Estimating**
- **Weaving a Thread: Changing Curriculum for 21st Century Biology**
  Carol Maillet and Conrad Toepfer – *Brescia University* Laun 228
- **Assessing for Multimodal Learning Using an Interactive Molecular Biology Website**
  Catherine L. Dornfield, *UW-Milwaukee*
  Steven Forst, *UW-Milwaukee* Laun 129
  Marvin H. O'Neal III, *Stony Brook University*
  Mark Hoelzer, *Milwaukee School of Engineering*
- **Project Based Courses**
  Daniel Meer, *Cardinal Stritch University* Laun 110

| 11:00-12:20 **SESSION 2** (80 minute workshops) | **Laun Center** |
|---|---|
| • **Investigative Case-Based Learning: Data Analysis and Visualization**<br>Kristin Jenkins, *Director of BioQUEST*<br>Ethel Stanley, *Senior Consultant BioQUEST Consortium* | Laun 129 |
| • **Why Do My Students Do That?**<br>Conrad Toepfer, *Brescia University*<br>Sibyl Bucheli, *Sam Houston State University* | Laun 110 |
| • **Genetics for All Seasons: An Active Learning Experience that Reinforces Mendelian Genetics and Forces Students to Think Like a Scientist.**<br>Debbie Meuler, *Cardinal Stritch University* | Laun 228 |
| 12:20 – 1:20 **LUNCHEON** | **Laun 209** |
| Call for Nominations: Three Steering Committee Positions and President-Elect<br>**"Out of This World"** Teaching Idea Contributions<br>BioScene Editorial Board Meeting | TBD |
| 1:30 – 2:20 **SESSION 3 (50 minute Roundtables/Presentation** | **Laun Center** |
| • **High School Student Participation in Regional, State and International Science Fairs: Where are we now? Where are we going?**<br>Robert Yost, *Indiana University-Purdue University Indianapolis*<br>Jim Clack, *Indiana University-Purdue University Indianapolis* | Laun 228 |
| • **Assessment of Learning and Retention in a First Year General Biology Sequence**<br>Lisa Felzien, *Rockhurst University*<br>Christina Wills, *Rockhurst University*<br>Elizabeth Evans, *Rockhurst University*<br>Chad Scholes, *Rockhurst University* | Laun 110 |
| • **Student Designed Labs in Human Physiology: Another Look**<br>Tom Davis, *Loras College* | Laun 210 |
| 2:20-2:30 Break | |
| 2:30– 3:50 **SESSION 4 (80 minute workshops)** | **Laun Center** |
| • **Tactile Teaching Tools-Making the Molecular World Real to Students Through Hands-On Explorations**<br>Margaret Franzen, *Milwaukee School of Engineering* | Laun 110 |
| • **Case It Workshop: Integrating Molecular Biology Computer Simulations and Bioinformatics into Case-Based Learning**<br>Mark Bergland, *University of Wisconsin-River Falls*<br>Karen Klyczek, *University of Wisconsin-River Falls* | Laun 129 |
| • **Laboratory Exercises for the Study of Photosynthesis**<br>Janice Bonner, *Notre Dame of Maryland University* | Chase Science 102 |

4:00 –5:00 Break and Poster Set-up at the Spaceport Sheboygan

5:00 – 6:00 **POSTER SESSION & SOCIAL HOUR** (Cash Bar –**Spaceport Sheboygan**)

POSTER TITLES & AUTHORS:

- **Teaching Undergraduates with Primary Literature**
  Rebecca S. Burton, *Alverno College*

- **Integration and Evaluation of Research in a Microbiology Lab – A Better Way to Effect Student Learning**
  Christine Bezotte, *Elmira College*

- **Annotation of Seven Fosmids from 2nd3L Control Region of *Drosopila erecta***
  Nighat Kokan, Sampson Boham, Adam Cosson, Ali Dobbe, Cassandra Kubricky, Danielle Ladzekpo, Roman Ramirez, and Sr. Lucia Wande, *Cardinal Stritch University*

- **Annotation of Seven Contigs from 3L Control Region of *Drosophila mojavensis***
  Nighat Kokan, Kwabea Agbley, Kayla Chapman, Bill Harrington, Marwan Ibrahem, Andre Kennedy, *Cardinal Stritch University*

- **Teaching Artful and Accurate Scientific Presentation Skills at the Undergraduate Level: A Multidisciplinary Approach**
  Andrew M. Petzold, *University of Minnesota Rochester*
  Marcia D. Nichols, *University of Minnesota Rochester*
  Robert L. Dunbar, *University of Minnesota Rochester*

- **Creating Mentoring Opportunities for Undergraduates within a Community of Science Research and Education: The CREST Program**
  Margaret Franzen, *Milwaukee School of Engineering*
  Michele Korb, *California State University*
  Tim Herman, *Milwaukee School of Engineering*

- **Developing Interactive Jmol Tutorials for Conceptually Difficult Topics**
  Nicole K. Fischer, *Mount Mary College*
  Colleen Conway, *Mount Mary College*
  Margaret Franzen, *Milwaukee School of Engineering*

- **Communicating Experimental Outcomes to Multiple Audiences –Preliminary Findings**
  Barbara Hass-Jacobus, *Indiana University-Purdue University Columbus*
  Katherine Wills, *Indiana University-Purdue University Columbus*

- **Factors Influencing Student Learning and Attitudes Towards Group Work**
  Karen Sirum, *Bowling Green State University*
  Alexis Majorczyk, *Bowling Green State University*

- **Assessing Gaps in Students' Science Reasoning Skills Using the Experimental Design and Analysis of Data Ability Tests (EDAT and ADAT)**
  Karen Sirum, *Bowling Green State University*
  Alexis Majorczyk, *Bowling Green State University*
  Alfred Andrews, *Bowling Green State University*

- **An Assessment of Student Learning in Traditional vs Online Hybrid Offerings of an Introductory Molecular and Cell Biology Course at a Regional State University**
  Melissa A. F. Daggett, *Missouri Western State University*

- **Teaching Observational Skills by Studying Natural and Social History in Australia**
  Lynn Gillie, *Elmira College*
  J. Charles Jacobson, *Elmira College*

- **Course Design and Outcomes for an Online Pathophysiology Course**
  Kristen L. W. Walton, *Missouri Western State University*

- **Cumulative Student Presentations as a Tool for Learning and Assessment**
  Susan C. Fontaine, *Elmira College*

- **Our First Year Experience with the Howard Hughes Medical Institute SEA-PHAGES Program: A New Paradigm in Undergraduate Biological Education and Research**
  Daniel Westholm and Anne Scherer, *The College of St. Scholastica*

**6:00-8:00 Dinner and Awards** **Spaceport Sheboygan**

Teaching Excellence Award – Presented by Kristen Walton

Out of this World Teaching Idea Winner – Presented by Paul Pickhardt

## Saturday, Oct. 20th

8:00 a.m. – 12:00 p.m. **Field Trips**

- **Kohler Andrae State** Park–Sand dunes and birding on the shores of Lake Michigan
- **Department of Public Health** –Tour the lab facility at the Milwaukee Department of Public Health with the Chief Molecular Scientist
- **Tilapia Farming (Univ. of Wisc. Sheboygan) and Wind Turbines (Lakeshore Technical College)** - Learn about sustainability initiatives on college campuses.
- **Ice Age Trail Center and Peat Bog Ecology**–Explore the unique geology and biology at the furthest advance of the last ice age.

12:00 – 1:00 **LUNCHEON & BUSINESS MEETING** **Laun 209**

Executive Secretary of Finance Report: Greg Smith, Lakeland College
BioScene Report: Jim Clack – Indiana University-Purdue University

**Presidential Remarks:** Tara Maginnis, University of Portland

Resolutions – Presented by Marya Czech

2013 Meeting (Our 57th) *Indiana University-Purdue University Indianapolis*
2013 Local Arrangements Chair: Jim Clack with an "Introduction to IUPUI"

1:00-1:25 Session 5 (25 minute presentations) **Laun Center**

- **Group Synchronization: The Evolutionary Significance of the Physiology and Behavior of Group Synchronization** Laun 228
  Emily Gaul, *DeVry University*
  Dianne Jedlicka, *The School of the Art Institute of Chicago, Columbia College Chicago, DeVry University*

- **While I Focused on the Forest/Tree Dilemma, My Students Were Looking at Lichens** Laun 210
  Conrad Toepfer, *Brescia University*

- **Estimating Population Sizes via Capture-Mark-Recapture Techniques to Actively Demonstrate Ecological Sampling** Laun 110
  Paul Pickhardt - *Lakeland College*

**Break 1:25-1:35**

**1:35-2:00 Session 6 (25 minute presentations)** **Laun Center**

- **Redesigning the Human Body Systems** Laun 228
  Abour H. Cherif, *DeVry University*
  Dianne M. Jedlicka, *DeVry University*
  William B. Phillips, *DeVry University*

- **Assessing Understanding of the Process of Evolution Reveals Gaps in Student Comprehension of the Connection with DNA** Laun 210
  Karen Sirum, *Bowling Green State University*
  Jill Jaksetic, *Bowling Green State University*

- **Sudden Student Certainty: Immediate Feedback Techniques in the Biology Classroom** Laun 110
  Sara Sheeley, *Upper Iowa University*
  Paulina Mena, *Central College*

# ABSTRACTS

(Organized according to session)

# KEYNOTE ADDRESS

## "Navigating Science in a Networked and Global Society: Active Learning for 21st Century Science"

Ethel Stanley, Senior Consultant BioQUEST Consortium

Preparing students to be scientifically literate citizens as well as to understand what it means to do science in the 21st century is challenging. Engaging our students in the classroom has become increasingly interdisciplinary, visual, quantitative, and global in terms of methodology, tools, and data. (NSF, 2008; NRC, 2009; AAAS, 2010; UNESCO, 2010; MOE, 2010) How are teaching strategies addressing active learning both here and abroad?

## "ACUBE's Latest Website Development – The Members Only Section"

Tara Maginnis, *University of Portland*

The ACUBE website welcomes a new addition: a member's only section. This session will showcase its features and demonstrate how members can use it to find and post teaching materials such as syllabi, lectures, labs, assignments, exams, etc. We hope that this new online component will serve as a useful resource for current members and aid in expanding our membership. In addition, we will provide links for all members to participate in our 2012-2013 annual survey. ACUBE and its governance exist to represent all its members, and with great feedback we can ensure concerted future directions.

## SESSION 1

### "What Do Students Really Want in the Classroom?"

Dr. Kathryn E. Lowrey, *Jefferson Community & Technical College*

Student diversity makes providing a meaningful classroom experience a challenge. What each student expects to encounter in the classroom is dependent on that student's past experience and preconceived notions. What the teacher expects from students may or may not fit those expectations. At a time when students are bombarded with constant entertainment, the teacher is faced with providing instructional services to an increasingly diverse student population, and with increased demands to demonstrate effective student learning.

But a surprising element reflects a difference in student expectations of activities in the classroom. Students equate in-class assignments with high school. As we are encouraged to have more engaging classrooms and more interaction between students and between students and the instructor, students ask for less engagement and a return to the stereotypical lecture-only classroom experience.

### "Weaving a Thread: Changing Curriculum for 21st Century Biology"

Carol Maillet and Conrad Toepfer, *Brescia University*

The increasingly rapid pace at which data and knowledge are being generated in biology has put further strains on our teaching. In addition, the complexity of many issues in biology is often greater than can easily be handled by biologists specialized in one area. In response to these challenges and several recent calls for reforming biology education (e.g., Vision and Change, HHMI, PCAST), we developed a curricular "thread" crossing multiple courses within the major at Brescia University. Within individual courses, the thread is examined in terms of basic content and in addressing potential misconceptions. All courses are then brought together near the end of each semester to share information, and students write a reflective paper in the fall term and, in the spring term, apply content from the year to a novel situation. In this presentation, we will present some of the successes and failures of the first year of the thread, along with our plans for the second year. We also hope to have some discussion about modifications at our school and how similar approaches may be used at other institutions.

### "Assessing for Multimodal Learning Using an Interactive Molecular Biology Website"

Catherine L. Dornfeld and Steven Forst, *UW-Milwaukee*
Marvin H. O'Neal III, *Stony Brook University*
Mark Hoelzer, *Milwaukee School of Engineering*

The Proteopedia entry "Beta-Prime Subunit of Bacterial RNA Polymerase" is an educational website designed to aid advanced biology students in understanding the mechanisms of nucleotide addition and translocation occurring during transcription in RNA polymerase. The Web page features narrated videos with physical models, an interactive tutorial, and a morph animation in addition to explanatory text. Specific learning objectives are given to guide students through key concepts. The main objective is to enhance students' understanding of physical positioning of crucial structures and nucleic acid in the protein complex. To assess the educational objectives of the Web page, the Proteopedia page was used as a voluntary supplemental activity in a lecture-only upper level biochemistry course at a large university in New York. The non-participants in the class served as the control group. The cohort in activity scored significantly higher on subsequent exams than the control group. This intervention will be repeated to determine if the effect is consistent and why the effect occurs. The initial results suggest that consideration of student accessibility, adaptation to multiple learning styles, and outlining educational objectives may benefit students.

### "Project Based Courses"

Daniel Meer, *Cardinal Stritch University*

What are we training are students to do? Write an essay? Take a multiple choice exam? Solve problems?
I'll take choice C – Solve problems. No matter the discipline, once you jumped through the hoops, there are no more "tests" to take. The true question is can you solve the day to day problems in your field. So why not cut to the chase and give your students a big problem to tackle? Design your course to cover multiple "tools" that give you a piece of the puzzle to solve this big problem. This approach allows students to dig in and still cover essential "tools" you would normally cover in your course. It works for BL209-DNA Technology and I am currently using it in my first year experience course – Show Me the Data. DNA Technology is a lab course that focuses on manipulation of genetic material. The goal is to generate a genetically-modified organism. It begins with bioinformatics and ends with microinjection. Along the way students pick up a lot of techniques common to biotechnology, but it is a directed to a common goal. Students are engaged and can't wait to get to the next step, how often does this problem occur in your class?

## SESSION 2

### "Investigative Case-Based Learning: Data Analysis and Visualization"

Kristin Jenkins, *Director of BioQUEST*
Ethel Stanley, *Senior Consultant BioQUEST Consortium*

Cases can provide entry points for biological issues such as global health, energy choices, and agribusiness. Students share their prior knowledge and experience, then collaboratively generate questions they need to answer in order to further understand the case. Join us as we explore global issues using simulations, online data and data visualization.

### "Why Do My Students Do That?"

Conrad Toepfer, *Brescia University*
Sibyl Bucheli, *Sam Houston State University*

How many times have you designed the perfect active learning exercise only to have students not respond the way you planned? The problem may be that your way of thinking is dramatically different from the way your students are thinking. Join us in this workshop as we explore how concepts from cognitive psychology and neurobiology apply to what we do in our classrooms. We will address concepts such as chunking, interleaving vs. blocking, novice vs. expert learning, and fixed vs. growth mindsets. We will leave time at the end to discuss strategies that we can all use in our classes.

### "Genetics for All Seasons: An Active Learning Experience that Reinforces Mendelian Genetics and Forces Students to Think Like a Scientist"

Debbie Meuler, *Cardinal Stritch University*

For this activity students are asked to establish the pattern of inheritance of several traits from the F2 generation of a population of pumpkin people. Pumpkin people (or egg people if the activity is done in the spring) are miniature pumpkins with a face drawn on them. The various characteristics of the face follow one of the following inheritance patterns – dominant, recessive, codominance, incomplete dominance, X-linked, or epistasis. During this workshop we will go through the activity including how students are assessed for understanding and discuss why students can find this activity frustrating.

## SESSION 3

### "High School Student Participation in Regional, State and International Science Fairs: Where are we now? Where are we going?"

Robert Yost and James W. Clack, *Indiana University-Purdue University Indianapolis*

Student engagement through research is an ongoing mission of higher education. Getting students involved in active inquiry during the middle and high school years is an excellent way to feed the pipeline. However, as experienced teachers reach retirement age, schools are tending to move away from science fairs as an inquiry model in favor of covering the standards needed to pass mandated achievement tests. What can be done to stimulate student participation in science fairs and science expositions in order to reverse this trend?

### "Assessment of Learning and Retention in a First Year General Biology Sequence"

Lisa Felzien, Christina Wills, Elizabeth Evans and Chad Scholes, *Rockhurst University*

Introductory biology courses pose many challenges, including a broad spectrum of student preparation, larger class sizes, and broad content and skills goals. The learning achieved in these foundation courses is critical for upper level classes, and thus assessment of both learning and retention is essential. In this work, we developed a simple assessment approach to compare basic incoming knowledge, knowledge gained in our first semester of general biology (Biology I), and knowledge retained or enhanced through our second semester of general biology (Biology II). This plan was built upon an existing pre-test given to all students at the beginning of Biology I. Pre-test questions were used again on the Biology I final exam, on a quiz at the beginning of Biology II, and on the Biology II final exam. Questions asked related directly to content in Biology I and were important background for the content in Biology II. We analyzed averages of student performance on these questions for 3 years and found consistent increases in knowledge in Biology I and varied performance on the pre-test at the start of Biology II. Performance on the post-test in Biology II was similar to that observed on the Biology II pre-test. Tracking of individual student progress is allowing us to begin to identify factors that affect retention of material from Biology I.

### "Student Designed Labs in Human Physiology: Another Look"

Tom Davis, *Loras College*

Student, self designed labs in the majors Physiology course at Loras College have been used successfully for over 15 years. I would like to share with the group the procedures and equipment that are used by student groups to design, collect data and present their results on Muscle, Cardiovascular and Respiratory physiology subject matter. Ultimately, students enjoy executing their own lab designs, are able to solve problems more effectively, take greater ownership of their results and conclusions and, not only learn applied physiology themselves, but also teach the rest of the class about their group's physiological results.

SESSION 4

## "Tactile Teaching Tools – Making the Molecular World Real to Students Through Hands-On Explorations"

Margaret Franzen *Milwaukee School of Engineering*

Students often struggle with concepts related to the invisible molecular world because they can't interact directly with molecules. This workshop will utilize student-centered interactive models that bridge the gap between the macro and molecular worlds. Using magnetized plastic water molecules, participants will explore properties of water and polar and non-polar interactions. We'll build on these concepts to demonstrate how proteins fold in the watery environment of the cell, using a kit with plastic sidechains attached to a foam-covered wire protein backbone. We'll highlight additional topics that may be explored with these models. Then, because the order of amino acids in a protein is determined by the nucleotide sequence in DNA, we'll use models to construct a double helix, much in the way Watson and Crick developed the first DNA structure. We'll explore the beta globin gene using a paper bioinformatics activity in which participants can explore reading frames, introns and promoter sequences. We'll conclude by describing the NSF-funded CREST (Connecting Researchers, Educators and Students) Program for involving undergraduates in a meaningful community of science centered on constructing accurate protein models for research and education. All materials used in the workshop are available for free loan through the MSOE Model Lending Library.

## "Case It Workshop: Integrating Molecular Biology Computer Simulations and Bioinformatics into Case-Based Learning"

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

Case It! is a project to provide molecular biology computer simulations and associated cases at no cost to educators. CaseIt 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. It is used by students to analyze cases based primarily on infectious and genetic diseases, but can also be used as a tool to study original research questions. In this session, participants will get hands on experience with using Case It v6.06 to analyze existing cases as well as learn how to create their own case scenarios using information from the literature and sequences from online repositories such as GenBank. Strategies for using Case It materials in the classroom, as well as assessing the effectiveness of using these materials to enhance students' understanding of molecular biology, will be discussed. The simulation software and cases, video tutorials, publications, and forums are available at http://www.caseitproject.org

## "Laboratory Exercises for the Study of Photosynthesis"

Janice Bonner; *Notre Dame of Maryland University*

Photosynthesis is arguably one of the most important biological pathways. It is surprising, therefore, that there are not many reliable laboratory exercises that can be used to study the process. This workshop will demonstrate three different activities that can be used to study photosynthesis. The first is an adaptation of the floating leaf disk assay, originally presented in American Biology Teacher in 1988, that addresses many of the challenges that made that protocol problematic. It is amenable to various adaptations that could be the basis for independent student exploration. The second activity is a statistical analysis of the depth of lobing and stomatal density of leaves from the top and bottom of an oak tree (Quercus alba) and a development of the relationship between these variables and the positioning of the leaves on the whole tree to maximize photosynthesis. The third activity is an analysis of a journal article (Van Der Burgh, Visscher, Dilcher, & Kurschner, 1993) that explains how the number of stomata on fossil Quercus leaves was used to predict the CO2 composition of the Neogene paleoatmosphere. These three activities could be incorporated into an introductory biology course, a non-majors course, or an upper-level biology course.

## SESSION 5

### "Group Synchronization: The Evolutionary Significance of the Physiology and Behavior of Group Synchronization"

Emily Gaul and Dianne Jedlicka, *The School of the Art Institute of Chicago, Columbia College Chicago, DeVry University*

We designed a discussion and exercises to illustrate the importance of group behavior for survival and as an evolutionary advance. Physiologically, the neural stimulation may come from either visual or auditory cues. Mirror neurons may be involved. Perception of the cues is very important to the individual and therefore the species. The resultant behavior, whether it is moving away from a stimulus or a behavior such as yawning or howling, may be a group effect. This group behavior has some advantage which then ensures the survival of its members. After our scientific information is presented, a student worksheet using higher cognitive questions such as synthesis and evaluation is presented. Some preliminary student answers will be examined. Some preliminary data suggest that visual communication is stronger than an auditory stimulation. Student responses often show creative insights now referred to as "thinking outside the box"!

### "While I Focused on the Forest/Tree Dilemma, My Students Were Looking at Lichens"

Conrad Toepfer, *Brescia University*

As educators we have long struggled with the tradeoff between breadth and depth in our courses. Should we focus on maximizing content or on examining less content in more meaningful ways? Active learning methods have many benefits, but even the most effective techniques usually require sacrificing some content. In addition, when your course provides a foundation for other courses or for standardized professional exams, there is pressure to make sure you cover it all. Over the last few years, I have given varying levels of control of course content and delivery to students in four courses. While I recognized successes (and problems) in every course, I also have begun to notice valuable outcomes that I suspect would have been less likely to occur in my more traditionally structured courses. In this presentation, I will share the approach I have used in these courses and some of the good, bad, and totally unexpected outcomes.

### "Estimating Population Sizes via Capture-Mark-Recapture Techniques to Actively Demonstrate Ecological Sampling"

Paul C. Pickhardt, *Lakeland College*

Determining accurate population size estimates is an important goal for many applied ecological studies yet most undergraduate biology students are not familiar with the statistically based methods that produce such estimates. One such method for estimating total population size, based on sub-sampling within the total population is the capture-mark-recapture technique. This technique applies probabilistic sampling to produce good estimates of large populations and can be easily adapted to many classroom or laboratory settings. In this presentation attendees will see how desktop scale populations can be assembled easily and inexpensively to conduct mark and recapture studies. The necessary assumptions that must be met for the formula to work and options for expanding the techniques for ecologically sampling natural populations will be presented. How teachers can easily assess student success in performing these hands-on exercises will also be offered.

## SESSION 6

### "Re-designing the Human Body Systems"

Abour Cherif, Dianne Jedlicka, and Dr. William Phillips, *DeVry University*

The Human Body is a remarkable biological machine that is supported and maintained by well-structured and interdependent body systems and their organs. Evolution has worked on humans for hundreds of thousands of years, yet the current pace of technological and social change have exposed possible human frailties and this in turn raises the question of whether or not nature's work could be improved upon. In this learning activity the students study morphological and anatomical structures and the physiological functions of the human body systems and their respective organs and parts. Then the students select their own favorite system or organ to re-design in order to optimize the efficiency of the anatomical structural, physiological function, and/or the ecstatic and functional morphology. Through group work and interaction (student groups compete for an "in-house" very prestigious Patent Award), students actively

engage in the learning process to understand the role of design in the efficiency and functionality of the human body system, to retain the new information, and to apply what has been learned in different situations.

### "Assessing UNDERSTANDING of the Process of Evolution Reveals Gaps in Student Comprehension of the Connection with DNA"

Karen Sirum and Jill Jaksetic, *Bowling Green State University*

Most measures of evolutionary understanding have largely ignored the molecular components of evolution while concentrating primarily on natural selection. We hypothesize that these molecular understandings are integral to alleviating student misconceptions, to aiding overall understanding of evolution, and to acceptance. Without an understanding of the basic molecular mechanisms underlying evolution, how evolution occurs may be reduced to a "black box" in students' understanding, and because the contents inside of this "black box" may be unknown to students, they may view evolution as an idea that is to be believed or not believed instead of known. To test this idea, we have developed a strategy that is capable of assessing students' ability to explain evolutionary concepts that span from the DNA-level to the level of speciation. So far, our data reveal that there is a significant gap in student understanding regarding the connections between DNA, genes, and proteins and the roles they play in evolution. Additionally, alternative conceptions were significant among students with regard to the molecular concepts as well as natural selection. The data collected from this research will provide further information about how understanding of evolution may relate to acceptance.

### "Sudden Student Certainty: Immediate Feedback Techniques in the Biology Classroom"

Sara Sheeley, *Upper Iowa University*
Paulina Mena, *Central College*

Immediate feedback techniques can have a variety of benefits in the classroom: active learning, peer teaching, self-assessment, incentive for review of class material, attendance, etc. In addition, students enjoy and are very engaged while using these techniques. We will present on several techniques of immediate feedback we use in introductory and upper level biology classes, including clickers, IF-AT forms, Poll Everywhere and others. We will present the varied methods we use (and allow you to use them) in addition to reporting on student perception and some assessment.

## POSTER SESSION

### "Teaching Undergraduates with Primary Literature"

Rebecca S. Burton, *Alverno College*

Undergraduates can successfully learn animal behavior using primary, peer-reviewed articles. In addition, they learn many of the abilities they need in any field of science, such as critically reading technical papers, using scientific conventions, and discussing papers in a scholarly manner. Under-prepared students, those with learning differences, and English language learners may face additional challenges, but can be successful if we use effective strategies. Teaching the skill of reading primary literature, structuring the discussion, and building in individual accountability are some of these elements. This poster is intended to promote sharing of ideas; links to resources and an opportunity to add your own strategies will be included.

### "Integration and Evaluation of Research in a Microbiology Lab – A Better Way to Effect Student Learning."

Christine Bezotte, *Elmira College*

This laboratory component addresses the "detachment" students perceive between classroom learning and its application to "real-science." By incorporating the practical aspects of investigative research and analysis, the lab provides contextual relevance to understanding the science behind an observed effect. An active learning opportunity enhances problem solving and encourages critical thinking skills through evaluation of research applications and its resulting data. The goal of the project is to engage students in relevant contextual learning experiences; the idea is to allow them to demonstrate the knowledge they have acquired.

The labs are based on the concepts of exploring and evaluating presented cases in microbiology. The cases are designed to explore a problem or concept. Students are introduced to the evaluation of scientific primary literature and the design of experimental research. Student teams meet for "research meetings" to discuss methodology, problems, directions and

results. They must demonstrate the extra effort to understand the principles behind the experimentation to address the case. Students ask the question, then design, execute and analyze their results. The exercise encourages student integration of learned concepts in Microbiology in ways that have scientific significance. Observed results will be presented and discussed.

## "Annotation of Seven Fosmids from 2nd3L Control Region of *Drosophila erecta*"

Nighat P Kokan, Sampson Boham, Adam Cosson, Ali Dobbe, Cassandra Kubricky, Danielle Ladzekpo, Roman Ramirez, and Sr. Lucia Wande, *Cardinal Stritch University*

The Genomics Education Partnership (GEP) is a consortium of 80 institutions of higher learning across the US comprised of ~95 GEP faculty at Primarily Undergraduate Institutions (PUI). These institutions provide genomic research opportunities to undergraduate students. The students through collaborative genomic research projects learn evidence-based annotation to annotate genes in Drosophila species. Students take raw sequence data and annotate genes leading to analysis of euchromatin, heterochromatin and repeat density in genomes of several Drosophila species. The purpose of this study was to find and annotate genes on seven fosmids (~300 Kb raw DNA sequence) from *D. erecta*. The results indicated 24 of the 27 features predicted by GenScan to be actual genes. It was interesting to note that in another project of same size in *Drosophila mohavensis*, only 17 of the 47 features turned out to be actual genes. Further studies are needed to corroborate these findings. During the process students learned the biology of genes, gene structure, the use bioinformatic tools and databases as part of BL 308 Genetics Course. Students find these projects to be challenging yet rewarding with the knowledge that they are adding genomic research data to biological databases and student scientist collaboration.

## "Annotation of Seven Contigs from 3L Control Region of *Drosophila mojavensis*"

Nighat P Kokan, Kwabea Agbley, Kayla Chapman, Bill Harrington, Marwan Ibrahem, and Andre Kennedy, *Cardinal Stritch University*

The Genomics Education Partnership (GEP) is a consortium of ~80 colleges in the US that provides genomic research opportunities for undergraduate students. The GEP faculty (95) from Primarily Undergraduate Institutions teach students evidence-based annotation on novel species of Drosophila using the reference sequence from *Drosophila melanogaster*. Bioinformatics tools and databases are used to find, identify and annotate genes in the DNA sequence of a new species. In this study, online bioinformatics databases and gene conservation evidence was utilized to identify and annotate the features predicted by GenScan in seven contigs (~300 Kb of DNA sequence) from the *Drosophila mojavensis* 3L control region. Our findings indicate that out of the seven contigs studied, GenScan predicted a total of 47 features ("genes"), though only 17 of those features were found to be actual genes. Three of the seven contigs did not contain any genes, and some features (contigs 47 and 48) showed a significant amount of overlap. A total of 17 genes and their isoforms were annotated as part of the BL308 Genetics Course. The annotation research projects allowed students to learn and become competent in evidence based annotation processes and develop a better understanding of bioinformatics tools and databases. These projects provide students with the opportunity to contribute real data towards collaborative student-scientist genome organization studies of Drosophila species.

## "Teaching Artful and Accurate Scientific Presentation Skills at the Undergraduate Level: A Multidisciplinary Approach"

Andrew M. Petzold, Marcia D. Nichols and Robert L. Dunbar, *University of Minnesota Rochester*

Dissemination of scientific knowledge is a skill tht is necessary for any undergraduate student within the sciences to acquire. Traditionally, this is accomplished through the instruction of scientific presentation or writing. Though important, this type of education ends to encourage students to focus on peer-to-peer communication, subsequently abandoning the dissemination of knowledge to a non-scientific audience. This has presented itself within traditional media, popular culture and education as an apprehension of science and scientific knowledge within the general populace and an aloof attitude within scientists. To that end, we have created a methodology to foster the ability of students within our Anatomy and Physiology two-semester series to discuss complex scientific ideas within non-scientific arenas. Specifically, to end the first semester, students expressed the breadth of their knowledge within an informal "cocktail party" discussion aimed at non-scientifically trained audience. To start the second semester, students reviewed material from the first semester through a creative-writing exposition. Within these experiences, students, in groups, were asked to describe physiological phenomena using non-traditional terminology while maintaining scientific accuracy. These activities successfully introduce

our students to the difficulties of communicating scientific knowledge to non-scientific audiences while allowing students to review knowledge gained throughout the courses.

## "Creating Mentoring Opportunities for Undergraduates within a Community of Science Research and Education: The CREST Program"

Margaret Franzen and Tim Herman, *Milwaukee School of Engineering*
Michele Korb, *California State University*

Connecting Researchers, Educators and Students (CREST) is an NSF-CCLI/TUES project in which students work closely with both researchers and educators to (i) explore a research topic to design an accurate physical model of a protein studied in the research lab and (ii) create innovative instructional materials related to the research topic. The project aims to measure the impact of these interactions both on student attitudes toward science and on the teaching practice of the participating faculty. The MSOE Center for BioMolecular Modeling (CBM) and seven diverse educational institutions, ranging from small liberal arts colleges to R1 research institutions, are partnering in this multi-faceted design-based research project. The physical models are based on atomic coordinates of solved structures, created by 3D printing technologies. These models, and accompanying resources (interactive Jmol tutorials, paper bioinformatics activities, molecular animations and cellular landscapes), serve as tools for student-centered hands-on learning, not only of protein structure-function relationships, but also for understanding the process of science – how we know what we know about these molecules.

## "Developing Interactive Jmol Tutorials for Conceptually Difficult Topics"

Nicole K. Fischer and Colleen Conway, *Mount Mary College*
Margaret Franzen, *Milwaukee School of Engineering*

Interactive Jmol tutorials were developed to improve student comprehension of molecular interactions that require mental models naïve learners often lack. Textbook images are two-dimensional, despite attempting to depict three-dimensional molecules. PowerPoint animations use spinning molecules, but are confusing; naïve learners often can't identify which part of the molecule the expert instructor is discussing. These tutorials allow the user to explore proteins at their own pace, and focus attention on specific portions of the protein using flashing segments, color, and size changes. The Jmol tutorials were targeted to address traditionally difficult topics for students. An undergraduate educator developed the learning objectives and text for the tutorial, and an undergraduate student created the Jmol scripts. Templates and training were provided by the MSOE Center for BioMolecular Modeling. The tutorial was piloted in an organic/biochemistry course for allied health majors. The tutorial was developed as part of the CREST Program (Connecting Researchers, Educators, and Students), an NSF-CCLI funded initiative creating meaningful scientific interactions among researchers, educators and undergraduate students based on construction of physical models of proteins currently studied in the research lab.

## "Communicating Experimental Outcomes to Multiple Audiences – Preliminary Findings"

Barbara Hass-Jacobus & Katherine Wills, *Indiana University-Purdue University Columbus*

The majority of studies in "writing biology" research involve teaching students how to write technical research reports to communicate their results to a scientific audience. On the other hand, multiple articles have been written in both popular and scientific sources outlining a need for scientists to communicate better with non-scientist audiences. In many institutions, students are required to take one or two semesters of English, with the assumption that students will successfully gain the necessary "writing for non-scientist" skills from these courses. However the emphasis in these courses tends to be in areas such as literature critiques, far removed from the scientific topics and writing skills that need to be addressed for biologists to successfully communicate with non-scientist audiences. Here we discuss the results of a preliminary study completed as a first step in addressing the question, "Does teaching students to write for both scientists and non-scientists within a biology course improve either their technical or non-technical writing skills?"

## "Factors Influencing Student Learning and Attitudes Towards Group Work"

Karen Sirum and Alexis Majorczyk, *Bowling Green State University*

Improving student learning involves creating environments in which students are using course material to solve problems by working with each other. However, there are many considerations that are not well understood when it comes to team dynamics and the impact of situational as well as student developmental factors. For example, what is the relationship between satisfaction with their group, student learning, and student attitudes towards biology? To begin to answer this question, two different strategies for implementing teamwork in the large, introductory, non-majors biology classroom

were compared. The main way the two approaches varied was in how "points" towards the course grade were earned: one placed greater emphasis on grading group work (extrinsic motivation), while the second approach placed a greater emphasis on intrinsic motivation in that an individual's grade was not dependent on the quality of work turned in by the groups. We compared these two approaches in terms of the impact on individual student learning, students' subjective description of "how good" their team was (team dynamics), and student satisfaction with the team experience. Our findings suggest that some student discontent with group work may be a positive indicator of a learning environment that is promoting student cognitive development.

## "Assessing Gaps in Students' Science Reasoning Skills Using the Experimental Design and Analysis of Data Ability Tests (EDAT and ADAT)"

Karen Sirum, Alexis Majorczyk, and Alfred Andrews, *Bowling Green State University*

The Experimental Design Ability Test (EDAT) is an open-ended prompt used to reveal students' ability to design a simple experiment to test a product claim (Sirum and Humburg, 2011). Student responses are scored by looking for the presence or absence of ten basic elements of experimental design. We have recently expanded the scoring rubric of the EDAT to describe the different ways an expert might include these basic experimental design elements versus a novice's approach. The ADAT is a new open-ended response instrument designed to minimize the threshold requirement for quantitative and visual literacy skills, while specifically assessing reasoning with data. These instruments have been used to assess both non majors and biology majors at all levels, and analysis of student responses reveals surprising and widespread gaps in fundamental science thinking skills, especially controlling variables. Understanding of the concept of controlling variables is connected to student cognitive development and to student understanding of the limitations and uncertainty in science. Using these diagnostic instruments will provide insight into students' science reasoning learning needs and allow instruction to be targeted to specific gaps in understanding and skills.

## "An Assessment of Student Learning in Traditional vs. On-line Hybrid Offerings of an Introductory Molecular and Cell Biology Course at a Regional State University.

Melissa A. F. Daggett, *Missouri Western State University*

Many faculty are under increasing pressure to provide students with alternatives to the traditional course format by offering more of their courses on-line. One concern for biology faculty is whether on-line introductory courses prepare students for further upper level courses. During the past spring and summer semesters, students enrolled in a traditional introductory molecular and cell biology course for majors at a regional state institution have been assessed and compared with students enrolled in the same class offered as a on-line hybrid. This on-line hybrid course did not include the posting of faculty presented lectures, but did require students to read the text and complete on-line assessments and tutorials. Results from pre- and post-course testing using a validated diagnostic assessment administered in a proctored testing setting, indicate that there was no significant difference in the mean learning gains of the important concepts as reported in previous studies. This research does not address all the concerns faculty have in moving away from traditional course formats, but does suggest that students are able to acquire important conceptual understanding in an on-line format that does not include faculty lectures.

## "Teaching Observation Skills by Studying Natural and Social History in Australia."

Lynn Gillie and J. Charles Jacobson, Elmira College

Students can learn observation skills by studying biology in non-science courses. Courses conducted abroad provide a unique way to appreciate the natural history of new areas and examine the world more closely. Natural and Social History of Eastern Australia is a course conducted abroad that grants credit for general and cultural distribution requirements, but does not fulfill the physical and life science requirement. Despite this credit designation, significant study of biology was part of the course. Students wrote daily journal entries in response to directed questions to encourage closer observation of their surroundings. Students compared different cities, habitats, people, plants, animals, and climate in four different states or territories. Desert, tropical rainforest, subtropical rainforest, temperate rainforest, and the Great Barrier reef were all studied. The itinerary, assignments, and outcomes will be discussed.

## "Course Design and Outcomes for an Online Pathophysiology Course"

Kristen L. W. Walton, Missouri Western State University

Pathophysiology at Missouri Western State University is a lecture-only course primarily serving pre-nursing majors. The course was offered online in summer 2011 and 2012. It was designed to parallel the face-to-face version as closely as possible. Video lectures, abbreviated versions of lecture slides, study guides, and other materials were posted online. Exams were given in a written, proctored format. Summer online course GPAs were similar to those from the course in traditional format (summer online course GPA = 2.47, n=60; versus the average GPA across four regular semester, traditional format course offerings = 2.61, n=319. Students in the online courses were surveyed about the online course design. Flexibility of schedule and the ability to re-watch video lectures were identified as positive aspects, while the most frequently cited negative aspect was less opportunity to interact with the instructor than in a traditional class. 71% of students responded that the online course was more challenging than a similar traditional-format course. Overall, the online course delivery was similar in effectiveness to the traditional format.

## "Cumulative Student Presentations as a Tool for Learning and Assessment"

Susan C. Fontaine, *Elmira College*

Students in introductory courses often fail to connect concepts learned throughout the semester. Instead, students learn only enough to pass the next exam. Cumulative finals and essays are helpful in assessing how well the student makes connection between ideas presented; however these methods do not usually allow direct instructor feedback. For a small class, such as my non-majors Introductory Microbiology, power point presentations by individual students, incorporating information covered throughout the semester, are ideal for assessing "big picture" understanding. Most of my students are nursing majors; to make the project relevant to them, I have each describe a human body system, the host defenses, normal flora, and six pathogens that affect that system. Not more than two pathogens may be from any one category (bacteria, virus, protozoa, fungi or helminth). This requires students to review and relate information and concepts from each chapter covered during the semester. I give each student immediate feedback, allowing them to correct mistakes and add missing information before passing in a final draft of their presentation. Student feedback has been positive. Importantly, this has allowed me to adjust my teaching style to facilitate student synthesis of course information and concepts.

## "Our First Year Experience with the Howard Hughes Medical Institute SEA-PHAGES Program: A New Paradigm in Undergraduate Biological Education and Research"

Daniel Westholm and Anne Scherer, *The College of St. Scholastica*

This past year The College of St. Scholastica participated in the SEA-PHAGES Program sponsored by the Howard Hughes Medical Institute (HHMI). This is a nationwide 2-semester course where students at all participating institutions characterize a novel mycobacteriophage (phage) that they isolate from their local environment. The HHMI SEA-PHAGES course offered at St. Scholastica, a primarily undergraduate institution with a focus on health science, was taught as a year-long elective sophomore level course. In the first semester, students isolated a phage from a soil sample, purified its genome and visualized their phage using electron microscopy. During the second semester, the genome of one of the isolated phages, Severus, was sequenced, and the students spent the remainder of the semester annotating and characterizing the genome. At the end of the year, one student attended a national conference and presented the class data. Our first year of the program was highly successful, as all students isolated phage and became proficient in bioinformatics during the annotation and characterization of the sequenced genome of Severus, a novel cluster A10 phage. Students identified 79 protein coding regions, along with 3 tRNAs in the genome of Severus and performed comparative genomics between Severus and other related phage. The course attracted our top students most of whom were pre-medical students (15/16). While grades, retention and engagement are not a concern for our first cohort of students, we did notice a discernible change in our students' attitude toward science and scientific research. We feel that it is especially important for our future doctors to learn how to read scientific literature and understand scientific methodologies especially since many medical schools have reduced their science/math requirements. Moving forward, we are continuing to track how the course affects student attitudes towards science, especially those who intend on pursuing a career as a physician.

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