Association of College & University Biology Educators

53rd Annual Meeting
October 9th – 10th, 2009
Program on

"Promoting Undergraduate Research"

Hosted by

ROCKHURST UNIVERSITY
LEARNING, LEADERSHIP AND SERVICE IN THE JESUIT TRADITION

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ACUBE 53rd Annual Meeting
Rockhurst University
Kansas City, Missouri
October 9th – 10th, 2009

Program

Thursday, Oct. 8th

5:00 – 7:00 Steering Committee meeting (Science Center)

Friday, Oct. 9th, 2009

7:00 – 8:30 a.m. **Registration** (1st Floor, Science Center)
Continental Breakfast Bar, Poster set –up
Registration will remain open during all sessions

8:30 - 10:00 AM **OPENING SESSION, Science Center, Room 115**

Welcome to ACUBE: ACUBE President Conrad Toepfer, *Brescia University*
Welcome to Rockhurst University: Dr. Tim McDonald, Interim Dean, College of Arts and Sciences
Greetings from Conference Chairpersons
Program Chair: Melissa A. F. Daggett, *Missouri Western State University*
Local Arrangements Chair: Laura Salem, *Rockhurst University*
Bioscene Editor: Stephen S. Daggett, *Avila University*
Keynote Address: Time and Money: Thoughts on sustaining undergraduate research in an economic down turn. Jeffrey Demarest, Ph.D., *Juniata College*

10:10 - 10:50 AM (40 min) **SESSION 1**

Development of a Comprehensive Research Requirement: The Doane College Experience. Room 125
Barbara Clement, Brad Elder, Kate Marley, Robert Muckel, Russell Souchek, Robert Wikel and Heather York. *Doane College, Crete, NE*

Navigating through Regulations for Using Animals in Undergraduate Research: Do You Need an IACUC? Part I Room 207
Elizabeth I. Evans, D.V.M. *Rockhurst University, Kansas City, MO*

Bringing Current Research Into the Classroom Room 302
Andrew Higginbotham. *Longview Community College, Lee's Summit, MO*

Interdisciplinary Research Programs for Undergraduate Students. (Roundtable) Room 306
Neval Erturk and Douglas Jensen. *Converse College, Spartanburg, SC*

11:00 – 12:20 **LUNCHEON (Fajita Bar) and FIRST BUSINESS MEETING (Massman Hall Gallery)**

First call for nominations
Out of This World Teaching Idea Contributions
Luncheon Presentation: Synthetic Biology: A New Opportunity for Multidisciplinary Undergraduate Research.
Todd Eckdahl. *Missouri Western State University, St. Joseph, MO*

12:30 – 1:10 PM (40 min) **SESSION 2**

Twenty Years of Undergraduate Research. Room 125
Paul Klawinski, Tara Allen, Scott Falke, Jennifer Moody-Weis and Wei Wu. *William Jewell College, Liberty, MO.*

Comparison of Student Participation and Comprehension in a Traditional In-class Human Biology Laboratory Course versus an Online Human Biology Laboratory Course. Room 207
Peggy J. Wright. *Columbia College, Columbia, MO*

Successful Student Projects: Pitfalls and Lifelines. (Roundtable) Room 302
Becky Burton. *Alverno College, Milwaukee, WI*

A Case for the Use of Technology in an Anatomy and Physiology Classroom. Room 306
Tom Rachow and Melissa Daggett. *Missouri Western State University, St. Joseph, MO*

1:15 – 1:55 PM (40min) **SESSION 3**

Semester-Long Research Projects for Non-Majors. Room 125
Janice Bonner.

Undergraduate Research: At What Cost Inquiry? (Roundtable) Room 207
James W. Clack. *Indiana Univ - Purdue Univ*

Incorporating Primary Literature into Upper- and Lower-Division Undergraduate Biology Courses. (Roundtable) Room 302
Kristen LW Walton. *Missouri Western State University, St. Joseph, MO*

Teaching and Measuring Rational Thinking in the Science Classroom. Room 306
Karen Sirum. *Bowling Green State University, Bowling Green, OH*

2:00 – 2:25 PM (25 min) **BREAK**

2:30 – 3:10 PM (40 min) **SESSION 4**

Using Case It! computer simulations to integrate molecular biology techniques and bioinformatics tools into case-based learning and open-ended research problems. (Computer workshop: continues into Session 5) Computer Lab 205
Mark Bergland and Karen Klyczek. *University of Wisconsin-River Falls, River Falls, WI*

Introductory Biology: What Works and What Doesn't. (Roundtable: continues into Session 5) Room 125
Tom Davis. *Loras College, Dubuque, IA*

Introducing BIO105: a twenty-five year perspective on content, process and engagement in an introductory biology class for majors. Room 207

Dave Ashley. *Missouri Western State University, St. Joseph, MO*

Preparing for Tenure. (Roundtable) Room 306

Greg Smith and Laura Salem. *Lakeland College, Sheboygan, WI, Rockhurst University, Kansas City, MO.*

3:15-3:55 PM (40 min) **SESSION 5**

Using Case It! computer simulations to integrate molecular biology techniques and bioinformatics tools into case-based learning and open-ended research problems. (Computer workshop: continued from Session 5) Computer Lab 205

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

Introductory Biology: What Works and What Doesn't. (Roundtable: continued from Session 4) Room 125

Tom Davis. *Loras College, Dubuque, IA*

Introducing Ethics into Introductory Biology. Room 207

James M. Okapal, Kurt Hartman and Mark Mills. *Missouri Western State University, St. Joseph, MO*

Student Research Projects in the Galapagos. Room 306

Lynn L. Gillie and Anne L. Bizub. *Elmira College, Elmira, NY*

4:00 – 6:00 PM **SESSION 6: POSTERS (Cash bar), First Floor of Science Center**

4:00 – 4:10 PM Social period
4:15 – 5:00 PM Presentation of even number posters
5:00 – 5:45 PM Presentation of odd numbered posters
5:50 – 6:00 PM Social period

6:00 PM – **DINNER & SECOND BUSINESS MEETING (Massman Hall)**
Presentation: David Ashley, Ph.D. "I make my students crawl for their undergraduate research experience!"

Saturday, Oct. 10th, 2009

8:00 – 9:00 AM **Bioscene Editorial Board Meeting** (Science Center, room 206, Rolls provided)

9:00 –9:50 AM (40 min) **SESSION 7**

Special Workshop: iWorx Physiology Teaching Kit Workshop Computer
(9:00 AM – 4:00 PM, By invitation only, preregistration required) Lab 205

Judi D'Aleo, iWorx Systems Inc

Team-Based Learning in the Introductory Biology Classroom. (Workshop: continued into Session 8) Room 125

Karen Sirum. *Bowling Green State University, Bowling Green, OH*

(SHORT SESSIONS)

9:00 – 9:20 AM

Biology for Non-Science Majors: What to Teach and How Should be Taught In Two Year College Level. Room 302

Farahnaz Movahedzadeh and Farrokh Asadi. *Harold Washington College, Chicago, IL*

Embedding Undergraduate Research into a Laboratory Course. Short talk Room 207

April Collins Potterfield and Gabriel McNett. *Westminster College, Fulton, MO*

9:25 – 9:50 AM

An Holistic Approach to the Teaching of Introductory Human Anatomy and Physiology. Room 306

Donald L. Williams. Park University, Parkville, MO

9:50 – 10:55 AM (40 min) **SESSION 8**

Special Workshop: iWorx Physiology Teaching Kit Workshop (9:00 AM – 4:00 PM, By invitation only, preregistration required) Computer Lab 205

Judi D'Aleo, iWorx Systems Inc

Team-Based Learning in the Introductory Biology Classroom. (Workshop: continued from Session 7) Room 125

Karen Sirum. *Bowling Green State University, Bowling Green, OH*

An Experience in Biological and Cultural Diversity: Conducting a Field Trip Abroad. Room 207

Chad Scholes and Mindy Walker. *Rockhurst University, Kansas City, MO*

What if Fossils Are Discovered On Mars? A Learning Activity Room 302

Abour H. Cherif. *DeVry University, Addison, IL*

The Trials, Tribulations, and Successes of Undergraduate Research—An Evolving Program Plan. (Roundtable) Room 306

Carol Sanders and Donald L. Williams. *Park University, Parkville, MO*

11:00 - 12:30 **LUNCHEON & THRID BUSINESS MEETING (Massman Hall)**

Resolutions: TBD
Executive Secretary Report: Tom Davis, *Loras College*
Bioscene Steve Daggett*, Avila University*
Presidential Address: Conrad Toepfer, *Brescia University*
2010 Meeting (54th) at Lourdes College, Sylvania, OH
Program Chair: Tara Maginnis, *The University of Texas*
Local Arrangements Chair: Marya Czech, *Lourdes College*

1:00 – 2:40 PM (40 min) **SESSION 9**

Special Workshop: iWorx Physiology Teaching Kit Workshop — Computer Lab 205
(9:00 AM – 4:00 PM, By invitation only, preregistration required)
Judi D'Aleo, iWorx Systems Inc

Building an Undergraduate Science Research Program - Making it Work. — Room 125
Aggy Vanderpool. *Lincoln Memorial University, Harrogate, TN*

Navigating through Regulations for Using Animals in Undergraduate Research: Do You Need an IACUC? Part II (Roundtable) — Room 207
Elizabeth I. Evans, D.V.M. *Rockhurst University, Kansas City, MO*

(SHORT SESSIONS)

1:00 – 1:20 PM

SURSCA – A student organization to support and promote undergraduate research across campus. — Room 306
Karen Klyczek and Timothy Lyden. *University of Wisconsin-River Falls, River Falls, WI*

1:25 – 1:50 PM — Room 302

Publishing with Undergraduates.
Robert Powell. *Avila University, Kansas City, MO*

Steering Committee Meeting 2:00-4:30pm, Science Center 206, includes newly elected members

POSTERS

1. A Molecular Laboratory Exercise to Test the Effect of Rapamycin Treatment on Zebrafish Intestinal Differentiation. **Khadijah Makky and Cynthia Horst**. *Carroll University, Waukesha, WI.*

2. Bringing Research into Genetics Laboratory: A Story of One Project **Irina Makarevitch**. *Hamline University, Saint Paul, MN.*

3. Assessment Techniques for Determining the Impact of Teaching Approaches in Genetics **Lisa Felzien**. *Rockhurst University, Kansas City, MO*

4. Research for the Non-Sciences Majors…. It takes Training! **Christine Bezotte and Martha Ritter**. *Elmira College, Elmira, NY*

5. My Summer Reading: A (Hopefully) Helpful Review of New, Non-Fiction Books You Can Incorporate into Organismal Courses. **Tara Maginnis**. *The University of Texas, Austin, TX.*

6. Stream Research in a Non Major Environmental Biology Course **Donald L. Williams and Carol Sanders**. *Park University, Parkville, MO*

7. Are We as Young as Our Mitochondria? **Laney McDougal and Farahnaz Movahedzadeh**. *Harold Washington College, Chicago, IL*

8. Implementing Genomic Research in the Undergraduate Classroom. **Nighat Kokan, Chad Koplinski and Lisa Hubert**. *Cardinal Stritch University, Milwaukee WI*

9. A Conflict between Epistemological Beliefs Lead to Divergent Effects on Teaching. **William D. Bennett and Soonhye Park**. *University of Iowa, Iowa City, IA*

10. BiPhotology-An Interdisciplinary Approach to Teaching Art and Sciences
Neval Erturk and Andrew Blanchard. *Converse College, Spartanburg, SC*

11. A clinically relevant respiratory function lab for undergraduates using iWorks data acquisition system: perks and pitfalls. **Aaron Bunker**. *University of Missouri, Columbia, MO.*

12. Utilizing a local river system for undergraduate research in a general ecology course **Paul C. Pickhardt**. *Lakeland College, Sheboygan, WI.*

13. Using Two-Week Learning Cycle Blocks (LCBs) in General Studies Biology: Pros and Cons. **John Rushin, Dave Ashley, Cary Chevalier, Jason Baker, Melissa Daggett, Todd Eckdahl, Kurt Hartman, Mark Mills, Karen Koy and Kristen Walton**. *Missouri Western State University, St. Joseph, MO.*

14. Biology in the News - Scientific Journalism Under the Microscope. **Barbara Hass-Jacobus** *Indiana University-Purdue University, Columbus, IN*

ABSTRACTS (Alphabetized according to first author)

1. **I make my students crawl for their undergraduate research experience! (Dinner speaker)**

Dave Ashley. *Missouri Western State University, St. Joseph, MO*

I have been teaching Cave Biology (BIO355) since 1992. This course, taught during alternate years, includes typical class lectures, discussions and demonstrations. The course does not include a standard laboratory meeting as is more typical for the majority of our Biology Department courses. Instead, each student is expected to participate in two off-campus, weekend, field trips to conduct miniprojects within several of Missouri's unique caves. These miniprojects are typically projects that involve quantitative studies monitoring cave biota. The cave biota we monitor typically involve common cave invertebrates (i.e. cricket populations) and obvious cave vertebrates (i.e. salamander densities and size classes). Some of the monitoring projects involve species of conservation concern which are federally or state listed (i.e. Threatened or Endangered species). Many of the caves we visit have restricted access because of the sensitivity of the species contained within. Students within the class are required to analyze data from our trips and prepare poster presentations for our campus-wide Multidisciplinary Research Day which is held ever semester. Often, the data involving our monitoring projects have been collected over several years. Each new class of students has access to these accumulated longitudinal datasets for their analyses. Many students enrolled in BIO355 have actually been able to co-author presentations which have been accepted for presentation at professional meetings at the state or national level. This applied research experience is very critical to the developing professional resume of my students.

2. **Introducing BIO105: a twenty-five year perspective on content, process and engagement in an introductory biology class for majors. (Session 4: room 207)**

Dave Ashley. *Missouri Western State University, St. Joseph, MO*

From 1983 to 2008, I taught the introductory biology course for majors at our institution. This presentation provides my reflection on content and approach over the years. Although the course content changed over the years based on curricular needs of the department a consistent emphasis on science investigation processes was threaded through the course. Lecture and laboratory assignments emphasized writing and quantitative communication skills. Students utilized a laboratory notebook with carbonless duplicate pages to record observations and organize data handouts. Laboratory activities emphasized hypothesis-testing and included field and laboratory experiments. A given laboratory session might have involved collecting data on multiple, new and on-going experiments. Students were sequenced through a series of activities to give them expertise in describing observations through descriptive and inferential statistics. We extensively used SPSS to provide summary analyses of laboratory results and for numerous homework assignments. An important role of this course in our department has also been to encourage our students to become involved in departmental activities, particularly to join and support the student organizations within the department and to consider future participation with faculty in independent research projects.

3. **A Conflict between Epistemological Beliefs Lead to Divergent Effects on Teaching. (Poster 9)**

William D. Bennett and Soonhye Park. *University of Iowa, Iowa City, IA*

In teaching science, the beliefs of science teachers may come into conflict and inhibit the implementation of reformed teaching practice. These conflicts sometimes arise during the course of implementing new or different curriculum in which teachers must reconcile their beliefs formed from previous experience and their intended goals for classroom performance. A case study of an experienced science teacher revealed that constructivist beliefs that conflict with positivist beliefs did not lead to changes to classroom practice. In this case study, a

number of issues, such as historical, contextual, and beliefs about learning, were identified that inhibited his implementation of reformed teaching. Additional science education literature has found that science teachers may have conflicts between beliefs and practices that persist without a resolution. The significance of this research for science teacher educators and curriculum developers lies in the ability of teachers to change their positivist beliefs and practices towards constructivism and student-centered classroom practice. Even though the definition of teachers' beliefs remains controversial in the current research literature, this case aims to further the discussion in defining the nature of teachers' beliefs and the factors that inhibit the adoption of reformed teaching practices.

4. **Using Case It! computer simulations to integrate molecular biology techniques and bioinformatics tools into case-based learning and open-ended research problems. (Session 4: room 205)**

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

This workshop will enable participants to gain hands-on experience using Case It and MEGA4 software as they analyze cases based on infectious diseases such as HIV/AIDS and influenza. Case It! is an NSF-supported project to develop software simulations in molecular biology to facilitate case-based learning and open-ended inquiry. Case It software reads DNA or protein sequences and runs realistic simulations of electrophoresis, Southern, Western and dot-blotting, ELISA, and multiplex PCR. It has recently been integrated with MEGA4 bioinformatics software (developed by the Center for Evolutionary Functional Genomics at Arizona State University) and also directly links to online databases and tools such as the BLAST server. We are developing research-based cases and problem spaces to take advantage of these capabilities. Once students use the software to analyze a case, the analysis is extended by asking open-ended questions that can be address using bioinformatics tools. Students can share their work and communicate via a dedicated web editor/conferencing system housed at UW-River Falls.

5. **Research for the Non-Sciences Majors…. It takes Training! (Poster 4)**

Christine Bezotte and Martha Ritter. *Elmira College, Elmira, NY*

"Oh…No…there's that dreaded phrase…"The Scientific Method!" What is a hypothesis, Me collect all that data? What should I do with it? What does it really mean? That's not what I wanted! Where did THAT come from??? In an effort to assist students understanding [and relieve stress and misconceptions] of "the way to do science", we developed a series of lab exercises designed to teach students what is really behind the scientific method. The exercises guide students through the how and why of planning, execution and analysis of research. The active learning opportunities enhance problem solving and encourage critical thinking skills through evaluation of research planning, applications and its resulting data. The goal is to engage students in relevant contextual learning experiences; the idea is to allow them to demonstrate the knowledge they have acquired, doing a research project. The labs are exercises designed to teach ways to explore a problem or concept. Students design and evaluate methods of data collection and analysis. They also discuss many practical as well as ethical issues related to research. Class 'research meetings" discuss plans, directions, methodology, directions and results. They must demonstrate the extra effort to understand the principles behind the experimentation. Students ask the question, then design, execute, analyze and present their results. The exercises encourage student integration of learned concepts in Human Biology in ways that have scientific and personal significance. Observed results will be presented and discussed.

6. **Semester-Long Research Projects for Non-Majors. (Session 3: room 125)**
   Janice Bonner.

   Semester-long research projects are valuable experiences for both first-semester biology majors and non-majors, because they provide an opportunity to experience how a biologist thinks and works in the laboratory. Such projects are also difficult to carry out because these students initially lack sufficient biology content knowledge to design and carry them out. This session will present an independent research project (IRP) similar to the type of product comparison carried out by Consumer Reports. Students select two brands of a product (e.g., microwave popcorn), determine three experimental variables, design a method of testing and quantifying each variable, carry out statistical analyses, analyze their results, and write a full report of their findings. The session will explain how the IRP is stretched out over the semester and how it is assessed.

7. **A clinically relevant respiratory function lab for undergraduates using iWorks data acquisition system: perks and pitfalls. (Poster 11)**
   Aaron Bunker. *University of Missouri, Columbia, MO*

   Respiratory physiology principles are frequently demonstrated following activities primarily involving exercise. Medical research currently focuses great efforts in conducting research that is clinically relevant or "translational". This respiratory lab, modified from J.P. Wallace's spirometery lab at Indiana University, extends beyond the typical lab into both basic principles as well as translational aspects of respiratory function using active and cooperative learning strategies. Materials used included: iWorks/214 computer interface with Labscribe V2.0, pneumotachometer, plastic bags, duct-tape, and pant belts. Lab Part 1 involved a brief examination into control mechanisms of breathing rate via iWorks and sealed bags. Lab Part 2 investigated how obstructive and restrictive pulmonary pathologies affect specific aspects of respiratory function, replicated by utilization of duct-tape and belts. Students calculated forced vital capacity, forced expiratory volume 1 second, and minute ventilation volume for obstructive and restrictive pulmonary pathology treatments. Many students acquired a greater appreciation for the contribution pCO2 makes to control breathing rate following this lab experience. Students responded well to how pathologies were replicated and gained knowledge of how the pathologies affect respiratory function. Common dilemmas were drifting of iWorks recordings and improper mouthpiece use. Recurrent student complaints included lengthy lab duration and exhausting calculations.

8. **Successful Student Projects: Pitfalls and Lifelines. (Session 2: roundtable, room 302)**
   Becky Burton. *Alverno College, Milwaukee, WI*

   This workshop will focus on successful student-led research projects that are integrated into courses. Despite the benefits of student research, some instructors may be wary of poor-quality projects, difficulty in grading projects, friction within research teams, or logistical concerns. Planning and curricular tools can greatly increase the success of student-led research projects. We will explore some ways to improve student research and communication skills, as well as improving student attitudes toward working in teams. We will be sharing strategies, forms, criteria, outcomes, self assessments, peer assessments, and other useful tools. Bring electronic versions of your favorites for inclusion in an on-line resource.

9. **What if Fossils Are Discovered On Mars? A Learning Activity. (Session 8: room 302)**
   Abour H. Cherif. *DeVry University, Addison, IL*

   According to American space agency (NASA) officials, the new NASA Mars Science Laboratory Rover, which weighs a 2,2000-pound and cost $2.2 billion to build, will be launched on a Mars

Mission in 2011, with the hope of landing on the planet in 2012. Scientists hold high hopes that this mission will lead to significant scientific discoveries and breakthroughs including signs that Mars could once supported life. And what if one of the discoveries happened to be that fossils, other than those of bacteria, are present on Mars? While the odds for such a discovery are next to nothing (at least for now), the possibility of such discovery raises interesting questions and makes us think seriously about how to prevent our planet from ending up uninhabited like the planet Mars. Thinking such as this requires complex web of social, economic, political, philosophical, scientific and technological implications.This paper outlines a role-playing scenario to help students to build a better understanding of scientific concepts and principles. In this scenario, students are part of the scientific community, religious community, economic community, political science community, philosophers and social scientists communities, and the media community. Those communities are faced with challenges about the Proposed new fossil discoveries, bacteria and a few bone fragments as well as plant parts, found on the planet Mars. In the activity, the students will assume roles as the presenters of these communities. After doing research, they will develop a plan and strategy for the members to present how their respective communities would react to the newly discovered fossils on Mars. To accomplish this goal, students will work together to collect information and acquire the knowledge that will help put themselves in the shoes of the real members of their prospective communities. They will develop informative and realistic perspectives that can be presented on behalf of the given communities. They also will learn to take on the roles of others and improve their social skills and academic performance. By actively engaging in this activity, students learn and reinforce their understanding of various concepts in science and how science interacts with various aspects of human endeavors. But most of all, we aim to invoke an interest in learning about the fossils and fossil formation, Planet Mars, And the concept of life and space exploration by the students involved and, in turn, excite them to learn about issues that they are likely to find themselves part of in debate. Thus, these students must be informed citizens.

10. Undergraduate Research: At What Cost Inquiry? (Session 3: roundtable, room 207)

James W. Clack. *Indiana Univ - Purdue Univ*

Colleges and Universities are putting more and more emphasis on undergraduate research as a means of enhancing student learning. This is a noble effort, but a number of practical issues are giving investigators second thoughts about investing the time and effort into a program which may or may not have an impact on student learning or their research efforts. Many investigators have recounted disasters precipitated by undergraduates who were simply not ready to use sophisticated lab equipment in a responsible manner. Others complain that the limited time available to the undergraduates does not allow a truly comprehensive research experience. Finally, institutions rarely provide adequate compensation to faculty in terms of time and materials to support undergraduates' research. Topics for discussion will include how institution and individual investigations deal with these issues and what innovations might help overcome some of these problems.

11. Development of a Comprehensive Research Requirement: The Doane College Experience. (Session 1: room 125)

Barbara Clement, Brad Elder, Kate Marley, Robert Muckel, Russell Souchek, Robert Wikel and Heather York. *Doane College, Crete, NE*

In 1998, the Doane College Biology faculty laid out a plan requiring all biology majors to complete a research project. To maximize sustainability, the faculty set benchmarks for faculty course-load reductions and student preparation. The program was implemented in

2002–2003, and approximately 160 students have completed projects since. To support this requirement, , emphasis is placed in the introductory biology course sequence on developing skills in hypothesis and experimental design application of statistics to research design and on learning to prepare written, oral and poster presentations. Third-year students collaboratively develop projects with faculty mentors and write and present their proposals. In their fourth year, students spend two semesters conducting their research, collecting and analyzing data and presenting their findings at a local, regional or national meeting. Due to the resultant success of the biology program, a research component has been added to a number of other majors at Doane, and faculty course loads have been adjusted campus-wide to accommodate research. We present salient aspects of the planning, implementation and review processes and discuss some of the difficulties of undertaking such a comprehensive program as well as some of the curriculum-wide benefits.

12. Introductory Biology: What Works and What Doesn't. (Sessions 4 & 5: roundtable, room 125)

Tom Davis. *Loras College, Dubuque, IA*

This interactive discussion will ask participants to bring copies of and share a two page summary/syllabus of their Intro Biology courses. The discussion leader will briefly mention some of the challenges, successes and problems with the 2 semester sequence at Loras College. Discussion topics will include content (top 10 concepts presented?), how to maintain a positive attitude/enthusiasm for being a Biology major and taking the next classes, what are some good labs that work and some that don't and why, and how have student complaints been addressed and problems solved.

13. Time and Money: Thoughts on sustaining undergraduate research in an economic down turn. (Keynote Address)

Jeffery R. Demarest. *Juniata College, Huntingdon, PA*

Time and money to support undergraduate research are in chronically short supply, even when the economy is good. Since we can not print time like the Federal Reserve Bank prints money, how can the finite amount of time within an existing curriculum be allocated for student/faculty research? - By changing the curriculum. As the economy stabilizes and may even show signs of improvement, how can an institution/department position itself to take advantage of funding opportunities? - By adopting "High Impact Practices". Can the educational community influence the upcoming legislative focus as Washington turns from health care to higher education? - Yes! (Maybe) - We should try.

14. Synthetic Biology: A New Opportunity for Multidisciplinary Undergraduate Research. (Lunch speaker, Friday)

Todd Eckdahl. *Missouri Western State University, St. Joseph, MO*

Synthetic biology is an emerging field in which researchers use the tools of molecular biology and mathematical modeling and the principles of engineering to design and construct genetic circuits in living cells. It has found applications in medicine, energy, the environment, and technology. Synthetic biology is exciting, interdisciplinary, relatively inexpensive and appropriate for undergraduate research. Research projects were conducted by joint teams of undergraduates from Missouri Western State University and Davidson College as part of the international Genetically Engineered Machines (iGEM) competition, sponsored by MIT. Each of the projects involves the use of bacterial computers to solve mathematical problems. They serve as examples of the opportunities for undergraduate research that synthetic biology provides.

15. Navigating through Regulations for Using Animals in Undergraduate Research: Do You Need an IACUC? Parts I (Session 1, room 207)) and II (Session 9: roundtable, room 207)

Elizabeth I. Evans, D.V.M. *Rockhurst University, Kansas City, MO*

Part I: This presentation will outline the federal (and state) regulations governing the use of animals in research and identify the criteria used to determine if and how they apply to individual colleges and universities. The requirements of an IACUC (Institutional Animal Care and Use Committee) will be outlined along with its responsibilities under the various regulations. Resources related to the welfare of research animals will be identified to help all institutions, even those that don't fall under any of these regulations. The goal of the presentation is to present information that will help all undergraduate research programs ensure the welfare of any (non-human) animals involved in their studies and meet the regulatory requirements for that program.

Part II: This discussion will focus on frequently asked questions about the use of animals in undergraduate research as well as any questions brought by the participants. Specific questions may include how to write a research protocol, how to set up (and run) an IACUC, and what paperwork is required for specific research studies involving animals.

16. BiPhotology-An Interdisciplinary Approach to Teaching Art and Sciences. (Poster 10)

Neval Erturk and Andrew Blanchard. *Converse College, Spartanburg, SC*

The purpose of this interdisciplinary, team-taught course is to cultivate appreciation and collaboration between science and art. Throughout the semester, students study the fundamental topics in biology focusing on scientific method, cell structure and function, cell division and evolution. Students also learn the importance of photographic documentation of biological topics studied with classroom interaction that equip them with technical skills needed to develop and create photographic prints by using historical and contemporary processes. Students are expected to present an artistic portfolio of the biological concepts. Students could take the class as an introductory level non-major biology course or as an upper level major art course. Students enrolled in either course are expected to study both the art and the science component of this course with the same rigor and intensity. Qualitative student evaluations showed that the students gained greater appreciation and enthusiasm of sciences when it was taught in conjunction with a demanding yet popular art form-photography.

17. Interdisciplinary Research Programs for Undergraduate Students. (Session 1: roundtable, room 306)

Neval Erturk and Douglas Jensen. *Converse College, Spartanburg, SC*

Biology lends itself to interdisciplinary research by building bridges between itself and/or with other fields, such as chemistry, physics, statistics, and psychology. Current progress in biological research requires collaboration between multiple disciplines in order to address multifaceted problems, such as climate change, emerging and reemerging diseases and renewable energy. Recent discoveries in the field of genomics also promise to undertake complex genetic problems such as genetic disorders. However, finding effective solutions to these questions and employing the available data for practical purposes require creative collaboration between disciplines. Research and educational initiatives are supported by universities and the National Research Council with the goal of training a new generation of scientists for increasingly interdisciplinary research endeavors. At Converse College we successfully implement an interdisciplinary approach to teaching and research in biology. Both the faculty and students involved in these projects indicate higher motivation towards

research and collaboration as well as greater satisfaction in their academic experience.

18. Assessment Techniques for Determining the Impact of Teaching Approaches in Genetics. (Poster 3)

Lisa Felzien. *Rockhurst University, Kansas City, MO*

Topics in genetics are well suited for teaching students both problem-solving skills and techniques for managing and understanding detailed conceptual information. Determining whether new approaches have an impact on student learning is essential in deciding which assignments should be retained, eliminated or modified. This project shows the analysis of the impact of a variety of interventions designed to maximize students' problem solving skills and conceptual understanding. Assignments examined included presentations of problems to peers, outlines of conceptual information due before beginning a topic in class, and student-designed animations. The effects of implementation of a laboratory component that had not been previously required were also examined. Assessment of these approaches was achieved by comparisons of student performance on problems versus concepts on exams over five semesters.

19. Student Research Projects in the Galapagos. (Session 5: room 306)

Lynn L. Gillie and Anne L. Bizub. *Elmira College, Elmira, NY*

The Galapagos Islands have an extraordinarily observable collection of fauna that are ideal for observational data collection. They were the main setting for the course, "In Darwin's Footsteps," which was designed to introduce animal behavior research in an evolutionary context to a mix of science and non-science majors. Three weeks were spent on campus and two weeks in Ecuador and the Galapagos Islands. Students researched the islands and the species they were most likely to see while on campus. Lab and field experiences provided students practice with hypothesis formation and observational sampling methods. Birding trips before going abroad were helpful, especially for non-science majors. Once in the Galapagos, multiple short observation periods were found to be most useful rather than one extended sampling session. Marine iguanas, blue-footed boobies and Galapagos sea lions were the most abundant and observable of the many available species. Types of experiments and trip logistics will be discussed.

20. Biology in the News - Scientific Journalism Under the Microscope. (Poster 14)

Barbara Hass-Jacobus. *Indiana University-Purdue University, Columbus, IN*

The general public first learns about new scientific discoveries through mass media news sources, including newspapers, television, and increasingly, the internet. Most people accept those reports at face value; few delve into the primary scientific literature, much less other sources, to verify the reported conclusions. Condensing a peer-reviewed research study into a summary for the general public can be challenging. While many news reports may be accurate summaries of new scientific discoveries, other writers take literary license with the study's conclusions to create catchy titles, phrase the summaries in ways that may be misleading or may not accurately represent the findings, and fail to include information regarding the source of the study, sample size, and other key factors of the research. This assignment asks majors' and non-majors' biology students to find a mass media report of a biological discovery, introduces them to primary scientific literature as they are challenged to verify the information they find, and requires them to apply their knowledge of biology and the scientific method to write a detailed analysis of the strengths and weaknesses of their mass media news article in reporting scientific findings to the general public.

21. Bringing Current Research Into the Classroom. (Session 1: room 302)

Andrew Higginbotham. *Longview Community College, Lee's Summit, MO*

The difficulty of introducing scientific research to students is the learning curve associated with the transition from lecture-heavy instruction to hands-on research experiences. It is often the case that the textbooks used in the modern classroom are outdated by several years from the current research being conducted. As a result, students lack a feel for the cutting edge questions being asked and are forced to make a quantum leap in understanding when they enter the research world. One example of a recent (circa 2000) paper used to explain and illustrate evolution by the presenter will be given. Problems with the direct presentation of journal articles will be discussed, along with several examples of how the presenter has enriched his teaching by referring to research in an anecdotal fashion to make it seem less threatening or overwhelming. A recent case study conducted by the presenter of students doing exploratory research as part of their lab curriculum will be discussed as an example of how to put the tools in the hands of the students and stimulate their own scientific curiosity.

22. Twenty Years of Undergraduate Research. (Session 2: room 125)

Paul Klawinski, Tara Allen, Scott Falke, Jennifer Moody-Weis and Wei Wu. *William Jewell College, Liberty, MO.*

In 1988, the William Jewell College (WJC) Biology Department moved from undergraduate research as an option for students to a requirement for all biology majors. Over time, as new majors were created (molecular biology and biochemistry), these majors were also required to conduct undergraduate research as part of the curriculum. William Jewell College's requirement differs from other programs in the United States in that it is a four semester program designed to involve the students in an in depth research project. Our program is also unique in that, over time, the program has become more intentional in training students in all facets of the conduct of research. Because of the presence of this graduation requirement, the faculty have altered the way courses are taught so that the entire curriculum supports the research experience. Our presentation will share the history of undergraduate research in our department, describe the program as it exists at the current time, and assess what we are doing right, what we could improve on and what we have learned, in terms of costs, benefits and challenges, in 20 years of doing undergraduate research at a strictly undergraduate institution.

23. SURSCA – A student organization to support and promote undergraduate research across campus. (Session 9: short talk, room 306)

Karen Klyczek and Timothy Lyden. *University of Wisconsin-River Falls, River Falls, WI*

Students at UW-River Falls interested in undergraduate research formed a student group to promote campus-wide support for these activities. The organization, SURSCA (Society for Undergraduate Research, Scholarship, and Creative Activity) was established in 2003 after the first UWRF students attended the National Conference for Undergraduate Research. Initially, the main goal was to ensure continued support for students to attend conferences to present their research, and the university administration has provided travel support each year since. The group also hosts seminar speakers and gives presentations to alumni groups and others. They established an annual fall "Evening Gala of RSCA" to showcase student and faculty research. In 2007, they worked with student government to propose a differential tuition plan that would support undergraduate research, which was approved by the UW System. This program, administered by SURSCA, provides $75,000 each year for student research supplies and travel. The success of this organization illustrates that students are powerful advocates to promote programs such as undergraduate research.

24. Implementing Genomic Research in the Undergraduate Classroom. (Poster 8)

Nighat Kokan, Chad Koplinski and Lisa Hubert. *Cardinal Stritch University, Milwaukee WI*

The genome sequencing of 12 Drosophilae species provides a resource for understanding the functional organization of genes and genomes for both scientists and students. The Genomic Education Partnership (GEP), a consortium of more than 50 participating undergraduate institutions across the United States, has provided opportunities for students to take part in a collaborative genomics research project. This abstract describes the implementation of genome annotations in two courses, Genetics (BL 308) and Independent Research (BL 402), at Cardinal Stritch University, Milwaukee, Wisconsin. Genome annotation, which involves identifying features in the DNA sequence, is a labor intensive procedure. Undergraduate students learn the process of annotating genes utilizing sequence data from a given Drosophila species. Through this process they become proficient in the use of computational tools and learn evidence-based annotation; they also provide novel contributions to scientific databases and ongoing scientific inquiry. Being part of a real research project gives the students a sense of excitement and compels them to learn more than they would in a standard lab project. Students find annotation projects a valuable learning experience where they gain insights into how actual research is done. For teaching institutions this is an excellent opportunity to incorporate genomics research into the undergraduate curriculum. Funding: HHMI grant to Dr. Sarah Elgin, GEP Program Director, Washington University St. Louis, Missouri.

25. My Summer Reading: A (Hopefully) Helpful Review of New, Non-Fiction Books You Can Incorporate into Organismal Courses. (Poster 5)

Tara Maginnis. *The University of Texas, Austin, TX*

Want to get your students reading something besides textbooks and websites? Looking for "points" besides tests and quizzes? I offer some extremely biased reviews and opinions about recent, non-fiction books (most published since 2006), and suggestions for where and how to incorporate them into various biology courses such as freshman biology, evolution, ecology, anatomy and physiology, developmental biology, and biology for non-majors. Examples of the 15-20 books to be discussed include "Your Inner Fish", "Into the Jungle", "The World Without Us", "The Reluctant Mr. Darwin", and "The Trouble with Testosterone".

26. Bringing Research into Genetics Laboratory: A Story of One Project. (Poster 2)

Irina Makarevitch. *Hamline University, Saint Paul, MN*

One of the classical genetics questions is "mutation in what gene causes a mutant phenotype?" One of our research projects involves answering just that question about "weedy" maize mutants, dwarf maize plants with an interesting phenotype that carry a mutation in a single gene. The nature and function of that gene is still a mystery. Based on the results of previous experiments, we knew an approximate location of the gene, down to 1/10th of a chromosome. During five week lab unit taught during Fall 2008, Genetics students identified and tested several molecular markers each to locate the gene of interest to one BAC (approximately 100,000 bp) that contained 5 candidate genes. In addition to advancing an important research project, students acquired deeper understanding of gene mapping, positional cloning, data mining, as evidenced by student answers to exam questions pertinent to these topics. We will continue this research project with the students during Fall 2009, when students will develop primers, PCR, and sequence five candidate genes, to identify the gene responsible for the phenotype of interest. Laboratory activities for microscope

characterization of the mutant phenotype, gene mapping and candidate gene sequencing will be presented together with assessment results from Fall 2008.

27. A Molecular Laboratory Exercise to Test the Effect of Rapamycin Treatment on Zebrafish Intestinal Differentiation. (Poster 1)

Khadijah Makky and Cynthia Horst. *Carroll University, Waukesha, WI*

In the last decade, cookbook style laboratory techniques in undergraduate courses have been gradually replaced by research-based methodology. This abstract presents a laboratory exercise that spans over four to five weeks applying a research-based teaching approach. The project focuses on intestinal growth and differentiation using zebrafish embryos. Students design, with the help of the instructor, an experimental plan to molecularly examine the effect of the immunosuppressive drug rapamycin on intestinal differentiation. Students monitor the expression of Intestinal Fatty Acid Binding Protein (IFABP), to determine if rapamycin treatment has an effect on intestinal differentiation. Students apply molecular techniques including mRNA isolation, RT-PCR and gel electrophoresis to determine the levels of ifabp expression in extracts from both control and treated zebrafish larvae. Throughout the exercise students must determine the appropriate controls and then use that data to help analyze the gel electrophoresis results. Additionally, students are provided histological sections of control and treated zebrafish intestines and asked to correlate these results with the gel electrophoresis results. Finally, students utilize science literacy skills to collect background information about rapamycin from web sites such as NCBI for inclusion in a written report.

28. Are We as Young as Our Mitochondria? (Poster 7)

Laney McDougal and Farahnaz Movahedzadeh. *Harold Washington College, Chicago, IL*

"I'm not young anymore; I no longer have enough energy to do the things I could once so easily do." These statements may sound familiar and probably do not provoke us to question the science beyond them; however, there is much taking place at the cellular level that is linked to the decline in energy throughout the aging process. In fact, recent studies have suggested that we may only be as young as our mitochondria, the largest organelle in our cells after the nucleus. Among the several functions of the mitochondrion, the most important is being the site of cellular respiration and the source of nearly all the ATP produced in aerobic animal cells. This ATP is the universal currency of energy in living things. Another essential function of mitochondria is to protect the cell against free radicals, which break chemical bonds and cause cell death. Ironically, the mitochondrion is the main source of these damaging free radicals and the primary protection against them. When mitochondria cannot keep up with the body's energy demands and therefore are unable to prevent the invasion of free radicals, cells die, tissues age, organs fail, and disease may result. So far, many diseases have been linked to mitochondria, including Alzeimer's, Parkinson's, heart failure, and even aging. Although these are merely speculations at this point, research has found that there is a mitochondria dysfunction in aging muscles, as they produce less ATP for the same amount of oxygen consumed. Perhaps we are only as young as our mitochondria after all.

29. Biology for Non-Science Majors: What to Teach and How Should be Taught In Two Year College Level. (Session 7: short talk, room 306)

Farahnaz Movahedzadeh and Farrokh Asadi. *Harold Washington College, Chicago, IL*

Today, we live in a time of unexpected growth in the biological sciences which, in turn, are having an unparallel impact on our lives. As a result there is increased pressure on colleges to improve scientific and biological literacy among their students. Students in biology for non-

science major classes are still need to learn the biological concepts and understand the importance of biology in society and everyday life. In this presentation, we will share with the participants the outcome of a study to identify the most important biology concepts needed to be taught in biology for non-biology majors and how these concepts should be organized, taught, and evaluated at the two year college level. The results of this study indicate that a favourable change in attitudes of non-science majors toward learning biology can be achieved by (1) redesigning the whole curriculum and learning environment, (2) reconstructing learning materials, (3) altering teaching approaches, and (4) changing the delivery form of the learning experiences.

30. Introducing Ethics into Introductory Biology. (Session 5: room 207)

James M. Okapal, Kurt Hartman and Mark Mills. *Missouri Western State University, St. Joseph, MO*

At one time, not so long ago, the disciplines of Ethics and Biology were thought to exist in their own, non-intersecting, bubbles. However, ethical controversies such as stem cell research, cloning, and falsification of research (to name just a few), suggest that such separation cannot be maintained. If this is correct, then perhaps some ethical content should be included in introductory Biology classes. Over the past 5 years, the professors who have taught Biology 105: Principles of Organismal Biology at Missouri Western State University have allowed me to give lectures in their courses, design writing assignments, and create test questions concerning ethics. This presentation provides an overview of the lectures, case studies to be used in written assignments, how the writing assignments mimic lab reports, and sample questions that could be used on an exam.

31. Utilizing a local river system for undergraduate research in a general ecology course. (Poster 12)

Paul C. Pickhardt. *Lakeland College, Sheboygan, WI*

The River Continuum Concept (RCC) posits that macroinvertebrate community composition in a stream changes predictably as stream order increases within a watershed. Using this framework and relatively simple sampling gear, undergraduate biology students can test various hypotheses on the relative proportion of macroinvertebrates in different functional feeding groups at low versus high stream orders. At Lakeland College we make use of three laboratory periods to sample a headwaters stream reach (primary or secondary order), a fifth to sixth order stream reach, and an in-lab period to sort macroinvertebrates to functional feeding groups. Here I present how macroinvertebrate data collected over a multi-week laboratory are pooled to test specific hypotheses and how those results are utilized by our students to produce a comprehensive lab report based on their individual research results. This approach allows for each small lab group to collect their own data, for the instructor to collect long term data on the invertebrate communities within the river, and for possible collaboration with governmental agencies.

32. Embedding Undergraduate Research into a Laboratory Course. (Session 7: short talk, room 302)

April Collins Potterfield and Gabriel McNett. *Westminster College, Fulton, MO*

Involving undergraduates in research continues to be a priority, not only for educators who wish to engage students in the scientific process, but also for potential employers and graduate schools who find research skills essential. Many formal courses teach the scientific method in the curriculum, however, many students will never use it to solve a significant

problem. In addition, with heavy course loads many faculty struggle to involve more students in research. To accomplish the goal of involving more students in research, two laboratory courses were designed to immerse students in the scientific process. Rather than having students conduct "cook-book" laboratories, the laboratory component of the Animal Behavior and Comparative Animal Physiology courses at Westminster College relied solely on student-directed independent research projects. The goals of this course design were for students to: (1) gain literacy in course-specific terminology, (2) use appropriate scientific literature, (3) solve problems, (4) design and implement an experiment to answer a specific question, (5) statistically analyze data, and (6) interpret and communicate their results. Students were required to write scientific manuscripts and present their results either at the Undergraduate Scholars Forum at Westminster College or an off-campus scientific meeting.

33. Publishing with Undergraduates. (Session 9: short talk, room 306)

Robert Powell. *Avila University, Kansas City, MO*

Once most undergraduates acquire the knowledge and experience necessary for conducting significant research, the time span in which to implement a substantive project is often quite short. Consequently, few have the opportunity to see the fruition of their efforts as coauthors of peer-reviewed publications. In some instances, the nature of the research becomes an obstacle. Sophisticated research projects may require many months and even years in order to iron out the methods, much less generate significant results. However, in the course of independent research at Avila and in the context of NSF-funded summer research programs, I have been able to mentor hundreds of students, with the vast majority of projects culminating in published articles and notes. Several key elements are involved: (1) Start young (I try to encourage sophomores and sometimes even freshmen to begin projects that might extend through their senior years); (2) Focus on projects for which abundant data can be collected in relatively short periods of time; (3) Select topics about which little is known (increasing the likelihood of publishable products); (4) Establish at the very beginning that publication is an achievable goal; and (5) Invest time in working with students to develop techniques, review the literature, and write appropriately.

34. A Case for the Use of Technology in an Anatomy and Physiology Classroom. (Session 2: room 306)

Tom Rachow and Melissa Daggett. *Missouri Western State University, St. Joseph, MO*

The technology available to enhance learning in the modern biology classroom has in the last few years continued to explode. The marketing of each new gadget or software system from rapid response systems ("clickers"), publisher study sites for textbooks, to the possibility of making your own video library of all your course lectures makes them all sound so easy to incorporate and use in the classroom. The truth is they all require a significant amount of time, cost, and administrative support to be successful and useful to the faculty and students. In this presentation, we will demonstrate the use of a few technologies that have been incorporated into a one semester anatomy and physiology lecture and laboratory. In addition to demonstrating how rapid response systems "clickers" and digital recordings have been incorporated into an anatomy and physiology course, we will provide information or "our story" of the process that lead to the successful incorporation of these technologies in the classroom.

35. Using Two-Week Learning Cycle Blocks (LCBs) in General Studies Biology: Pros and Cons. (Poster 13)

John Rushin, Dave Ashley, Cary Chevalier, Jason Baker, Melissa Daggett, Todd Eckdahl, Kurt Hartman, Mark Mills, Karen Koy and Kristen Walton. *Missouri Western*

State University, St. Joseph, MO

This paper uses the Test of Integrated Process Skills (TIPS) to measure gains in student understanding of science process skills after intervention with several two-week Learning Cycle Blocks (LCBs) in a 1st–year college general biology laboratory (Bio 101 Principles of Biology). In this course, all students are enrolled in a traditional lecture of from 40 to 128 students that meets four times per week and each student is also enrolled in a weekly 2-hour lab that has a maximum enrollment of 24 students. Perceived student gains in overall science understanding as a result of the LCBs was also determined using a questionnaire developed by the course instructors. In each of the two–week LCBs, Week 1 involves the students in engagement, exploration and concept explanation using short demonstration-type experiments followed by discussions. Toward the end of the Week 1 lab session (or at the beginning of the Week 2 lab session) the students work in small groups to set up their own scientific mini-investigations in order to elaborate upon the processes and concepts learned earlier during week 1. These independent mini-investigations are completed over the next seven days and during the next (Week 2) laboratory session. The results and conclusions of the mini-investigations are shared with the entire class during the Week 2 lab. An evaluation (quiz) of the learning of science concepts and processes by the students during the LCB is also completed at the end of the Week 2 lab session. Some positive gains in student understanding of science processes were determined using the standardized TIPS survey for summer, fall and spring Bio 101 classes. In addition, on a separate survey students indicated a positive view of how the LCBs helped them to understand the nature of science investigations.

36. The Trials, Tribulations, and Successes of Undergraduate Research—An Evolving Program Plan. (Session 8: roundtable, room 306)

Carol Sanders and Donald L. Williams. *Park University, Parkville, MO*

Research and the scientific method are complicated processes that are best learned through trial and error and numerous, repeated attempts. Park University has several different venues for Undergraduate Research, including a long standing Honors Program and more recently, the Biology Program. The Honors Program has been presenting undergraduate research projects since spring 2003. In the fall of 2008, the Biology Program implemented a capstone research project to engage our majors in research, prepare them for graduate school and/or careers, and to give them an exposure to research, as well as an opportunity to experience the scientific method in action. The capstone research project is not a single class, but the culmination of an upward spiraling progression of learning acquired throughout the student's science curricular studies. This roundtable discussion will provide a brief outline of the scope and sequence of the Biology Research Capstone program currently in use and discuss the successes and pitfalls that have been encountered. Previous and current examples of student research projects will be provided.

37. An Experience in Biological and Cultural Diversity: Conducting a Field Trip Abroad. (Session 8: room 127)

Chad Scholes and Mindy Walker. *Rockhurst University, Kansas City, MO*

Providing students the chance to participate in field work in turn provides them with an invaluable opportunity to explore biology and learn about themselves and their strengths and limitations. Further, field trips abroad can provide not only lessons in ecology and biodiversity, but also in language, research, ethics, socioeconomics, and service. Because our teaching philosophies govern that we expose students to new experiences, we cannot envision an experience to better educate and engage students than by giving them the opportunity to approach complex, real-life problems through experiential-, and service-

learning abroad. Herein we will present our experiences with planning and implementing a field trip abroad, as well as provide information about the field station at our field trip destination in Central America.

38. Teaching and Measuring Rational Thinking in the Science Classroom. (Session 3: room 306)

Karen Sirum. *Bowling Green State University, Bowling Green, OH*

Rational thinking is not measured by currently used and accepted intelligence tests such as IQ, GRE, SAT, and placement tests—there is to date, no RQ (Rationality Quotient). Yet, in terms of helping people make decisions that help them attain their goals, rationality is even more important than intelligence as it is currently measured. Even in intelligent people irrationality persists, evident, for example, in the $10 billion spent on pseudoscience medical products and services each year. How is it that we graduate students from college who, in spite of high intelligence, fail to think rationally? The answer is that rational thinking is generally not explicitly taught. For example, in science classes students are presented with a list of ordered steps to memorize, often found in the first chapter of their text, as evidence of their understanding of the scientific method, and in teaching labs, the labs are often "cookbook" style. It should come as no surprise then that these students are still are unable to demonstrate basic experimental design abilities. However, basic experimental design can be taught, even in the non-majors introductory biology classroom, and in such courses students gain the skills and values of this aspect of rational thinking.

39. Team-Based Learning in the Introductory Biology Classroom. (Sessions 7 & 8: room 125)

Karen Sirum. *Bowling Green State University, Bowling Green, OH*

Introductory science classes serve as gateway, facilitating student interest and recruitment to the sciences and scientific ways of thinking, or alternatively, turning students away from the sciences as a major, an area of interest, and even as a value in everyday life. Interactive engagement teaching strategies include methods to facilitate student interaction with not only the course content and with the instructor, but also among students--the benefits to student learning are well documented. These pedagogical approaches include peer instruction, active, problem-based, cooperative, and collaborative learning. I am working to bring the advantages of students working together in small groups to the large enrollment classroom using a highly structured teaching strategy called Team-Based Learning (TBL). TBL is a strategy that takes advantages of the learning benefits of group problem solving activities while ensuring accountability and learning of ALL team members. TBL is effective for both large and small enrollment classes and has a fundamental structure that can be applied to any discipline. In this workshop session, participants will learn about TBL by actually doing it, and we will share ideas about group work as an instructional strategy, including ideas about how technology can be used to make it more effective.

40. Preparing for Tenure. (Session 4: roundtable, room 306)

Greg Smith and Laura Salem. *Lakeland College, Sheboygan, WI, Rockhurst University, Kansas City, MO.*

Are you worried about getting tenure? No matter where you are on your tenure timeline, we hope to provide insight on how to make yourself competitive in the tenure process and/or how to prepare your application. In this roundtable, we will share our experiences going through this process. Topics for discussion may include: criteria for tenure and/or promotion at different institutions, preparing a portfolio, and promoting peer-review teaching processes in the department.

41. Building an Undergraduate Science Research Program - Making it Work. (Session 9: room 125)

Aggy Vanderpool. *Lincoln Memorial University, Harrogate, TN*

Participation in field or laboratory research is one of the most effective learning experiences for undergraduate science majors. Successful undergraduate student research programs in the sciences generally include close partnership and collaboration with one or more faculty members. In addition, successful undergraduate student research programs are based upon well-defined and measureable learning outcomes. This session will focus on factors required for successful undergraduate student research programs in the sciences including developing faculty buy-in, administrative support for faculty/student research, budgeting for and funding undergraduate science research, using undergraduate research to build community presence and to promote college and university science programs, and finding and developing research partners for undergraduate science research.

42. Incorporating Primary Literature into Upper- and Lower-Division Undergraduate Biology Courses. (Session 3: roundtable, room 302)

Kristen LW Walton. *Missouri Western State University, St. Joseph, MO*

Primary literature is an excellent tool for students to explore current research in biology and is also an important part of engaging in the process of science. However, incorporating primary literature activities or discussion presents several challenges, including the time and resources needed for the instructor to find appropriate journal articles, as well as balancing content coverage with class time needed for discussion of the paper. There are a variety of ways to use primary literature as course material for discussion or student presentations. In lower-division or nonmajors courses, selected figures may be used to illustrate concepts, or papers with relatively straightforward methods can be assigned for discussion. In physiology, for example, papers published decades ago can be an excellent source for studies using relatively low-tech methods that resulted in major advances in the field. In upper-division courses, single articles or a series of related articles can allow students to explore one topic in depth while reviewing broader essential background concepts. The goal of this roundtable is to discuss successful activities and resources and share advice on using primary literature in biology courses at any level. Participants are encouraged to bring electronic files of articles, activities, or resources to share.

43. An Holistic Approach to the Teaching of Introductory Human Anatomy and Physiology. (Session 7: short talk, room 306)

Donald L. Williams. Park University, Parkville, MO

Many introductory human anatomy and physiology courses and elementary human biology courses are heavily weighted in course time and schedule with the naming and identifying of bones and muscles resulting in a lack of time to address other vital systems. Such courses, usually populated with beginning biology students who become overwhelmed with the memorization of bone and muscle facts, seem to do more harm than good toward encouraging students to continue in the biological sciences. An alternative approach is to present a constructivist holistic approach to anatomy and physiology via the development of a body fluid compartments and body fluid dynamics model which can then be used as the foundational model for the teaching and understanding of all other body systems. Once this model is mastered, specific anatomy and physiological aspects of all other systems can easily be taught and enhanced with a greater amount or lesser amount of memorization of factual material depending on the scope and focus of the specific course and/or instructor. This presentation will demonstrate a constructivist and holistic approach to developing a Fluid

Compartment Model of body function.

44. Stream Research in a Non Major Environmental Biology Course. (Poster 6)

Donald L. Williams and Carol Sanders. *Park University, Parkville, MO*

Non-major biology students, at best tolerate the mandatory general education science with laboratory course and at worst fear or may even loath it. They enroll in such a course out of necessity to meet a graduation requirement. To challenge and excite students about science, and to make it more real to them, a field research activity is employed. In the Biology Department at Park University we use the Missouri Department of Natural Resources Stream Team activities to demonstrate real-world data collection and data analysis. This poster presentation shows how Stream Team activities are used for laboratory investigations as an attempt to engage students in real-world science.

45. Comparison of Student Participation and Comprehension in a Traditional In-class Human Biology Laboratory Course versus an Online Human Biology Laboratory Course. (Session 2: room 207)

Peggy J. Wright. *Columbia College, Columbia, MO*

An increasing number of secondary and post-secondary institutions are developing science laboratory courses to be delivered online. Institutions implementing online laboratory courses, as well as institutions considering how to transfer credits from such courses, should carefully consider the variety of issues arising from online vs. traditional in-class laboratory courses including student safety, rigor, comparability of topics covered and experiments performed, and student-instructor interaction opportunities. In the fall of 2009, Columbia College, a private, four-year, coeducational liberal arts and sciences college, located in Columbia, Missouri will offer its first fully online science laboratory course. The new course will be an eight-week, two credit hour human biology laboratory course meant to be taken in conjunction with a separate three credit hour human biology lecture course, also online. Students taking the online lab course will purchase a customized home-lab kit consisting of eight lab modules including The Scientific Method, Macromolecules of Life, Cell Function, Tissues and Organs, The Cardiovascular System, Mitosis and Meiosis, Human Genetics, and Human and Habitats. An additional five lab modules will be provided by the instructor. In order to assess student comprehension in the online lab compared to the in-class lab, a post-lab test will be developed based on the Macromolecules of Life lab and given to both in-class and online students. Preliminary results of this test will be presented and used to describe post-lab comprehension of the topic and overall student experience of the topics and materials.