# 50th Annual Meeting

***The Revolution and Evolution of Biology Education: Where 50 Years Can Take Us***

**October 26-28, 2006**

**Millikin University, Decatur IL**

**ABSTRACTS**

**INVITED SPEAKERS**

## Marc Abrahams, *Editor, Annals of Improbable Research*

**"Improbable Research and the Ig Nobel Awards"**

## Malcolm Campbell, *Director, Genome Consortium for Active Teaching*

**"Biology Education 2056: Balancing Innovation with Improvement"**

With the rapid pace of biological research, it is hard to know when to adapt to the new times, and when to hold tight to proven methods. Biology education needs to address many of the concerns enumerated in *Bio2010* (e.g., increase quantitative aspects of biology curricula, improve interdisciplinary training, welcome students from diverse backgrounds, and provide hands-on opportunities that reflect real-world research). We need to measure and publish when a method helps, hurts, or makes no difference at all. Yet, we cannot forget the personal touch, the extra time answering sincere questions, the pat on the back for trying but failing to understand. College students have not changed as much as the technology around us. What can we do now to prepare our students for a future in science? Every time I see a newborn child, I am reminded how wonderful the natural word is and how fun it is to share biological insights with my students. I will highlight some of my efforts to share the excitement of discovery.

## Celeste Carter, Program Director, Division of Biological and Health Sciences, Foothill College

**"Building a Biotechnology Program at Foothill Community College: Lessons Learned and Future Trends"**

This presentation will describe the current Biotechnology Program at Foothill College, discussing the growth of both the biotechnology and bioinformatics programs. The integral role of industry partners as both instructors and advisors, and the impact of the regional industry on the program will be presented.

## WORKSHOPS

### Session I

### The Bioscene of Yesterday, Today, and Tomorrow

Stephen S. Daggett, *Avila University*

*Bioscene: Journal of College Biology Teaching* has been in existence since 1974, replacing the *Proceedings of the AMCBT* newsletter. The journal has evolved in that time and undergone several editorial changes. Four issues of *Bioscene* are currently published annually and distributed two to three times a year. With a new editor at the helm, it is an excellent time for members to reflect on their organization's publication. This workshop presentation will examine *Bioscene* in its past and current forms. Members will be solicited for ideas for future issues, the editor's duties, and the role of the editorial board.

### Video and Digital Cameras in the Modern Biology Classroom, Or How I Got Rid of My Stereoscope and Enabled My Students to Document Everything!

Dick Wilson, *Rockhurst University* (emeritus)

Most lecture halls have document or presentation cameras, and we have all begun to use them extensively. The video or digital camera can be an even more powerful tool in the laboratory. Small, complex demonstrations from showing proper dissection technique, to photographs in books, to text highlighting, to final electrophoretic plates, to comparisons between two species of flies, are much more easily done with a laboratory document camera. They can also magnify, almost eliminating the need for a stereo scope. Additionally students can record images of organisms, or dissections, or traits for insertion into papers and posters, or make time lapse movies of seed germination, or effects of acid rain on amphibian embryos. Good document cameras are also portable into the field, even some go underwater for studying aquatic life, *in situ*. All images are exportable to *Word, Word Perfect, and or PowerPoint,* and are PC or Mac compatible. This will be a hands-on workshop and opportunity will be available to try some or all of these things yourself. Bring all your labs alive with the newest generation of laboratory technology --- easy to use, small foot-print, and relatively inexpensive.

### A Martian Invasion of Teachable Moments for Environmental Science

Abour H. Cherif[1], David Morabito[1], Robert Aron[1], Jerry Adams[2], and Jeremy Dunning[3], [1]*DeVry University*, [2]*Columbia College*, [3]*Indiana University*

The recent missions to Mars have produced a mass of data and information in all forms and have forced the minds of many people world-wide to rethink their own perspectives on life itself. This drama unfolding about 35 million miles from earth, and digitally on our TV screens, is offering a growing reservoir for teachable moments. The curiosity and wonder of every image received prompts innumerable opportunities for inquiry. In this presentation we will share some of our ideas on how to bring into the classroom these exciting resources emanating from the Red Planet. Myth, reflection, research and behavior are likely targets of this Martian Invasion, stimulating students to examine further the environment around them. In the second part of the presentation, we would like to engage the audience in a discussion about their ideas on how to take advantage of these Mars missions for their classrooms, and other contemporary teachable moments that may capture the imagination of our students as they discover science. After this presentation and whether you are teaching topics related to desertification or deforestation, design and technology, space travel or and colonization, to name a few, the planet Mars and the recent missions to its environment will become part of your Never Ending Resources In Teaching Science.

**Teaching the Process of Scientific Inquiry**

Teresa Gonya[1], Paul Whitaker[2], and Richard Hein[3], [1]*University of Wisconsin-Fox Valley,* [2]*University of Wisconsin-Marathon County,* [3]*University of Wisconsin-Mantowoc*

Many students enter college with a dualistic approach to education in general and science in particular: something is 'fact' or 'theory'. This dualistic attitude prevents students from understanding the true nature of scientific inquiry as a continuous process of gathering information about the natural world. Even students of the sciences do not always learn to interpret new information and think critically about the process of science. This general lack of understanding about how science works already threatens to allow pseudoscience ideas to be incorporated into science curricula throughout the nation. Several colleagues in the Biological Sciences Department have completed an education project designed to increase student understanding of the process of scientific inquiry which is so critical to produce educated citizens. We devised two assessment tools to allow us to measure student understanding of good scientific investigations. Students completed one assessment before and a different assessment after completing a biology course. One group of students had experience with teaching tools and case studies designed to encourage practice and interpretation of the scientific process, and the other group did not use the teaching tools. Results from this comparison study will be discussed.

**Session II**

**Collaborative Case-Based Study of Genetic and Infectious Disease Via Free Molecular Biology Computer Simulations and Internet Conferencing**

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

Case It! is a National Science Foundation-sponsored project to promote collaborative case-based learning in biology education, via free molecular biology computer simulations and Internet conferencing. In this session, we will demonstrate how Case It! Software can be used to enhance understanding of molecular biology techniques for analyzing cases based on genetic and infectious diseases, as well as awareness of ethical issues associated with these diseases.

Students first use the Case It! simulation to analyze DNA and protein sequences for cases involving genetic diseases or infectious diseases such as SARS, HIV, West Nile, ebola, and influenza, among others. Simulated tools for case analysis include DNA and protein electrophoresis, Southern blotting, Western blotting, dot blot, PCR, and ELISA.

After analyzing the cases, students construct web-page "posters" using the Case It! Web Editor. They then play the roles of counselors, medical personnel, "family members", and others as they ask and answer questions about the case results using a custom Internet conferencing system hosted on our web site. Workshop participants will discuss how the Case It! system can be adapted to their home institutions. See the Case It home page for additional information - http://caseit.uwrf.edu

**Wouldn't Less Be Better? A Round-table Discussion of Content in Secondary and Undergraduate General Biology Texts**

Marya Czech, *Lourdes College*

Because the current condition of science education seems to be inversely proportional to increasing science text size, would it behoove us to examine encyclopedic biology texts and make recommendations for their simplification? Many state departments of education are adopting the NSTA content standards for K through 12 science curricula. Could we use the life science/biology standards to recommend a life science/biology curriculum in which the teacher has a resource text, a solid curriculum plan, and a classroom provided with laboratory, print, and online resources in place of encyclopedic texts in every student's desk?

**Investigation Spaces: An Emerging Model for Online Research and Collaboration**

Ethel Stanley[1], Margaret Waterman[2], and Stephen J. Everse[3], [1]*BioQUEST, Beloit College*, [2]*Southeast Missouri State University*, [3]*University of Vermont*

The use of *Investigation Spaces* is an emerging model for science curriculum, curriculum development and undergraduate research. Investigation Spaces address contemporary issues in science, technology and society and include robust research-based online materials and tools to explore these issues. Available online, each Investigation Space features collaboration tools to support instructors who wish to add to the space as well as student research groups who wish to work together online.

Each *Investigation Space* houses selected data sets, interactive online tools, and curricular materials such as Investigative Case Based Learning modules in order to provide a broad invitational framework for gaining a deeper understanding of the biological sciences. Therefore, Investigation Spaces provide expanded opportunities for learners: (1) to develop skills in the collaborative processes of scientific inquiry, data handling, quantitative analysis, and presenting results; (2) to gain a better understanding of both the requirements and rewards of careers in the sciences, engineering and mathematics; and (3) to become better prepared for making decisions about complex issues involving science, society and technology. Participants will explore connections between fetal development and adult cancer within a new Investigation Space on *Stem Cells and the Sonic Hedgehog Pathway.* We will focus on using resources including datasets, tools, and strategies for engaging learners in interdisciplinary, quantitative and collaborative investigations.

**Art as Experience: Arts Integration into the Science Classroom**

JoElla Eaglin Siuda, *Illinois Institute of Art @ Chicago*

The value of creativity and imagination in a variety of disciplines, has spurred the inclusion of the Arts in non-art classes. The creative process is one of searching for patterns, for orderly connections; using intuition or aesthetic sense, and developing new analogies (Root-Bernstein, 1984). Weisburd (1987) believes that art should play a more central role in education because it stimulates “transmutational thinking between concrete and abstract ideas”. John Dewey, Maxine Greene and Elliot Eisner are some that looked at the Arts as a means of forward movement not only in education, but in life. Expanding horizons, contribution to meaning and value of future experiences, and altering ways of perceiving the world were goals of Dewey; Maxine Greene similarly alluded to aesthetic imagination as a vehicle with which to see things “as they could be otherwise” (1981), as did Eisner in his idea on perception through ‘different lenses’ so as to enrich and liberates cognition so as to develop a ‘literacy of the senses’. He believed that “it is with the spark of artistic vision that one is allowed to see the best that science, language and social interaction has to offer” (1982).

It is armed with this background, that I wish to involve my colleagues in a presentation showing just how patterns, symbols, and artifacts in a commercial Arts college science classroom environment foster multimodal literacy, and is in fact are deeply set in the methodology and assessment of the classroom. This involvement will consist of three parts: 1) a brief looping PowerPoint Presentation of the pioneers of Arts integration, 2) a hands-on activity exemplifying Arts integration in the sciences as a means of viewing how experience, patterns, symbols, and artifacts interrelate, followed by guided discussion, 3) and lastly, viewing of some select pieces from the six offered chemistry, biology, and physics that manifest these interrelations.

Our college, The Illinois Institute or Art @ Chicago is a NCA accredited college here in the Midwest, with a population of approximately 3,500 students. Having degrees such as multimedia, web page design, fashion design, culinary, interior design, game art, etcetera, we are driven by industry standards. Nevertheless, this is tempered with a strong underpinning in general education to place individuals in the workforce not only prepared for their respective careers, but also able to envision what society demands will follow. It is this vision that goes back to the idea of Arts integration in the curriculum. At The Illinois Institute of Art, we know that leaders in Arts integration such as Dewey, Greene, and Eisner have sound ideas, and they are definitely in place in our classrooms.

**PAPERS**

**Session I**

**From Tourist to Ecotourist to Conservation Biologist: Planning Travel Courses to Teach Biology and Responsible Global Citizenship**

Judy Damery Parrish, *Millikin University*

Planning and carrying out field ecology courses should not only allow students to experience and integrate principles of ecology, but also prepare them to understand that in order for conservation of resources to be sustainable, needs of people surrounding the ecological sites must be met. Effective classroom work prior to trips prepares students to recognize the "stars" of many of the textbook examples of biotic interactions, and careful planning allows for the proceeds from tourism to benefit the local economy. Trips can also give students the chance to see the side of environmental debates they seldom have contact with, the side of those who are often negatively impacted by environmental preservation. I will present examples of our ecological journeys to Costa Rica, South Africa, and Alaska. A high point of our courses is the exposure to alternative business ventures that allow the rural poor to achieve and maintain an acceptable quality of life while preserving habitat. We try to expose students not only to the fascinating organisms in their habitats, but also to people deeply committed to finding and implementing alternative ways of feeding their families, while conserving biological resources. Instead of coming away with a gloomy outlook because of the diminishing biodiversity, our students are energized with models of economically workable projects and a vision of how they can improve the outcome. In most cases, student journals show gradual transitions in attitude, from ethnocentric superiority to eco-tourist, with understanding of the major conservation issues at the site.

**The Essential Physics of the Human Body: An Interactive Learning Module for Nursing and Health Science Students**

Mahmoud Khalili[1], Jeremy Dunning[2], Dianne M. Jedlicka[3], Abour H. Cherif[3], Robert Aron[3], Frank Burrows[4], [1]*Northeastern Illinois University*, [2]*Indiana University*, [3]*DeVry University*, [4]*Pearson Custom Publishing*

Utilizing the technical creativity of modern times, Nursing and Health Science students will interact within on-line modules that not only describe and then illustrate the more common Physical laws but they will also play matching "games", fill in boxes, roll wheel chairs up and down ramps…all on their computers, in order to bring home these Physical Laws. Most of the examples and illustrations will focus on the Medical and Health Care fields. Direct applications and illustrations of the Health professions with allow the students a degree of familiarity with the subject and thus make the learning of Physics more appealing. While some math is incorporated into the course, this publication focuses more on applications. DeVry University and Pearson Custom Publishing have teamed up to explore the possibilities on the subject of Physics in the Health Sciences and Nursing. A series of animated and interactive exercises have been created to illustrate Physical Laws in such a way that they will be remembered. Backed up by an illustrated student workbook, once the on-line component is completed, the student fills out the corresponding workbook pages. Students will learn the materials via various formats: by on-line activities, exercises, and animations and also by actual handwritten exercises including "thought questions" of higher order thinking.

**Random Design: A New Paradigm for Creation**

Richard Colling, *Olivet Nazarene University*

Responding to continued assaults on evolution, the National Academy of Science, the American Association for the Advancement of Science, the National Science Teachers Association, and others, issued clear statements that science and the scientific community is not anti-religion. Yet despite these attempts to appropriately define the boundaries of science and faith, a sharp disconnect persists between what science reveals and what many people actually believe. The potential stakes are enormous: Erosion of science definitions to fit political and religious agendas weakens foundations of a democratic society. It even diminishes the long-term viability and credibility of faith.

Polls reveal a key role for education in overcoming this disconnect. Yet effective teaching of evolution presents unique and striking challenges for faculty teaching at secular vs. religious universities, teaching majors vs. non-majors, and for those teaching in secondary or middle schools.

Language matters. Yet with strong confirmations of evolution arising from molecular genetics, learning the complex scientific language can be daunting for students and teachers alike. Another challenge is to find appropriate words in the context of a science class, that acknowledge the validity of student's religious beliefs, thus creating space for open communication and more effective learning.

The current paper addresses some of these challenges, offering a comprehensive solution to the science-faith controversy * Random Design. Random Design grants to both science and faith everything they claim to want: Science is free; God's place is secure.

**Toward a Culturally Inclusive Science Curriculum**

Angela Bauer-Dantoin and Donna Ritch, *University of Wisconsin-Green Bay*

In an effort to create a more culturally inclusive undergraduate science curriculum, a course entitled "Ethnic Minorities in Science" was designed and implemented. The course has the following learning objectives: 1). to understand the history and culture of science in the U.S., in order to recognize what has led to the current under representation of specific ethnic groups in the sciences; 2) to appreciate the often undervalued or overlooked contributions of minority scientists and physicians; 3). to gain a perspective on the disparities in the quality of health care available to various ethnic groups in the U.S; and 4). to identify ways to initiate change and improve the climate for minorities in the fields of science and medicine. Course readings, pedagogical methods and the impact of the course on students' awareness of diversity issues in science will be discussed.

**Session II**

**The Dover Decision**

Neil Baird, *Millikin University*

For six weeks during the fall of 2005, the small town of Dover, PA was the center of national attention at a landmark trial challenging the presentation of "intelligent design" as a "scientific" alternative to evolution. Dr. Kenneth Miller, professor of biology at Brown University, served as an expert witness during the first two days of the trial. He is co-author of the high school biology text used in the Dover Public Schools (as well as at 35% of the nation's other high schools). Miller's trial testimony serves as an excellent mini-course in helping the public to understand this complex issue. Transcripts of the entire 6-week trial are available on-line. Federal Judge John Jones issued his 139-page decision on December 20, 2005 ruling that ID is a form of creationism and therefore clearly violates the separation of church and state provisions of the First Amendment. Judge Jones' lengthy decision is also available on-line. Elements of the trial testimony and decision will be discussed in this session and compared to the balanced treatment "creation science" trials of the 1980s.

**Report from the International Problem Based Learning Conference Lima, Peru**

Margaret Waterman, *Southeast Missouri State University*

This session will report highlights of the fourth International Problem Based Learning Conference held at the Universidad Católica del Perú in Lima**,** July 17-24, 2006. Problem Based Learning (PBL) has many forms (including Investigative Case Based Learning), but in every case, learning begins with a meaningful, realistic problem. In the pursuit of analyzing and solving the problem, students learn appropriate concepts, skills and attitudes, including highly valued skills of information management and collaboration. At the I-PBL conference participants from 50 countries engaged in nearly 300 sessions, workshops and plenary sessions. The sessions featured the use of PBL, creating PBL experiences, and research on learning with PBL in virtually every discipline. The conference website is http://www.pucp.edu.pe/eventos/congresos/pbl2006abp/i01_2.htm

**The First-Year Seminar—Setting Students Up for Success**

Katherine O'Clair and Robert E. Page, *Arizona State University*

This program will describe a First Year Seminar (FYS) course offered by the School of Life Sciences at Arizona State University at the Tempe Campus. The First Year Seminar is a semester-long, 1-credit course with a small enrollment that is centered around a specific topic related to the faculty member's specialization. It is designed to give students the opportunity to interact with top-level faculty and to introduce students to college-level learning and the resources that will help them to succeed in their academic endeavors. While most seminar courses are designed for upper-division students, this seminar allows entering students to become familiar with the tools, technologies, and strategies they would use in future classes. A strong emphasis is placed on the research process, and how to effectively gather, process, and use information, all within the context of the study of a scientific discipline.

In this program, we will share our approach for teaching this course, including curriculum design, instructional strategies and the integration of information and technology literacy. We will also discuss the goals and outcomes, as well as the evolution of the course. A question and answer period will follow the presentation.

**Session III**

**The History of NSF-funded Teacher Education**

Sr. Marya Czech, *Lourdes College*

Eleven years of NSF-funded summer institutes provided our secondary schools with a generation of well-educated and competent teachers of science and mathematics. The institutes made available masters level courses which endowed both breadth and depth to high school science and mathematics curricula. These experienced pedagogues translated their knowledge into the solid teaching of science and mathematics in the classrooms of the 1970s and 1980s. The education and training of today's science and mathematics teachers pales by comparison and may be at least partly responsible for both decreasing interest and lagging test scores.

**Skill-Specific Assessments in Introductory Cell Biology and Biochemistry Courses.**

Melissa A. F. Daggett and Benjamin D. Caldwell, *Missouri Western State University*

Curriculum requirements in the sciences often reflect the importance of a laboratory experience as an opportunity to enhance the learning of science-related skills, content and processes. Most science faculty would agree that laboratories play an important role in enhancing the learning and retention of new information. In today's high tech laboratories and professions, students will be required to work with increasingly sophisticated equipment that many teaching institutions do not have available. However, the lack of experience on sophisticated equipment may not be the most important factor that prevents our students from excelling after graduation, but rather a lack of basic laboratory skills that many laboratory veterans, including faculty, take for granted. In order to ensure that students graduate with the basic skills required for succeeding in the day-to-day operation of a laboratory or as a professional, a series of skill-related assessments are being developed and tested for use in the introductory cell biology and biochemistry courses at Missouri Western State University. These standardized skills can then be assessed later in advanced courses in order to monitor retention. The advantage of developing and using standardized assessment tools will permit changes in future laboratory assignments in order to improve the retention of these skills.

**Easy-to-Use Physiology Lab Kits from iWorx/CB Sciences**

Steve Andre, Technical Support Manager, iWorx/CB Sciences

**Note:** This presentation will conclude at 4:45.

Physiology laboratory kits from iWorx/CB Sciences make it easy to perform human and animal physiology experiments, including exercises on the cardiovascular, neuromuscular, and respiration systems. A typical teaching kit includes the data recording unit, probes and electrodes, transducers, LabScribe software for recording and analyzing data, and courseware to perform over 150 experiments with multiple exercises. One click of an electronic button or two, and data can easily be collected or analyzed. Users can also complete experiments of their own design with the same "click and play" ease.

**Session IV**

**Engaging Non-Science Undergraduate Students in a Practical Human Biology Course**

Christine Bezotte, *Elmira College*

As scientists we are comfortable with the development and execution of the scientific method in our work. To the non-major the term and its significance is often an abstract concept. To this end, many avoid lab based science classes in their Gen. Ed. requirements. In addition, few Human Biology lab manuals offer students exercises significant to them. These two factors combine to generate little enthusiasm for increasing their knowledge base of experimental concepts and the critical evaluation of a question. We developed a course that is a merging of the sciences [biology and chemistry] to investigate a number of the various modalities available which are related to health and how and why to question a "Snake Oil" claim. Students then applied their "scientific evidence" to what they learned about important anatomical physiological body systems. An emphasis was placed on the critical evaluation of product claims by utilizing the scientific method.

**Integrating the Scholarship of Teaching and Research: A Study of Window-Bird Collisions at Millikin University in Decatur, Illinois**

David J. Horn, *Millikin University*

Often considered distinct, the scholarship of teaching and research can be complementary, and provide students with a valuable experience that integrates theory with practice. I describe a class project on window-bird collisions being conducted by undergraduates at Millikin University in Decatur, Illinois. Between 100 million and 1 billion birds in North America die annually in window-bird collisions. However, additional research of factors influencing collision frequency and the development of solutions is needed. Millikin University students are studying window-bird collisions through daily searches for carcasses, as well as studies of bird scavengers and search efficiency. The research is coordinated by biology majors in upper-level courses. These students train non-major students to conduct the study. In addition to training non-major students, upperclassman are asked to present oral presentations and written papers of the research, while non-majors chronicle their experiences through a journal, and write a scientific paper on window-bird collisions. Ultimately, results from this teaching and research program may yield practical solutions to reduce collisions that can be implemented at other institutions while providing a curriculum with personal meaning and value.

**A Scientific "Holistic" Approach to Nutrition and Health**

Dianne M. Jedlicka[1], Abour H. Cherif[1], Sujata Verma[2], Robert Aron[1], and Frank Burrows[3], [1]*DeVry University*, [2]*Ivy Tech State College*, [3]*Pearson Custom Publishing*

Nutrition, Health, and Wellness is a new textbook edited with not only Nursing and Health Science majors in mind but also edited for people who want to learn the basics (including Biology and some Chemistry) about the foods we eat and the fluids we drink. The Digestive System is described in detail including its maintenance and related health issues. The relationship of the Endocrine System with overall health is explained in terms of Biology, Chemistry, and Physics. Also discussed are current ideas about allergies and other disorders, including why some foods might battle or even "prevent" certain conditions. There are sections devoted to biomechanics at the macro level (muscular exercise and fitness) as well as sections focusing on the energetics of metabolic reactions at the molecular level. This is an all encompassing idea and is expressed in a very readable college level text. Not only is the **text** a great resource but so are the accompanying on-line labs, discussions, thought questions, and animations. What a wonderful way to learn using all these multi-media methods and different modes of learning!

**POSTERS**

**A Semester-Long Learning Experience with Aquatic Ecosytems in General Biology**

Chad Scholes, *Rockhurst University***

I use aquatic ecosystems in General Biology II as a teaching tool through the entire semester. The first day of class students are assigned a 3-5 page literature review of ecosystem function that specifically addresses biodiversity, energy flow, and nutrient cycling using primary literature. In the first lab of the semester, students are given the assignment of planning a functional 4-5 L freshwater ecosystem. As part of this assignment, students predict what significant interactions will occur using a model or flow chart, which serves as their working hypothesis. Students assemble their ecosystem after assessing the initial abiotic and biotic parameters two weeks later. The ecosystems are observed at least weekly for six weeks and then are deconstructed and assessed for abiotic and biotic changes. Students then write an individual, formal lab report on their ecosystem experiment, focusing particularly on explaining the significant events that occurred during the six week period (e.g. – growth, death, change in pH). A crucial part of the lab report is the formulation of a revised and significantly more complex model explaining how the ecosystem actually worked. The last component of this process is an essay question on the final exam asking how biodiversity, energy flow, and nutrient cycling interact.

**Developing a Genetic Interaction Map of Cytoplasmic Dynein in *Neurospora crassa***

Laura Salem[1], Sarah Lamb[1], Robert Schnittker[2], and Mike Plamann[2], [1]*Rockhurst University*, [2]*University of Missouri-Kansas City*

Cytoplasmic dynein is a multisubunit complex that functions as a microtubule-associated motor required for organization of Golgi, ER to Golgi trafficking, retrograde transport of organelles in axons, assembly of the spindle, and intracellular transport of viruses such as herpes simplex and rabies. Cytoplasmic dynein function and interaction with various cargoes requires an additional multisubunit complex know as dynactin. A genetic screen has been developed, using the filamentous fungus *Neurospora crassa* that allows the isolation of hundreds of mutants defective for cytoplasmic dynein or dynactin. We took several dynein mutants and used a genetic reversion approach to begin to develop a genetic interaction map of the dynein gene and other interacting proteins.

**Biosafety Education: Drawing Language and Speeches**

Marco Antonio Ferreira da Costa, *Oswaldo Cruz Foundation*

The new orientations of the researches in education, evidence the importance of investigations that privilege the analysis of the discursive dimensions and using images in the processes of teaching-learning of sciences, in situations of class room. In that context, the present study has as its purpose to analyze the drawing language and the speeches produced by 82 students of a course of technical level of the area of health and 12 teachers of the Oswaldo Cruz Foundation / Rio de Janeiro / Brazil. The results, pointed through this technique, demonstrated that the biosafety-learning occurs through the oral and visual language and with a habitual speech, and that the use of the drawing language isn't properly understood by the teachers.

**1 Librarian + Teaching Faculty = Successful Collaborations!**

Andrea Dinkelman, *Iowa State University*

This poster presents several examples of my collaborations with teaching faculty at Iowa State University. The following courses are highlighted: English 105/Microbiology & Horticulture Learning Communities; Biology 313: Principles of Genetics Laboratory; and Biology 394A: Biomes of Australia. I have partnered with faculty in a variety of ways including: developing assignments which reinforce information literacy principles such as knowing how to evaluate information quality; providing instruction on library resources and research techniques; and meeting with students individually to track research progress. These partnerships are a result of a growing concern among faculty that students are often unprepared to identify and use appropriate information resources. This poster summarizes my involvement in the courses and includes classroom activities and student assessment data regarding the library instruction component of the courses.

**Snake Oil or Cure: An Investigation of How & Why It Works**

Melanie Anastasio and Christine Bezotte, *Elmira College*

Non-science majors are quite capable of critically analyzing scientific information when it is presented to them in a context which is familiar to their everyday lives. This poster will detail an interactive laboratory exercise that utilizes the student's natural curiosity for the reasons behind the effectiveness of herbal essential oils. Students studying the body systems through looking at alternative health therapies, scientifically evaluate the therapeutic claims utilizing separation, distillation and chromatographic chemistry and looking at inhibition of microbial growth on medium.

**Undergraduate Teaching Without a Net: A Student-Driven Environmental Biology Course**

Conrad Toepfer, *Brescia University*

During the Spring 2006 semester, I offered a new course, Applied Environmental Science, as an upper-level elective in the biology major at Brescia University, a small liberal arts school in KY. Most students in the course had completed a four-semester biology core but had no prior exposure to environmental biology. In order to strengthen students' critical thinking skills, I designed the course to be almost entirely free of lectures. One particular system, southern LA, was emphasized through the semester, although comparisons also were made to other locations, locally and globally. The course was loosely based on a case study approach with five themes, loss of land in southern LA, the Gulf Dead Zone, environmental health and justice, the energy industry, and introduced species. Students were evaluated on participation in discussion, their coordination of research for one theme, and in their production of a journal in which they independently evaluated material for each topic. At the end of the semester, students provided a subjective self evaluation of their before and after understanding of 36 topics that came up during their research and indicated significant (Paired t-tests, $p < 0.001$) improvement on their understanding of all 36 topics. While my evaluation of the approach was less favorable, it was apparent from class discussions and journals that students' awareness of the existence and complexity of environmental issues did improve over the course of the semester. They also developed a greater level of skepticism and were more willing to question the validity of statements from different sides of controversial issues.

**Histodetective: Using Forensic Pathology to Teach Histology**

Lynn Gillie and Mary Anne Perks, *Elmira College*

Student interest in learning introductory histology can be increased by linking the study of tissues to forensic applications. Students observe and describe standard mammalian tissues using commercially prepared slides. After students are comfortable with identifying the 'normal' set of tissues, they are given a set of 6 unknowns to identify. Each unknown has some type of disease or problem evident through careful observation. The students' challenge is twofold: correctly identify the tissue type, and then describe how it differs from the normal condition. After playing the role of forensic pathologist, students are more likely to see the relevance of learning normal tissue histology.

**The Development and Use of Two-week Long Learning Cycle Blocks (LCBs) in a Freshman General Biology Course for Non-majors**.

John Rushin, Dick Boutwell, Cary Chevalier, Melissa Daggett, Todd Eckdahl and Sandie Seeger, *Missouri Western State University*

This paper describes the development and use of a series of two-week long learning cycle blocks (LCBs) in the laboratory sections of a traditional large (80 to 130 students) non-major general biology lecture. (Each lab section has a maximum of 24 students.) Week 1 of the LCB involves the students in engagement, exploration and concept explanation using short demonstration-type experiments and discussions. During Week 1, the students work in small groups to set up their own directed scientific mini-investigations in order to elaborate upon the processes and concepts learned earlier in the lab period. These independent mini-investigations are completed over the next week and during the next scheduled laboratory period. The results and conclusions of the mini-investigations are shared with the entire class during the Week 2 lab period. An evaluation of the concepts and processes learned by the students during the LCB is also completed at the end of the Week 2 lab period.

**Zebrafish Gene Expression Research in a Molecular Biology Course**

Lisa Felzien, *Rockhurst University*

Integration of research is essential to undergraduate education, as it provides opportunities for students to experience scientific discovery and to become lifelong learners through problem solving. In addition, an active research program in an undergraduate setting allows for faculty and students to remain intellectually active, leading to enhanced teaching and learning as well as an enriched academic environment where inquiry, intellectual curiosity, and questioning are valued. The work detailed here shows a three-step model for a zebrafish research project implemented in a molecular biology course. This approach required students to formulate a relevant question, perform experiments to answer the question, and defend their results in front of their learning community of peers. Ideas for student research projects were generated when students were taught about the molecular biology of cancer and development in the course. Projects were based on these ideas that were supplemented with extensive student research of the literature. The experiments that students completed were: 1) staging embryos at student-determined key developmental time points; 2) determining genes that were logical to examine during zebra fish development, 3) examining whether these genes were expressed during key developmental time points.

**Using Case Studies Online and Face-to-Face to Facilitate Information Transfer in Human Biology for Social Work Majors**

L.J. Swatzell, *Southeast Missouri State University*

Students who will work on a personal level with the public, such as those in social work or criminal justice, require a substantial knowledge of Human Biology and the ability to apply that information to themselves and their work with others. Instruction in Human Biology for this group requires a learning process that can facilitate the complex task of information discovery, personal application, and transfer into social work (information transfer), both in the classroom and online. Therefore, we proposed to test the efficacy of using case studies to facilitate information transfer in Human Biology. One online classroom and one face-to-face classroom were asked to read cases and provide information within an application framework. In addition, students responded to a pre- and post-semester questionnaire to assess attitude toward biology. Ability to provide information improved throughout the semester, but ability to transfer information into an applicable form did not. However, attitude toward biology increased markedly. The data suggest that, regardless of whether the course is online or face to face, case studies are not necessarily effective in facilitating information transfer with respect to others, but are effective in helping students accept that biological information can be meaningful to them personally.

**"From Cob to Corporation" a seemingly simple genetics laboratory that requires complex problem solving .**

Cynthia Horst, *Carroll College*

This laboratory was developed for a first lab in an introductory genetics course. The students are presented with the scenario that they work for a seed company that would like to develop a new strain of corn to market to farmers. The specific assignment goals are for students to:

- Review the concepts of genotype, phenotype and Mendelian inheritance.
- Develop an hypothesis, supported by statistics, describing how kernel color in corn is inherited.
- Develop a detailed plan regarding how a new seed company should proceed to bring a product to market

Although the genetics are straight forward on paper, this exercise incorporates significant problem solving because of the constraints of the organism's life cycle. This allows the students to have early success in the laboratory (figuring out how kernel color is inherited), then forces them engage in problem solving to determine how to most efficiently develop the product. Initially, students will typically propose things like "take a kernel that is homozygous dominant." In response, they are asked "how do you figure out which one that is", or "how many years will it take you to figure that out using your plan, is there a faster way?" Students then write a proposal to submit to their hypothetical boss and the company president that details what gets planted, how many fields it will require, what gets crossed and how many years are required to get a product to market

**Enhancing Student Learning by Creating a Monitored Core Curriculum Coupled to Faculty Development**

Cynthia Horst and Susan Lewis, *Carroll College*

Two key goals of the Biology program at Carroll College are to help students 1) more successfully retain basic concepts and 2) approach their senior research with a solid foundation in scientific methodology. We have identified three curriculum development objectives to help us meet this goal:

1. enhance the investigatory skills of students,
2. model the integration of biological fields across the core courses, and
3. develop and implement assessment strategies across the curriculum that validate practice and identify areas for growth.

To meet our three curriculum development objectives we needed to effect change while building a common vision. To facilitate this process we adopted two strategies: implementing teaching collaboratives, and supporting faculty development to integrate effective pedagogies. These practices have led directly to: 1) redistribution of how some of the content is divided among our four core courses, 2) selection of a new textbook that is appropriate for all four courses, 3) creation of a series of exercises for the core courses that incrementally expand students' science literacy skills and 4) evaluation of assessment tools used for the core courses. Much of the success of this project is due to a series of meetings and events held annually. Because these events are consistently productive, we have found that faculty members are willing to make time in their schedules, and that new faculty have enthusiastically joined in the process.

**New Approaches to First-Year Biology Labs: Moban Landings**

Eric Thobaben, *Carroll College*

Introductory biology labs are an excellent opportunity to tap into student creativity and develop key skills. At the start of the fall semester, the first lab experience often entails the necessary tedium of reviewing the lab schedule, expectations in the course, and safety videos. To spice up the experience of incoming freshmen, we have adopted an exercise where students pretend to be on a scientific expedition from the planet Moba to describe life on Earth. Student pairs creatively describe a common organism and a second, unique organism, then orally share their findings with the class. By hearing varied descriptions of the same organism, students develop a better appreciation and understanding of the importance of description in biology. Student presentions promote self-confidence and reinforce the importance of disseminating your research results in science. This exercise makes the first lab experience more fun and breaks the ice, which fosters more open discussion among students throughout the semester.

**Virtual Poster Presentations**

Eric Thobaben, *Carroll College*

In addition to traditional lab reports, students are sometimes asked to present the results of group research projects through an oral or poster presentation. By adopting the use of “virtual posters” our students are provided an opportunity to practice both of these skills without the expense of printing. Students create meeting-quality posters and project the posters using an LCD projector during their oral presentations. To expedite learning how to make a good poster, students work from a PowerPoint template file that includes text boxes with a fixed font size, boxes for inserting figures and tables, and spaces for appropriate headings. Students immediately wrestle with space limitations, how to balance the use of text and figures, and what key information to include. Because construction of the virtual poster is built into several labs leading up to the week of presentations, student procrastination is avoided, and the quality of student presentations is vastly improved. The students also benefit by retaining an electronic copy their poster to use as a template for creating future posters.