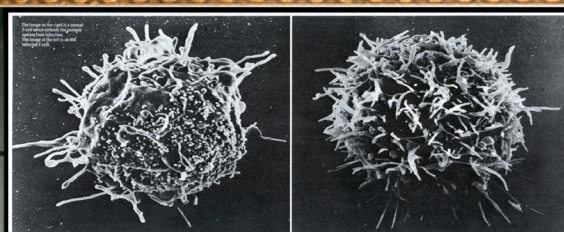
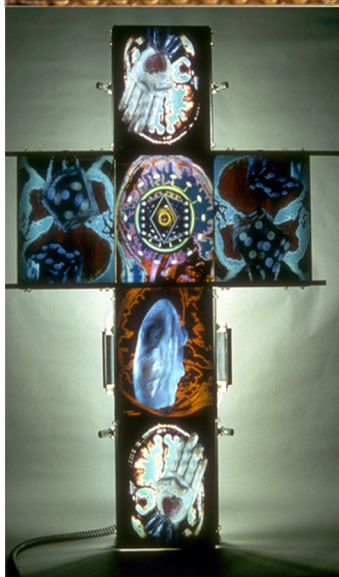
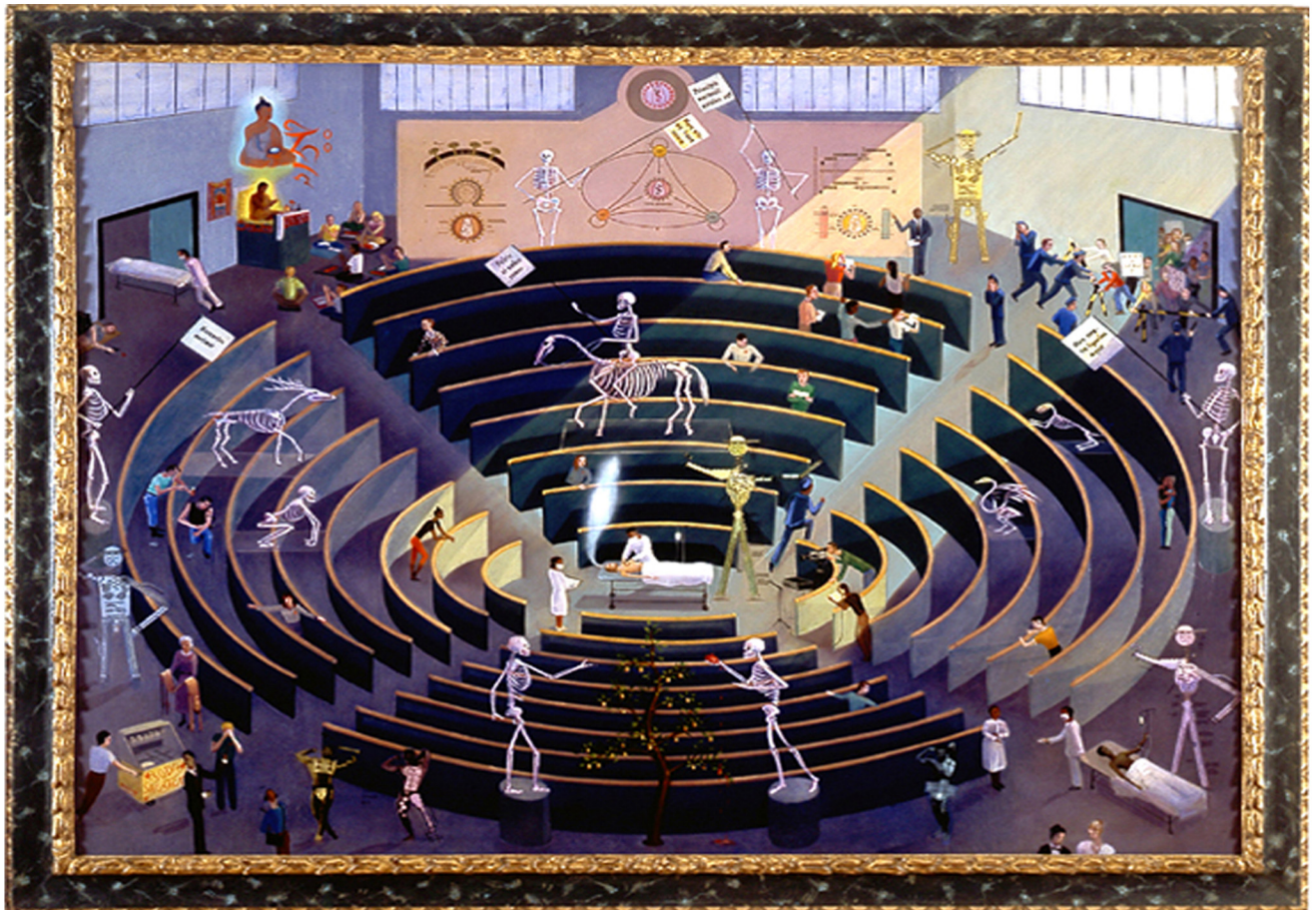


Bioscene

Journal of College Biology Teaching



VISUALIZE THIS.



SILENCE=DEATH

To look at me, you'd never know I was HIV+. I mean I look great. I never know that I have lost 40 lbs. since last summer. I mean I'm standing here beside you and you're reading this like any other person. It happened to walk into the room and you'd never know the difference. I carry within me 24 hours a day. I never know that I must take Bactrim, AZT and ddI and I take different vitamins through my body just to keep my head above water. I'm now I'm managing to stay afloat. But I'm treading water every minute of the day, hoping that I do not tire before a life boat comes to bring me back to dry land. What a joy it would be to feel my feet planted on the sureness of firm ground where expectation and anticipation didn't always include a core of darkness and fear.

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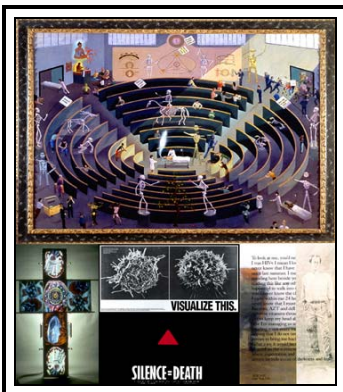
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Please submit manuscripts by
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the next issue.



Cover image: Composite of
the figures from "The Visual Art
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Approach to Teaching About
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article starting on page 15 of
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Bioscene: Journal of College Biology Teaching

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Deadlines for Submissions

April 1, 2003 for the May 2003 Issue

July 1, 2003 for the August 2003 Issue

Studio vs Interactive Lecture Demonstration – Effects on Student Learning

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ABSTRACT: Two delivery methods for a course in Genetics and Evolution were compared using pre- and post-testing of basic concepts to evaluate the effectiveness of each method. The metric $\langle g \rangle$, the gain in learning, was calculated as the ratio of the difference between the post-test and pre-test score divided by the difference between the highest possible score and the pre-test score. The first or studio teaching method involved heavy use of team work by students, hands-on exercises, and minimal lecturing; the second or interactive lecture demonstration method met in a large lecture hall and involved posing questions followed by simulations or other demonstrations of results. The instructor, textbook and other course materials, web sites, and tests were very similar for the two methods. The second method resulted in a drop in student learning from $\langle g \rangle = 0.75 \pm 0.25$ to $\langle g \rangle = 0.46 \pm 0.37$. The results suggest that studio techniques are more effective means of instruction than interactive lectures.

KEYWORDS: Studio, Lecture demonstration, Genetics, Evolution, Student learning, Web tools

INTRODUCTION

It is widely understood that straight lecturing is relatively ineffective when compared with interactive learning techniques such as those that we use at Rensselaer in our studio classes, and those used at other universities under other names and rationales. Studio classes, which consist of a mixture of student exercises, instructor coaching, and sometimes laboratory experiments, draw their inspiration from the idea of interactive learning and generally take advantage of modern technology to deliver instructional materials (Cummings et al. 1999; Roy, 1996; Pipes and Wilson, 1996). However, in cases where an appropriate room is not available, or there are not enough instructors to implement a studio class, it is necessary to resort to a lecture hall or some other large space to hold a class. In physics, a method called interactive lecture demonstration has been shown to enhance the gain in learning $\langle g \rangle$, which is measured as the ratio of the difference between a pre- and a post-test and the difference between the highest possible score and the pre-test. In this method, one sets up a demonstration, and asks the students to predict and write down, with consultation among themselves, their prediction of how the demonstration will work out. One then carries out the demonstration, discusses the results, and presents the relevant theory. The idea is to engage the students, elicit a commitment to a position, confront this with reality, and use this event to trigger reflection and foster understanding. A series of such

exercises substitutes for the usual method of providing a narrative of ideas in physics. Applying these concepts, Cummings et al. (1999) supplemented a studio class in physics with interactive lecture demonstration methods and observed an approximately two-fold increase in the gain in learning.

I have been using the studio method to teach Genetics and Evolution at Rensselaer for several years (Roy, 1996), and recently began using the gain in learning metric $\langle g \rangle$ to keep track of the effectiveness of the course. The class had an enrollment from 10 to 40 students in a section, and 50 to 75 students per year. By combining data from several sections, it was found that the gain in learning was 0.75 ± 0.25 , with some variation within this range that seemed to be dependent on whether the course was taught in the spring or the fall (Roy, 2001). One problem with teaching this as a studio class is that there is only one instructor available, and sometimes it is not possible to have a teaching assistant. Thus, it was necessary to offer the course two or three semesters a year. Partly to deal with this issue, but mainly because of the discoveries in teaching physics described above, an interactive lecture demonstration version of Genetics and Evolution for a lecture hall was designed using the technique of setting up demonstrations, usually using computer programs that simulate genetics experiments. These programs included the Genetics Construction Kit®, the well-known BioQuest® (<http://www.bioquest.org>) program that allows students to design and carry out simulated

experiments in basic genetics. This is a very of data, accept a very wide range of experimental designs from the students, and introduce the students to the pleasures of analysis even when they are not able to work with live organisms in sufficient depth to generate significant data. Other programs, such as Visual Genetics® (Jones and Bartlett Publishers, <http://www.jbpub.org>) were used. These also offer a range of student actions, but are more controlling, giving more guidance to the student at each step of the way. Together, the simulation programs cover a broad array of experiments in genetics ranging from crossing “electronic flies” to gene mapping and DNA sequencing. In cases where there were no programs to illustrate genetic concepts, exercises were drawn up to present students with questions at the beginning of class. Students were required to put down answers to queries about the simulations or concepts, and turn these in for credit (this was nominal, totaling about 2% of the grade). These assignments were not graded in order to encourage participation at every level of preparedness and incidentally to avoid a large increase in the instructor’s workload.

The materials for the course, which included an elaborate web site, the simulation programs discussed above, a discussion board, problem sets, online quizzes, computerized examinations, online notes and external links remained very largely the same as for the studio version of the course (Roy, 1996; Roy, 2001).

METHODS

Running the class

In general, the curricular design could be implemented reasonably well. However, as anticipated, the ideal of entirely replacing narrative with interactive demonstrations could not be fully realized. This was due to two reasons: 1) some topics, such as changes in chromosome number and structure, were not susceptible to the demonstration method; and 2) some demonstrations took less time than planned. Under these circumstances, the traditional narrative method had to be relied upon. However, what was actually delivered included all the demonstrations that were plan, and the class was as interactive as possible.

Attendance

This issue arose over a long period. Initially upon implementing studio methods, a qualitative sense that attendance was “up” was experienced. This was interpret to mean that students were interested in the studio design, at least when it was new. Over time, however, perhaps because this method came to be more familiar to them, attendance appeared to decline. (Student opinion polls followed the same pattern – initially they went up but slowly they receded; this is anecdotally supported by the experience of other instructors, so we seem to be witnessing a kind of Hawthorne effect). Attendance was fostered by giving each student 0.1 course point for turning in the written

sophisticated program that can generate large amounts answers to queries in each class. Attendance was 77% $\pm$ 15% (SD). It was noted that some of the better students stopped coming to class once it was clear that their grades would be high. However, many of the best students attended regularly despite this.

Student opinion

Student opinion polls were distributed and these were sent to an independent firm which produces reports. These reports showed a moderate level of approval, not different from what had seen earlier with the studio method. The primary concern is with the objective metric of <g> to evaluate the technique for teaching this course. No effort was made to modify the instructor’s personality or manner, or in any way to change the degree to which the students would like the course. It is felt that student opinion concerning the instructor’s personality or manner had no affect on the delivery of the course or the performance of the students in the comparisons performed. It seemed that students were more likely to seek out the instructor outside of the classroom than with the studio version. Using the computer to grade tests might seem at first blush likely to cause problems. However, for high stakes exams, students were required to turn in their written solutions to the problems as well as submit their answers via the computer. Partial credit was awarded for those written answers that deserved it. The hard copies of exams were not returned, but photocopies were provided to students on request. The WebCT® tool displays the graded computer exam with feedback for each question. Very few requests were made for re-grading of exams. There was an increase in technical complaints about the operation of the quiz tool in WebCT® (version 3.1); in some instances, it failed to record the answer the student gave. The problem was traced to the use of scrolling mice; it is not felt that any of these factors impacted student performance.

Calculation of <g>

Questions were taken from a computerized database drawn from textbooks or created during the course of several years of teaching Genetics and Evolution (Roy 2001). This course emphasizes genetic mapping, population and quantitative genetics, but includes some molecular genetics. The computer program used to manage the database is WebCT®, which allows tests to be administered and graded automatically. This allows for multiple instances of any single question, and types of questions including calculated, matching, and differentially weighted multiple choice. No essay questions were included and no subjective grading was included in the data for this paper, i.e., the awarding of partial credit does not influence the values of <g> reported here. The tests were not identical, but were judged similar based on experience. The tests were administered under supervision using WebCT®. The post-test was treated

as a final exam, and consistently students were allowed to consult a page of equations for population and quantitative genetics for the final; however, these equations were not needed for solving any of the problems. The difference between the post-test and the pre-test includes not only the experience of the class, but also the motivation that the final exam counted for slightly different proportions of the grade, depending on whether it was in the interactive lecture demonstration version (10% of the grade) or studio version (12% of the grade). The difference between the weighting of the post-test in the two versions was compensated by a 2% award for class attendance for the interactive lecture demonstration version. The lack of opportunity for preparation for the pre-test represents an obligatory part of the design, as this test is needed to set up a baseline for measuring student progress, and this could in principle be vitiated by students attempting to prepare for the pre-test. It was though that the difference between a 10% and a 12% weighting of the final would not have a significant effect on the students' motivation to do well on the post-test.

Overall grades for the course

Slightly less than a fourth of the grade comes from online quizzes, one fourth comes from term papers based on work with simulation programs, and the rest comes from high stakes examinations and about 2% for attendance.

RESULTS

The pre- and post-tests consisted of 15 questions, some with multiple parts, designed predominantly to assess the students' ability to solve linear mathematical problems based on core principles of genetics. The topics ranged from simple Mendelian inheritance to restriction mapping and gene regulation.

The gain in learning $\langle g \rangle$ was calculated as the ratio of the difference between the post-test and pre-test score divided by the difference between the highest possible score and the pre-test score.

Data were combined for three instances of the studio version of the class in a single group for comparison with the interactive lecture demonstration version of the class. An online utility from graphpad.com was used to calculate a two-tailed T-test of the results (Table 1).

The results indicate that the gain in learning for the interactive lecture demonstration was $0.42 \pm .37$, as compared with a mean gain of learning of $0.75 \pm .25$ for studio classes. The T-test indicates that this difference was highly statistically significant: the two-tailed P value was less than .0001 (Table 2).

Overall grades were qualitatively consistent with this pattern, in that the class average for the interactive lecture demonstration version was $74\% \pm 21\%$ (SD), as compared with $85\% \pm 10\%$ (SD) for the studio.

Table 1. T-test of gain of learning. The gain in learning was calculated for each student, based on pre- and post- testing using similar tests for all instances of the class. The mean and standard deviation (SD), and the total number of students in each group are shown above. Studio = combined data for three studio classes of Genetics and Evolution. Interactive Lecture = data from one interactive lecture demonstration class of Genetics and Evolution

Label	Groups Compared	
	Studio	Interactive Lecture
Mean	0.75	0.42
SD	0.25	0.37
N	55	50

Table 2. Unpaired t test results.

P value and statistical significance:

The two-tailed P value is less than 0.0001
By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of Group One minus Group Two equals 0.3300
95% confidence interval of this difference:
From 0.2087 to 0.4513

Intermediate values used in calculations:

$t = 5.3977$
 $df = 103$
standard error of difference = 0.061

The results appear to be clear-cut, and quite different from what was anticipated when designing this project. The goal was to use a method that had been demonstrated to enhance learning in a studio setting, and that appeared to work well in lecture halls. The hope was that, as in some other instances of comparisons between studio and lecture classes, student performance would be about the same, or even that the interactive lecture demonstration would outperform the studio method. The results were quite the reverse of these expectations, however naïve they might have been. The data indicate clearly that the implementation of the interactive lecture demonstration was less effective than the studio version in teaching the students what they were expected to know to answer questions about basic genetic concepts. The range of student performance seemed to be greater in the interactive lecture version. This was reflected not only by the gain in learning measurement, but also was seen in the overall grades. This seems qualitatively to be due to the fact that less able students did more poorly than in the studio class. If the effects had been uniform across all students, the standard deviations

should have been more similar, since the numbers of students in the two groups compared were close to the same. Quantitatively, the grades show less of an effect than does the gain in learning. This probably reflects the fact that more students did reasonably well on the quizzes (which are based on problem sets and are taken under open-book conditions) and the term papers.

The interpretation of the results is open to some debate. Taken at face value, they suggest that studio methods, at least as implemented under these conditions, are superior to interactive lecturing. One could argue that the size of the class has an effect. Combining the data from the studio classes to make this comparison on roughly equal numbers of students, still results in fewer students in a studio class than in the lecture hall. It is thought that size alone does not account for the difference because in a previous study the dependence of grades on class size was rather feeble (Roy, 2001). However, one could also propose that implementation of the interactive lecture

demonstration method was sub-optimal. There are some grounds for believing that is partly correct, since this was a first attempt at interactive lecture demonstration in a lecture hall setting. Some components were not suited for teaching by the demonstration method. It is for this reason that others may take up the challenge and perform further controlled tests of this idea. My own intention is conditioned by duty to my students to try only those ideas that I believe will work to help them learn. From this study, it is not felt that interactive lecture demonstrations, in a lecture hall, are as effective as a full-fledged studio course; for this reason the course will be taught as a studio course in the future.

However, it is worthwhile to make sure the students come to class, by monitoring attendance, and I believe it is effective to include interactive lecture demonstration techniques within the studio setting, as demonstrated by Cummings et al (1999).

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ACUBE

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Biology for Contemporary Living



Modeling the Process of Science: Investigating Sexual Dimorphism in Crayfish

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ABSTRACT: To develop an accurate understanding of science as a method of inquiry, students must actively participate in a scientific investigation in which they utilize the skills, tools, and techniques associated with the formulation and testing of scientific hypotheses. This laboratory investigation engages students in the full range of activities associated with the scientific endeavor, providing an authentic experience with scientific inquiry. While investigating sexual dimorphism with respect to chela size in crayfish, students make observations, function as part of a research team that asks a specific scientific question, formulate hypotheses, devise an investigation, collect and analyze data, and draw conclusions. Evaluations by the students indicate that they find the investigation effective in aiding their understanding of fundamental aspects of scientific inquiry.

KEYWORDS: *science, experimental design, statistics, t-test, sexual dimorphism*

INTRODUCTION

Reports from scientific organizations concerned with the quality of science education recommend that science be presented as a process for acquiring knowledge by engaging students in inquiry-based activities that require the use of tools and techniques commonly used in scientific decision-making. (American Association for the Advancement of Science, 1993; National Research Council, 1996; National Science Foundation, 1996). The rationale for these recommendations is that students come to understand science through actually ‘doing science.’ Doing science involves formulating questions, forming hypotheses, designing experiments, and analyzing data with the aid of statistical tools.

An objective of our introductory courses for biology majors is to encourage students to think and act like scientists through experiences that foster their understanding of the process of science as a method of inquiry. While many laboratory activities are available that involve students in components of the scientific process, few expose students to the entire range of the process. This paper describes an investigative laboratory series designed to introduce students to the scientific process using crayfish. The laboratory

provides students an opportunity to seek answers to a question concerning sexual dimorphism in crayfish using the methods of science, allowing them to model the scientific process in a structured atmosphere.

WEEK 1 Pre-Lab Discussion

The students are introduced to the phenomenon of sexual dimorphism—the occurrence of nongonadal morphological differences between genders that is related to reproduction. Students are asked to cite examples of sexual dimorphism they have observed. Antlers in some deer species and bright plumage in some species of birds are often noted by students and are utilized to expand the discussion of sexual dimorphism.

It is explained that sexual dimorphism does not occur in all species, but when it does occur it typically results from gender-related differences in reproductive potential. Students are asked to identify the determinants of a female’s reproductive potential (the number of eggs she can produce) and discuss the energy investments associated with egg production. Students are then asked to consider the determiners of a

male's reproductive potential (the number of eggs he fertilizes).

The concept of evolutionary fitness is then introduced—the number of copies of his/her genes an individual passes to future generations. Students are asked to consider how males and females can enhance their fitness: males by mating with as many females as possible; females by being selective and mating only with high-quality males.

It is explained that these differences in reproductive strategies frequently result in one or a combination of the following types of sexual dimorphism listed below.

1. Females are larger than males, which occur when a female's egg production is a function of her size; observed in invertebrates (spiders) and most fish.
2. Males are larger than females or possess weaponry (e.g. antlers), which occurs when males physically compete with each other for access to the females.
3. Males possess elaborate secondary sex characteristics (e.g. peacock tail feathers), which occurs when females actively choose their mates. The elaborate characteristics are thought to be an indicator of the male's quality.

Question Formulation

Sexual dimorphism in chela size is known to exist in some decapod crustaceans (crabs and lobsters). In all these cases, the males have larger chelae than the females. Students are shown male and female fiddler crabs and they observe the difference in chela size between males and females. The enlarged chela is utilized in male/male competition, mate attraction and possibly in defense against predators. The students are informed that male crayfish (*Procambrus* sp.) also compete with each other for access to females. The class formally adopts the question: "Do crayfish exhibit sexual dimorphism with regard to chela size (i.e. are chela longer in males than in females'?)?" as the question they will seek to investigate scientifically.

Hypothesis Formulation

It is explained that in any scientific study there are two hypotheses that, if properly formed, are all encompassing and mutually exclusive:

1. Null Hypothesis (H_0): There is no difference or effect between groups (this is the hypothesis that is tested).
2. Alternative Hypothesis (H_a): There is a difference or effect between groups (this is accepted if H_0 is rejected).

There are two general types of hypotheses: directional and non-directional. A non-directional hypothesis (# 1

below) is appropriate in studies in which one is seeking to determine if a measured value differs from a specified value. Directional hypotheses (# 2 below) are appropriate when one is seeking to determine if a measured value differs in a specific direction from a specified value.

Students are presented with the two sets of hypotheses, which are listed below and asked, "Given the observations you have made and the question you are seeking to answer, which set is most appropriate for your study?"

1. H_0 : Male chela size is not different than female chela size (no dimorphism).
 H_a : Male chela size is different than female chela size (dimorphism).
or
2. H_0 : Male chela size is less than or equal to female chela.
 H_a : Male chela size is greater than female chela size.

The students determine that in this study they are seeking to find out if males' chelae are larger than females', thus the second set of hypotheses is appropriate.

Experimental Design

Students are asked how they can test their hypothesis. The idea of measuring and comparing chela lengths from samples of males and females is initially put forward. They are then asked to suggest an appropriate approach by asking "How should size be measured?" Students often suggest several dimensions that could be measured including: length or breadth of either the left or right chela, an average of the length or breadth of the two chelae, and the length or breadth of the longer chela. The class usually agrees to measure the length around the curvature of the larger chela of each crayfish. It is explained to the students that overall body size is a variable that could confound the interpretation of those results if males in general are larger than females. Further, it is noted that total body length may not be a good indicator of body size since the tails of crayfish tend to get damaged as they age. Students are asked how they could control for issues involving overall body length, and guided to the understanding that cephalothorax length would be a better indicator of overall size. Thus, the experimental design involves taking measurements of chelae and of cephalothoraxes lengths and determining the ratio of the two from a sample of male and female crayfish.

Students form research teams of 2 persons and are taught to distinguish between male and female crayfish. Each team selects 5 male and 5 female crayfish. Typically, there are 10 -12 research teams in a laboratory resulting in the use of 100 crayfish. Students measure chela length and cephalothorax

length for each crayfish and calculate mean chela and cephalothorax length for each gender. The instructor collects a copy of the measurements made by each research team for analysis in subsequent lab meetings.

WEEK 2

Pre-Lab Discussion

Student teams record their data (means of chela and cephalothorax lengths for each gender) on a table that is presented to all students (Table 1), and are asked to analyze the data. For most groups, the mean value for chela size of the 5 male crayfish is greater than that for the female crayfish. Students are asked to consider the observed variation among the male means and among the female means, and asked “Do we accept or reject H_0 ?” Typically, students are intuitively hesitant to reach a decision based on the raw data, and it’s noted that their caution is appropriate. The variation in chela length within the male crayfish population is pointed out. The students’ data is used to illustrate that the difference between the means of two samples of males (e.g. Groups 5 and 9 in Table 1) can be as large as the difference between male and female means. This is used to point out that there are two types of variation in a study of this type:

1. Inter-population variation—variation between the study populations (between males and females) that occurs because of the phenomenon being studied.
2. Intra-population variation—variation among individuals of the same population (among males or among females).

It is explained to the students that the challenge for scientists is to determine whether the difference between the two study populations (males and females in this case) represents inter-population variation (males have bigger chelae) or intra-population variation (there is no real difference between males and females), and the relative magnitude of the two types of variations should affect their confidence in stating that sexual dimorphism exists. For instance, if there is a great deal of inter-population variation but little intra-population variation—a large difference between males and females but little difference between different males—then, intuitively, they could be confident in stating that sexual dimorphism exists. Scientists use statistics to determine if the differences are real.

Table 1. Crayfish chela and cephalothorax lengths.

Research Team	Average Cella Lennghth (cm)		Average Cephalothorax Length (cm)	
	Male	Female	Male	Female
1	4.3	4.3	5.2	6.0
2	4.3	3.7	5.4	5.4
3	4.9	3.9	5.2	5.5
4	4.5	3.1	4.7	5.4
5	4.0	3.4	5.1	5.2
6	4.6	3.8	5.3	5.2
7	4.8	3.5	5.4	5.4
8	4.2	3.8	5.1	5.4
9	5.3	3.7	5.8	5.6
10	4.4	3.4	5.3	5.3

Note: n = 5 for each gender, for each research team.

Introduction to Statistics

Scientists utilize statistical procedures to aid in making decisions. Statistical analyses indicate how much difference must exist between two means before we can be confident that the difference is not due to intra-population variation. Stated another way, statistics are tools for distinguishing between inter-population variation and intra-population variation.

Students are engaged in a common activity (coin flipping) to illustrate the point. Borrowing a quarter from a student, the class is asked if they believe that it is a “fair” or equally balanced coin, “how can they test if it is a fair quarter?” Students respond that a fair coin

has a 50/50 chance of turning up heads when flipped. The students are asked to consider the following results from flipping the coin 10 times.

5 heads/5 tails
6 heads/4 tails
7 heads/3 tails
8 heads/2 tails
9 heads/1 tail

They are asked which outcome would cause them to reject the H_0 —that the coin is fair. After taking a poll of students, they are asked “Upon what criteria did you

make your decision?" It is pointed out that they were subconsciously calculating the likelihood of getting each of the results from a "fair" coin. At some point, they decided that the probability of getting that result from a fair coin was so low that they decided to reject the H_0 that the coin was fair. That is what scientists do when evaluating experimental results. Statistics serve as a tool for determining the probability of getting particular results from a true null hypothesis, given a particular sample size.

Scientific Convention

At some point (in the coin example), they intuitively decided that the probability of getting a particular result from a fair coin was so low that they decided to reject the H_0 . Scientists reject the H_0 when the probability of getting their results, given a true null hypothesis, is less than or equal to 0.05. Applying the 0.05 convention to the coin example, if the odds of getting a given result from a "fair" coin is less than 5 times out of 100, you would reject the H_0 . The probability of getting 8 heads and 2 tails (or 8 tails and 2 heads) from a "fair" coin is about 0.087, so you would accept the null hypothesis. The probability of getting 9 heads and 1 tail (or 9 tails and 1 heads) from a "fair" coin is about 0.019, so you would reject the null hypothesis.

The students are informed that there are many different statistical procedures, allowing for the analysis of varying types of data; one of the tests that is commonly utilized for comparing means of samples from two populations is the Student's t-test. The t-test compares the difference between the means of two samples based on the degree of variation within each sample population. With increased variation in each sample (intra-population variation), the greater the difference that is needed between the means of the samples (inter-population variation) before a statistically significant difference is determined. It is possible to get a difference between two means due to intra-population variation, but at some point the difference is large enough that it is unlikely to have occurred because of intra-population variation, and the difference is labeled "statistically significant."

Students are instructed on the use of the student's t-test. One of the research group's data sets is used to demonstrate the calculation of the t-statistic and it is pointed out that the t-statistic is the ratio of inter-population variation to intra-population variation. Intuitively, if that ratio is large, one would feel confident concluding that the inter-population variation is real and sexual dimorphism exists. If, on the other hand, the ratio is small, one would not be confident in concluding that the inter-population is real.

Students are asked, "What is the cut-off between a large ratio and a small ratio?" They are informed that the cut-off is the ratio you would get if the probability of getting a given result, given a true null hypothesis, is exactly 0.05. Luckily, that ratio can be determined

without any further calculations from a table of critical t-values that are constructed using the laws of probability.

Students examine a table of critical t-values and are instructed how it is used to determine if statistically significant differences are realized at given confidence levels. It is explained that the values in the table represent the t-value that they would get if the probability of getting their results, given their sample size and a true null hypothesis, is exactly 0.05. If their calculated t value is greater than the table value (critical t), they should reject the H_0 ; if their t-value is less than the table value, they should accept the H_0 . They are reminded that since they formulated a directional hypothesis, they will be using the critical values for a 1-tailed hypothesis.

As an assignment for the next lab meeting, students are asked to utilize the data they collected to perform a statistical analysis (t-test) to determine if the differences between male and female mean chela length, and male and female mean cephalothorax lengths are statistically significant. During that time the instructors conduct similar analyses on the pooled data from the class.

WEEK 3

Drawing Conclusions/Sample Size

The exercise begins by asking students how many found a significant difference in chela size and in cephalothorax size between males and females. Often some groups find differences in one or both characters between males and females (Tables 2 and 3). They are asked, "What can be concluded from these results?" Most students note the variability of the results, and observe that little can be concluded. They are then asked what could be done to increase the consistency of the results; and helped to understand that with such a small sample size, even if there is true sexual dimorphism in chela size, it is possible to randomly draw 5 males and 5 females that are not different from each other. They are asked, "What can be done to increase the possibility of detecting a difference, if there is one?" Students typically note that by increasing sample size they can increase the ability to find a difference between groups, if one exists.

Students are shown the results of the same analysis using the pooled data that was collected on the first day. A significant difference between male and female chela is typically indicated, and students observe the lowered p-value achieved using the sample size of 50 compared to those utilizing sample sizes of 5 (Table 4). The students are asked "Does this result indicate sexual dimorphism in crayfish?" Students recall the potential confounding variable of cephalothorax size, and observe the results of the pooled cephalothoraxes analysis. The results typically indicate that differences in cephalothorax size are not statistically significant (Table 4).

Table 2. Unpaired *t*-tests for chela length between male and female crayfish

Research Team	Mean Length CM		dF	t-Value	P-Value
	Male	Female			
1	4.32	4.30	8	0.50	.961
2	4.28	3.70	8	1.71	.126
3	4.92	3.90	8	1.56	.158
4	4.54	3.12	8	3.24	.012
5	4.04	3.42	8	1.36	.210
6	4.56	3.82	8	1.63	.143
7	4.78	3.54	8	4.90	.001
8	4.24	3.84	8	0.94	.375
9	5.32	3.76	8	2.03	.077
10	4.64	4.56	8	0.14	.891

Note: n = 5 for each gender, for each research team.

Table 3. Unpaired *t*-tests for cephalothorax length between male and female crayfish

Research Team	Mean Length CM		dF	t-Value	P-Value
	Male	Female			
1	5.24	5.96	8	-2.16	.063
2	5.38	5.44	8	-0.21	.838
3	5.52	5.54	8	-0.76	.942
4	4.72	5.38	8	-1.38	.205
5	5.14	5.22	8	-0.28	.790
6	5.35	5.20	8	0.47	.649
7	5.36	5.36	8	0.00	1.000
8	5.10	5.42	8	-1.17	.278
9	5.76	5.58	8	0.46	.659
10	5.30	5.34	8	0.14	.894

Note: n = 5 for each gender, for each research team.

Table 4. Unpaired *t*-tests between male and female crayfish.

Chela Length					
Mean Length (cm)					
Male	Female	dF	t-Value	P-Value	
4.52	3.70	98	5.42	<.0001	
Cephalothorax Length					
Mean Length (cm)					
Male	Female	dF	t-Value	P-Value	
5.89	5.44	98	0.73	.467	
Chela/Cephalothroax Ratio					
Male	Female	dF	t-Value	P-Value	
.867	.679	98	7.72	<.0001	

Note: n=50

Students are asked if they are now comfortable concluding that there is sexual dimorphism in crayfish chela size. The vast majority indicates that they are now comfortable drawing this conclusion. Next they are asked, "What could be concluded if they observed a difference in chela size *and* a difference in cephalothorax size?" Students typically realize that little could be concluded. It is explained that it is possible to have true sexual dimorphism both in chela size and in body size (as measured by cephalothorax size), and the analysis conducted does not allow one to distinguish between that possibility and the possibility that sexual dimorphism exists only in size.

Students are then asked how they could determine if true sexual dimorphism exists in chela size, regardless of differences in cephalothorax size. It is suggested that the best approach would be to calculate the ratio of chela length to cephalothorax length for each gender and then use the Student's t-test to test for a difference in the ratios. They are shown the results of that analysis, indicating a difference between the genders and the existence of sexual dimorphism (Table 4).

INSTRUCTOR NOTES

There are several ways that this exercise could be modified or expanded to fit the needs/approaches of individual instructors. For example, students could use total body length instead of cephalothorax length as a measure of size. Cephalothorax length was chosen because it gives an opportunity to discuss the fact that there may be more than one way to measure size and that some are more reliable than others. It was decided to wait until the end to point out the weakness of the approach (the inability to detect sexual dimorphism in chela size if there is also sexual dimorphism in body size). This gives the students the opportunity to learn from their mistakes and gives the opportunity to place strong emphasis on the importance of sound study design. Occasionally, a perceptive student will detect the weakness at the beginning and discussion of measurements and comparisons of the ratio will occur

at that time. In the 'Honor's' sections of this course the students are given an introduction to the primary literature, an introduction to using Internet and library tools for searching the primary literature, and instructions on writing in a scientific format. They are then given the assignment of preparing a manuscript of their investigation in a form suitable for publication in a scientific journal. The following is a brief list of relevant primary literature that our students typically find in their searches: Bildstein et al., 1989; Gavey and Stein, 1993; and Stein 1976.

STUDENT EVALUATION

The rationale for developing this laboratory series was to involve students in an authentic scientific investigation in which they experience the full range of science as a method of inquiry. It was hoped that by involving students in scientific investigations early in their program of study, they would develop an understanding of science upon which we can build in subsequent courses.

Given that this laboratory experience was the initial exposure of many of our students to the range of the scientific process, the educational objectives of the investigations center on increasing students' experiences with and appreciation of science as a method of inquiry. To assess student perceptions of the effectiveness of the laboratory series, the students were administered a five-item survey at the end of the investigation (Table 5). The evaluation (which was filled out anonymously) asks students to rate each aspect of the laboratory series on a numerical scale according to the degree to which they agree or disagree with each statement.

Overall, the mean scores suggest that students believe the laboratory investigation fostered their understanding of fundamental aspects of the scientific process. Most students indicated a degree of agreement with each item. Few students indicated that they disagreed with any item, though a moderate number were neutral about particular items.

Table 5. *Student evaluation of effectiveness of the laboratory exercise.*

QUESTION: As a result of the laboratory exercises I believe I:	Score	SD
Possess a deeper understanding of the process of science (scientific methodology). Disagree 1 2 3 4 5 Agree	3.84	0.9
Have a greater understanding of the role of statistics in science. Disagree 1 2 3 4 5 Agree	3.98	0.9
Have a greater understanding of the role of hypothesis formulation in scientific investigations. Disagree 1 2 3 4 5 Agree	4.00	0.8
Have an increased understanding of the significance of study design (control of variables, sample size, etc.) in scientific investigations. Disagree 1 2 3 4 5 Agree	4.03	0.9
Am more comfortable reading/analyzing reports of scientific findings. Disagree 1 2 3 4 5 Agree	3.66	1.0

Note: n = 148

CONCLUSIONS

To develop an accurate understanding of science as a method of inquiry, students must actively participate in scientific investigations in which they utilize the skills, tools, and techniques associated with the formulation and testing of scientific explanations. Often, we find that students in our introductory biology classes have an incomplete conception of science as a discipline due to their limited experience with science as a method of inquiry. This laboratory investigation is designed to engage students in a full range of activities associated with the scientific endeavor, providing an authentic experience with science as a method of inquiry. Students make observations, are a part of a research team that asks a specific scientific question,

formulate hypotheses, devise an investigation, collect and analyze data, and draw conclusions using statistical tools.

Initial feedback suggests that students believe the laboratory experience provides them with an increased understanding of the process of science, the role of statistics in science, the role of hypothesis formulation in scientific investigations, the significance of study design, and enables students to be more comfortable interpreting scientific findings. Students conduct this laboratory investigation early in the semester. We believe it fosters their understanding of the process of science as a method of inquiry, and provides experiences upon which we can encourage them to think and act like scientists.

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Call for Applications -- John Carlock Award

This Award was established to encourage biologists in the early stages of their professional careers to become involved with and excited by the profession of biology teaching. To this end, the Award provides partial support for graduate students in the field of Biology to attend the Fall Meeting of ACUBE.

Guidelines: The applicant must be actively pursuing graduate work in Biology. He/she must have the support of an active member of ACUBE. The Award will help defray the cost of attending the Fall meeting of ACUBE. The recipient of the Award will receive a certificate or plaque that will be presented at the annual banquet; and the Executive Secretary will provide the recipient with letters that might be useful in furthering her/his career in teaching. The recipient is expected to submit a brief report on how he/she benefited by attendance at the meeting. This report will be published in Bioscene.

Application: Applications, in the form of a letter, can be submitted anytime during the year. The application letter should include a statement indicating how attendance at the ACUBE meeting will further her/his professional growth and be accompanied by a letter of recommendation from a member of ACUBE. Send application information to:

Dr. William J. Brett, Department of Life Sciences, Indiana State University, Terre Haute, IN 47809; Voice -- (812) 237-2392 FAX (812) 237-4480; E-mail -- lsbrett@scifac.indstate.edu

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Truman State University

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Living in the contemporary world requires an ever-increasing need for biological information and understanding. Students are facing issues such as understanding emerging diseases, spread of invasive species, stem cell research, loss of habitats and species, and implications of the human genome project. How are we meeting the need to educate students in a biocomplex world?

Presentations and workshops addressing other topics are welcome; here are some examples of potential presentations:

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Many of you have addressed these issues in creative ways. Please consider sharing your ideas and techniques at the ACUBE 47th Annual Meeting at Truman State University in Kirksville, MO in 2003.

Please email your 200 word abstract AND mail a hard copy of the abstract with the completed form BEFORE May 31, 2003 to

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Proposed Title: _____

(Please print clearly)

Presentation type: _____ 90 minute workshop _____ 45 minute paper _____ Poster

(Rank your choice)

Equipment/facility needs: _____ 35 mm slide projector _____ Overhead projector
 _____ Macintosh projection system _____ Macintosh computer lab
 _____ PC projection system _____ PC computer lab
 _____ Other: (explain)

Name of presenter: _____

Work address of presenter: _____

Phone No. presenter: _____ email _____

Please include names and contact information for additional presenters on back.

The Visual Art of HIV/AIDS: An Interdisciplinary Approach to Teaching About HIV/AIDS

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ABSTRACT: Undergraduate education is shifting from fragmented subject areas to unified disciplines. To add to the growing interdisciplinary awareness, we are suggesting an approach to teaching the biology of HIV/AIDS by using the visual art that relates to this pandemic. Our reasons for formulating an alternative biology curriculum are: (1) to address different learning styles, thereby increasing the students' understanding of the material; and (2) to affirm the interconnections between biology and art, and to stimulate creativity among students. We detail how pieces of art can be used to initiate discussions about biological/medical consequences of HIV/AIDS, history of the epidemic in the US, and the emotional ramifications of this disease. By describing this integrative curriculum, we provide a means of uniting intellectual boxes which academia traditionally separates.

KEYWORDS: HIV/AIDS, visual art, interdisciplinary approach, visual learners

INTRODUCTION

Undergraduate education is shifting from fragmented subject areas to unified disciplines. Surging popularity in interdisciplinary education is attributed to the practical aspect of addressing various learning styles of students (Gardner, 1999; Kirby et al., 1998). The widespread development of interdisciplinary curricula also is due to the valid pedagogical ideology articulated by Gardner:

Education in our time should provide the basis for enhanced understanding of our several worlds—the physical world, the biological world, the world of human beings, the world of human artifacts, and the world of the self (Gardner, 1999).

Incorporating the visual arts with other disciplines positively affects the students who learn most effectively with images. Verbal learners only need words for comprehension of a concept, but the image

learners need pictures and diagrams (Banner & Rayner, 1997).

There are indeed precedents for using the visual arts within the realm of the science curriculum. Chicago's Columbia College reinforces the interconnectedness between the disciplines of science and art in an interesting way. By the end of science and math courses, students must complete an art assignment in any medium that creatively portrays a particular science or math concept (Papacosta & Hanson, 1998). Northern Arizona University offers an interdisciplinary course that connects art, math and chemistry. Topics of discussion include the mathematics behind Renaissance one-point perspective, the chemistry of conservation and restoration, and how the atmospheric conditions might alter works of art (Kelley et al, 2001). This paper, uniting the study of HIV/AIDS with works of art and extends the current interdisciplinary approach in science education and the arts.

Representational works of art can augment at least three broad areas of discussion: the biological/medical aspects of HIV/AIDS, the history of the

epidemic itself, and the emotional consequences for people living with the disease.

Why use art to teach about HIV/AIDS instead of simply reading a textbook? Our reasons for formulating an interdisciplinary biology curriculum are: (1) to address different learning styles, thereby increasing the students' understanding of the material and (2) to affirm the interconnectedness of biology with art to potentially stimulate creativity among students. The separation of the intellectual boxes of art and science is outdated.

Linking Biological/ Medical Issues to Art:

The teaching of the biological and medical ramifications of AIDS can be divided into three main subject areas: basic information on HIV, the progression of the disease, and possible medical treatments for those infected. To understand the basics of the virus, students must be exposed to the physical structure and genetic makeup of the virus; they also must understand the specific interaction between the virus and the host's CD4+ immune cells. To coincide with teaching about the effects of the virus, we recommend showing a piece like Nancy Burson's *Visualize This* (1991) (Figure 1). This modified "diptych", is part of a collaborative poster project to

help the public visualize the effects of the disease,; it portrays a healthy T cell on the right juxtaposed against an HIV-infected T cell on the left. Another piece useful for this discussion is Joseph Kosuth's *Guests and Foreigners* (2001) installation of murals in the boardroom of the Wall Street headquarters for AmFar (Hammond, 2001). It furthers the discussion of the HIV structure by presenting mural-size computer-generated graphic representations of the virus and its surface proteins with a timeline of major events in the pandemic, such as when the virus was first identified, superimposed.

Using both of these examples, one can discuss what is meant by the visual references to viral structure and the infection process. By displaying artwork with images of the viral structure, students can picture the structure with various surface molecules. A deeper understanding of the HIV/CD4+ interaction is gained by visualizing the depicted surfaces and how they connect to produce infection. The topics of conversation in the classroom then can extend into the HIV entry mechanism, the integration of the viral genome into the host DNA, potential areas of vaccine research using the molecules pictured on Kosuth's mural, and more.

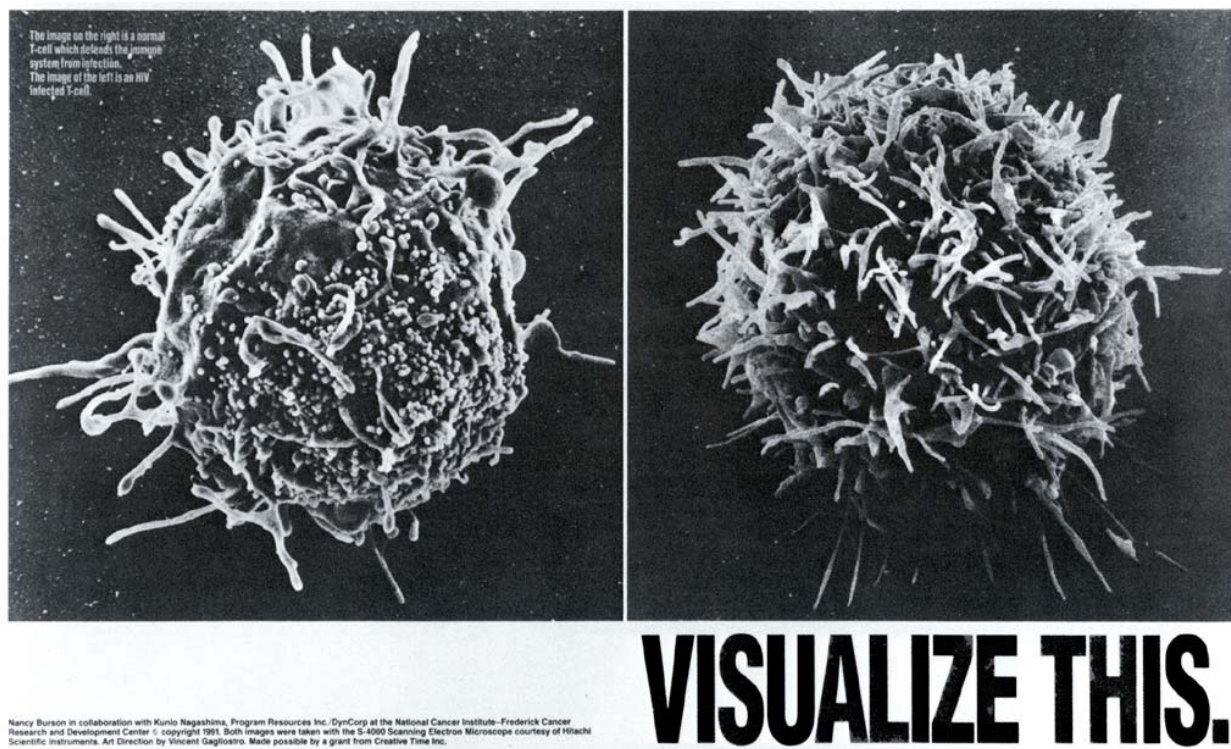


Figure 1. Visualize This (1991). Poster. Nancy Burson. Courtesy of the artist.

Burson's and Kosuth's images show the interrelatedness between science and art. One cannot separate the art from the science in a work like *Visualize This*. The electron micrographs of T cells and her artistic intentions meld together in her poster. Likewise, Kosuth utilizes computer representations of cellular surfaces to relay the importance of selected events found in the superimposed timeline.

To describe the progression of AIDS, one must include all stages, from the infection by HIV to the eventual death due to opportunistic disease(s). Two works of art are good examples of this disease progression. The silver gelatin print created by Rosalind Solomon called *Garden, New York* (1988) illustrates the concept of immunosuppression and infections by portraying the Kaposi's Sarcoma lesions on the calves and feet of an AIDS patient standing in a garden (Atkins & Sokolowski, 1992). To represent the wasting syndrome in the advanced stages of AIDS, Greer Lankton created a seven-foot tall mixed-media sculpture of two emaciated bodies sitting next to each other, called *Freddy and Ellen* (1985). While slightly humorous, this work of art could show students how an artist responds to the reality of potentially losing 50% of one's body weight in six months (Schoub, 1999).

Showing pieces similar to Solomon's and Lankton's artwork allows educators to address the range of opportunistic infections in AIDS patients. At a glance, the artwork appears to be illustrating strikingly different illnesses. The emaciated bodies look far removed from the lesions on the anonymous man's legs. Teaching the students about how HIV causes the destruction of the immune system and leads to the opportunistic infections can connect these two images in a meaningful way. Our hope is that students will absorb the artistic portrayals of human figures and grasp the extent of potential infections.

How health care professionals treat people living with AIDS, from diagnosis to hospitalization, also may be considered through various works of art. Robert Farber, in his *Western Blot Series*, makes reference to one of the HIV diagnostic techniques. By showing a work like his *Western Blot No. 15* (1992) (Figure 2), the professor can review the variety of AIDS medications indicated in the text Farber superimposes over his self-portrait: "I must take acyclovir, Bactrim, AZT and ddI and many different vitamins throughout the day just to keep my head above water" (Farber, 1997). Along with drug developments, the hospitalization aspect of the AIDS experience must be considered. Frank Moore's surrealistic hospital imagery proves most pertinent in this case. *Arena* (1995) (Figure 3) shows the hospital as a bizarre operating theater of nine circles with the doctor and AIDS patient at the center (Baker, 1994). The artist's portrayal of the hospital environment provokes various interpretations, from a place of medical relief to one of eminent death.

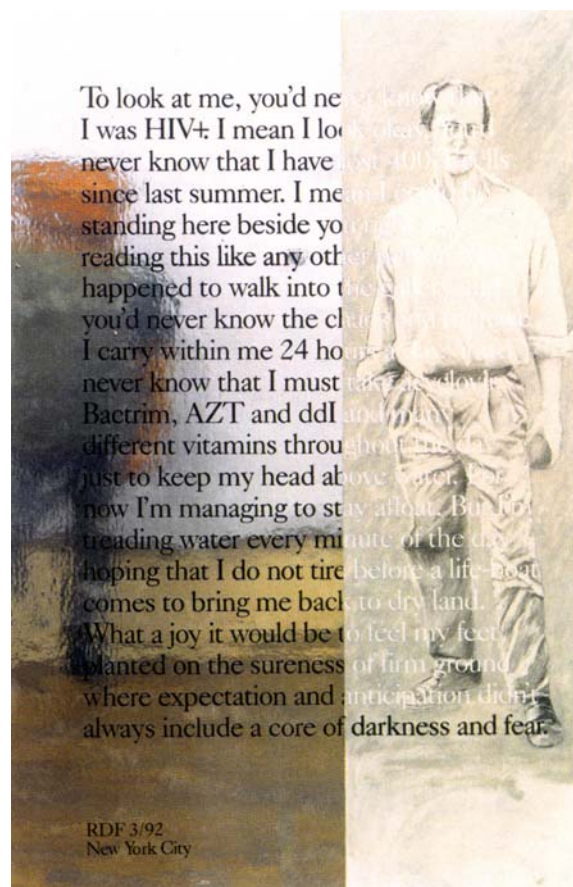


Figure 2. *Western Blot #15* (1992). Mylar, oil, and charcoal. Robert Farber. Courtesy of the estate of Robert Farber.

The Farber and Moore examples stimulate discussion on current health care of AIDS patients by making direct reference, verbally and pictorially, to medical treatment. The images again, will serve the needs of visual learners as they are exposed to images detailing the medicine involved. These works depict the outline of the disease from diagnostic testing to the final stages of advanced AIDS. Highlighting the title of Farber's piece offers an opportunity to introduce the students to the Western blot technique and its use in identifying the presence of HIV. Farber's superimposed text makes reference to the variety of medications employed in the suppression or inhibition of HIV and can lead into a discussion of their effects and possible future methods of combating this disease. Detailing how these drugs suppress or inhibit the action of HIV is extremely valuable in education on medical treatment. When talking about how the final stages of the disease frequently involve hospitalization, one could point to the pictures of physicians performing various procedures on patients in Moore's painting.

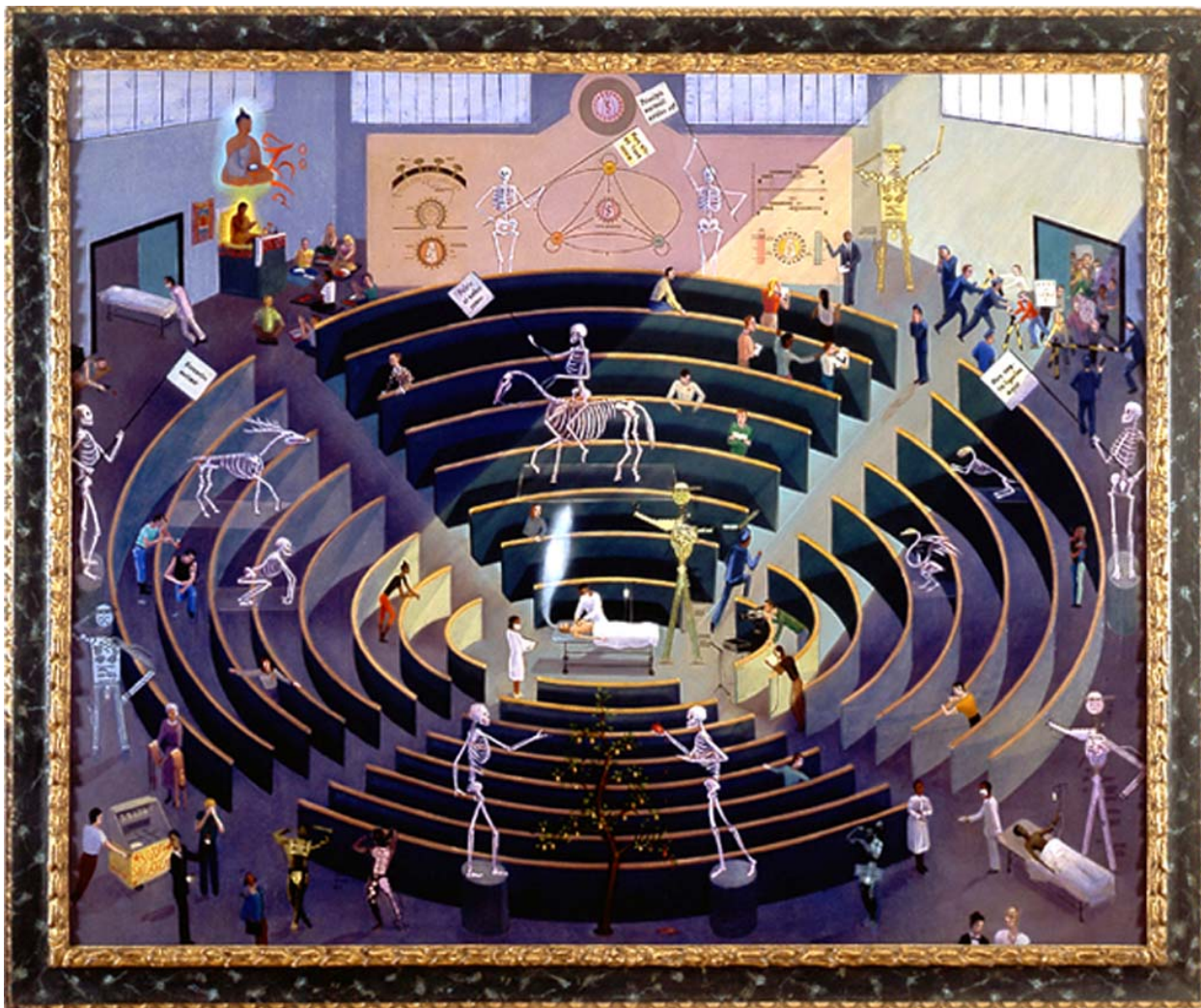


Figure 3. *Arena* (1992). Oil on canvas with wood frame. Frank Moore. Courtesy of Collection Gian Enzo Sperone, New York. Courtesy of Sperone Westwater, New York.

Epidemic's History through Art

In addition to the biological and medical issues of HIV/AIDS, the history of the epidemic in the United States must be explored in the classroom setting to emphasize the social and political issues involved.

The epidemiology of HIV in the US, originating in homosexual populations at the coasts and spreading into all aspects of society, can be demonstrated with HIV/AIDS artwork. The initial artistic response was that of gay activism artwork, indicating one of the initially infected populations. Certain works can help inform students about the initial responses to the epidemic. While some individuals were referring to AIDS as the "gay plague" and WOG ("wrath-of-god"), activists were creating work like "Silence = Death" (Figure 4) and "Fight Homophobia, Fight AIDS" (ACT UP, 2000; Baker, 1994; Brandyberry & MacNair, 1996; Miller, 1992). A stellar example of public figures' disdain for people with AIDS is the ACT UP piece entitled *Let the Record Show* (1987). The work,

part of a window exhibit at the New Museum of Contemporary Art in New York, lines up the conservatives (like Jesse Helms) to mimic a prison. The image of an anonymous surgeon exemplifies the hateful response with his quote: "We used to hate faggots on an emotional basis. Now we have a good reason" (Baker, 1994; Wallis et al, 1999).

An understanding that everyone is at risk for HIV, not just homosexuals and drug users, became clear as the disease spread to other groups in the United States. Beginning in 1986, cases of heterosexual, mother-to-child, and transfusion-associated transmission were publicized (Miller, 1992). Artists like Jackie Kirk responded to the changing face of the AIDS epidemic. Kirk's painting of facial portraits in the early 1990s pictured AIDS patients, male and female, young and old, from various ethnic and social backgrounds (Watten, 1991). Her work clearly indicates that the term "gay plague" is inaccurate.

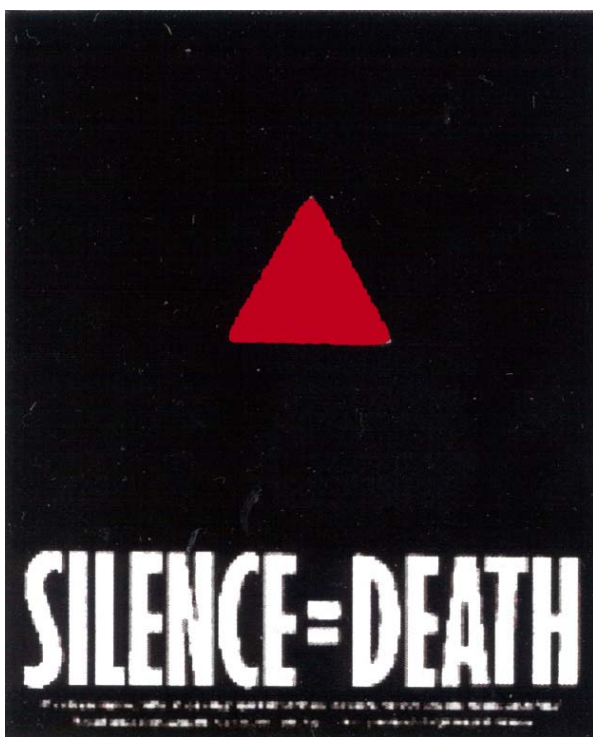


Figure 4. Silence = Death (1986). Poster. Act UP Group. Courtesy of ACT UP.

With these art works, students can discuss issues related to epidemiology, transmission, and responses of the community to HIV/AIDS. Viewing the art chronologically demonstrates how the artistic community responded as the scientific community disseminated more information on the disease. As the scientific understanding of the disease increased, so did the images portrayed in the artwork.

Our expectation is that students will become more aware that biological information can be obtained from many sources, including the walls of art galleries.

Emotional Consequences in Art

The effects of AIDS reach far beyond physical symptoms. The disease has been linked to various emotional issues like depression, anxiety, and stress (Clay, 2000). One cannot discuss HIV/AIDS without bringing up such emotional aspects of the disease. Artwork is one way to express the physical and emotional concerns of AIDS patients.

Viewing a variety of artistic responses to HIV and AIDS dramatically expresses to students a range of emotions and issues that each patient must confront. To highlight the anger and frustration of being diagnosed with HIV, the work of Sue Coe would be helpful. She is able to capture very vulnerable emotional moments of AIDS patients in her drawings

and prints. Often, she adds textual elements describing feelings and thoughts of the patient.

Sexuality and AIDS have been inextricably linked since the epidemic's beginnings. Any person who contracted the virus was perceived as having engaged in homosexual activities or drug use (Patton, 1993). Many patients had to reconcile sexual behavior with an HIV+ status. The impact of an AIDS diagnosis has dramatic effects on patients and/or their lovers and should be discussed when teaching about HIV/AIDS.

Various notions of sexuality, from condemnation to education, present themselves in the work of AIDS artists. Keith Haring, taking an activist stance, frequently drew cartoon-like images referencing safe sex. His images cover everything from subway walls to tote bags. Frank Moore approaches the issue of homosexual sexuality in a more haunting light. His *Debutantes* painting shows two homosexual couples riding through a garden where images of torturing gay men fill the landscape (Baker, 1994; Harris, 1993). It is important for students to be aware that the type and amount of sexual activity vary greatly among people and are worth discussing.

Along with sexuality, spirituality should be addressed as it overtly appears in a great deal of the artwork around HIV/AIDS. Individuals facing a chronic illness like AIDS often turn to spirituality for solace. Previous research has noted the correlation between levels of a spirituality and mental health in people living with AIDS. Finding meaning in life using spirituality is a common occurrence following diagnosis (Fryback & Reinert, 1999; McCormick et al, 2001).

The absolute death sentence of HIV diagnosis causes artists to explore the supernatural in their work. Questions of God, salvation and the after-life provoke powerful creative responses. For example, Niblock-Smith sets up a mixed media installation called *Personal Best* (1992) where the central image references the AIDS patient as Christ-like with stigmata. The recurring imagery of the cross also could be pointed out in the artwork as a direct reference to spiritual seeking. For example, the group (ART) created a cross of colorized CAT scans from an AIDS patient with an image of the virus at the intersection of the cross (Atkins & Sokolowski, 1992) (Figure 5).

We are not trying to simplify the emotional experiences of people living with AIDS by breaking them down into neat categories. We only encourage educators to discuss both the biological *and* emotional consequences of infection. Even when discussing the biology of HIV/AIDS, the epidemic cannot be forced into a neat pamphlet on CD4+ cells and safe sex. Coe, Moore and Niblock-Smith are just a few artists who highlight how the biology of HIV/AIDS is linked to emotional and psychological issues.

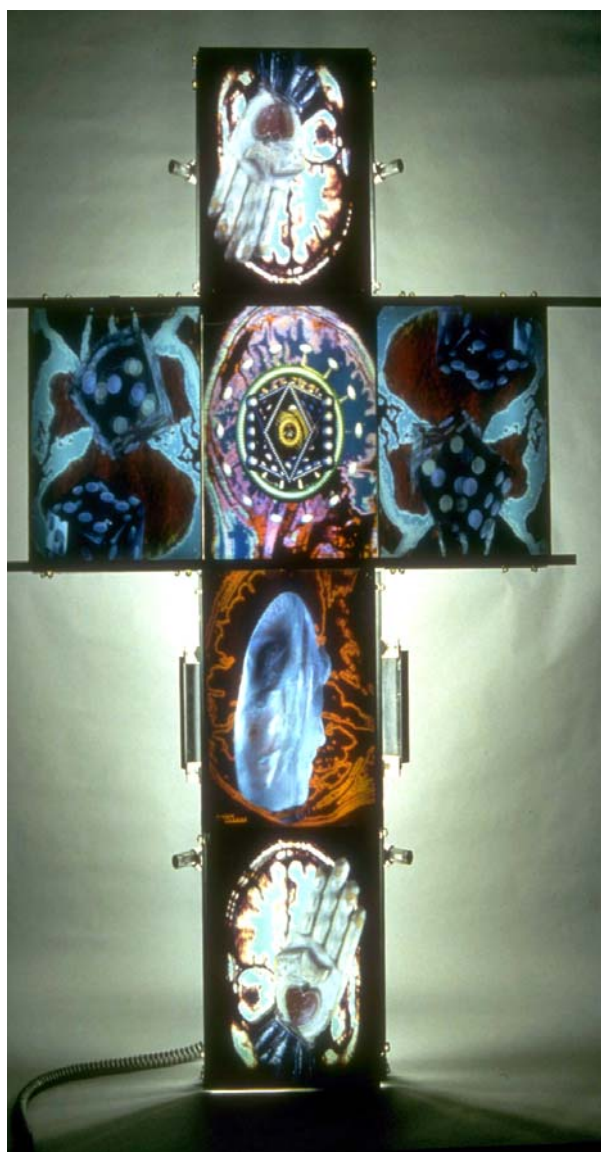


Figure 5 . Messiah (1987). *PHSCologram sculpture*. (ART)ⁿ. Courtesy of (ART)ⁿ.

CONCLUDING THOUGHTS

A vast amount of artwork exists surrounding the HIV/AIDS epidemic (Table 1). Artists are continuing to respond to the AIDS experience. The products of their creativity can be incorporated into the classroom setting, generating a variety of benefits.

A primary goal of our curriculum is for more students to become aware of the variety of educational materials on HIV/AIDS. Supplementing lectures on HIV/AIDS with works of art engages visual learners in an active way. As we have shown, pertinent biomedical concepts, epidemiology in the US, and patients' emotional issues can be addressed by introducing works of art into the classroom. These

works can act as a stepping off point for discussions and create a deeper understanding of the material for visual learners. Stimulating more groups of learners embraces a major educational goal of enhancing the understanding of all students.

One of the goals of our curriculum is to utilize the connections between the visual arts and biology to teach about HIV/AIDS. In demonstrating connections between HIV/AIDS biology and visual art, we hope to disprove the notion of separate and distinct disciplines. Our educational system tends to compartmentalize the subject areas, labeling students as "right-brained" or "left-brained". In doing so, the potential connections between areas of study are neglected. We need to recognize the similarities between the creative mind of the artist and the creative mind of the scientist. As Colin Tudge eloquently states:

"The point is to show that the artist and the scientist are bent on a common endeavor, which is to say something true and interesting about the universe, that their notions are complementary, and that for most of their journey they can travel in tandem, or indeed in unison." (Tudge, 1998)

By examining the connections between the visual arts and the biology of HIV/AIDS, we affirm Tudge's point of the common journey.

As a final goal, we hope a curriculum of using the arts when examining HIV/AIDS will promote healthy behavior among students. College students are among the most educated populations about HIV/AIDS; however, as a whole, they do not perceive themselves to be at risk (Brandyberry & MacNair, 1996). One of our hopes in creating the HIV interdisciplinary curriculum is to establish both the human and the biological sides of the disease. Seeing the art created from those actually dying from the disease or affected by it hopefully will make the risk seem more tangible to students.

By bringing the arts and biology together, as seen in the HIV curriculum previously outlined, we are moving toward an interdisciplinary understanding of two seemingly disparate topics. We are moving also toward an academic approach that more effectively engages different types of learners. The truth is that our world consists of paintbrushes and micropipettes working simultaneously. Our teaching methods should reflect this reality, these daily interconnections.

ACKNOWLEDGEMENTS

We would like to thank Verna Case, Georgia Ringle, and Julie Ivins for their helpful review of this manuscript.

Table 1. Books and Web Sites Containing HIV/AIDS Art

Books

- Atkins, R. and T. W. Sokolowski (Curators). From media to metaphor: Art about AIDS. 1992. Independent Curators Incorporated. New York.
- Desire: Contemporary photography from the Visual AIDS archive project (Contact Sheet). 1999. Light Work. New York.
- Farber, R. Someday: Robert Farber, a retrospective. 1997. Brandeis University. Waltham, MA.
- Gott, T. Don't leave me this way: Art in the age of AIDS. 1994. National Gallery of Australia. Canberra, Australia.
- McGovern, T. Bearing witness (to AIDS). 1999. Visual AIDS: A.R.T. Press. New York.
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Web Sites

- Keith Haring -- <http://www.haring.com>
- Visual AIDS -- <http://www.thebody.com/visualaids>
- ACT UP -- <http://www.actupny.org>
- Light Box -- <http://seurat.art.udel.edu/Events/lightbox/index.html>
- Sue Coe: AIDS Portfolio -- <http://www.graphicwitness.org/coe/aids1.htm>

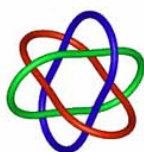
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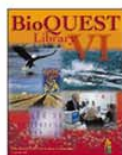
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Web-Based, Active Learning Experiences for Biology Students

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ABSTRACT: Educational research shows that learning is enhanced by experiences that help students challenge preconceptions and connect new concepts to prior knowledge. While it is often difficult to provide “hands-on” learning experiences in large classes, the Internet offers the opportunity to create classroom and laboratory lessons that are engaging, self-paced, and encourage critical thinking. Although a growing number of online exercises exist, broken links and labor-intensive assessment preclude their easy adoption. We have developed a website that avoids these problems and teaches students about exotic species, their introductions, and their potential impacts. Students are provided with background information, a glossary, and online quizzes that allow self-paced, investigative learning that builds on prior knowledge and challenges misconceptions. Our website addresses concepts that form a foundation for understanding ecology, pest management, and environmental ethics. These concepts are relevant to multiple biology classes, including introductory biology, ecology, biogeography, and human ecology. Key features of the website are (1) its self-contained, non-linear design; (2) a learning environment that allows students to test ideas without penalty; (3) real-world examples; and (4) built-in assessment tools that evaluate both background knowledge and student learning. We believe this website provides an excellent model for designing and implementing active learning exercises using the Internet, and that other biology educators can enhance their courses by developing similar websites to teach other concepts.

KEYWORDS: Online exercise, active learning, exotic species, website design, preconceptions

INTRODUCTION

Science works because those conducting science search for answers to unknown questions through the scientific method. The scientific method combines the investigator’s prior knowledge and experience with observation and experimentation to falsify incorrect hypotheses. Laboratory exercises and other “hands-on” lessons allow students in college and university science courses to experience the process of science first-hand. These experiences allow students to actively participate in their own learning, an important condition for the act of constructing meaning (APA, 1992). However, in many lower division classes, large class size and constraints on time and resources limit the implementation of such exercises. Professors and instructors often fall back on lecture-style delivery of information, perhaps augmenting lectures with multimedia aids. While this approach is an efficient way to deliver content, traditional lectures may not effectively challenge the preconceptions that students

bring to class. Unless the students’ existing understandings are explicitly drawn out, misconceptions will persist (Bransford et al., 2000). In addition, students learn faster and retain information longer when new concepts are connected to their prior knowledge and experience (Caine and Caine, 1994). These connections can be achieved by engaging the student’s curiosity, challenging his or her misconceptions, and providing opportunities to explore ideas and construct new meaning (Carin and Bass, 2001).

While technology may not necessarily provide a panacea for the challenges of teaching large classes, educators have increasingly turned to Internet-based exercises to improve interaction and enhance learning. Moreover, as universities, colleges, and private companies launch more and more websites, students are able to use search engines to quickly reach sites where the webpage creator has provided a concise summary of the concept under study. Many of these

web pages are, in essence, short lectures that impart knowledge through facts and clear-cut examples, rather than alternative outcomes. In addition, web-based lessons often require a writing assignment or other time-consuming assessment tools (such as checking links to multiple web pages) that are difficult to implement in large classes.

We have developed a website that allows students to go beyond simply searching for factual information, which is based on a constructivist approach to learning. Using an inexpensive web-authoring package (Sausage Software 6.5) and Internet resources that are free to educators (<http://school.discovery.com>), we created the "ESCAPE" website, a site that allows students to investigate multiple real-world examples of the impacts of exotic species on North American ecosystems. The site lets students assess their background knowledge via a pre-test, learn more about twelve species that occur in North America, and take a post-test to see what they have learned. The corrected results of both the pre- and post-test are emailed to the student and the instructor, making the exercise easy to implement with large classes.

The ESCAPE website has several important structural features that make it a useful model for teaching other biology concepts. This paper will discuss each of these key elements in detail, and indicate how the website has been successfully tested in our classes, and discuss some general principles of website design.

THE ESCAPE WEBSITE

Background

The ESCAPE website was created to help users learn about the positive and negative impacts of introducing species to new areas. The issues surrounding exotic species introductions are of particular concern, because exotic species have become a serious threat to the nation's economy and environmental health, directly costing the U.S. economy over \$130 billion per year. This is a remarkable figure and it accounts for only a small proportion of the more than 4,500 established exotic species in the United States (U.S. Congress, 1993). In fact, only about one in ten species that are introduced become established and of these, only about one in ten cause significant economic harm (Williamson and Fitter, 1996).

Beyond the economic impact, the introduction and spread of invasive species pose a tremendous threat to ecosystem health because they potentially exert a multitude of significant effects on the environment. These threats include competitive exclusion of native species (sometimes leading to extinctions), alterations in the natural patterns of disturbance (such as increased frequency of fires), and reduction in habitat quality for wildlife and recreational activities. Exotic species pose direct threats to

than resources that allow students to learn through active investigation of multiple examples with agriculture, through decreased crop yields, toxic reactions in livestock and vectoring crop diseases.

It is important to note that not all exotic species are this troublesome. Most ornamental plants, agricultural crops, and domestic livestock are not native to the North American continent. It is also important to understand that some species that are intentionally imported escape and become serious pests. The reasons for introduction of exotic species are varied, ranging from intentional introductions for use in agriculture, biological control, and aesthetics to accidental introductions.

The problem of exotic invaders is likely to worsen rather than improve. Federal inspectors who are charged with interception and exclusion of pests at points of entry face increasing challenges created by an ever-changing global economy and an ever more mobile society. Personnel involved in these safeguarding activities are capable of inspecting only a small proportion of the materials arriving on our shores. Therefore, it is likely that as more people and goods are moved across continents, we will see a rising number of initial infestations resulting in greater chances that new invasive species will become permanently established. As these exotic invaders become entrenched, both the costs associated with eradication, control, and management and the impact on threatened native species rise dramatically (U.S. Congress, 1993).

Efforts to contend with the impacts of invasive species in North America were strengthened in 1999 when President Clinton signed Executive Order 13112 (Anonymous, 1999). This order mandates that federal agencies take action to address the problem of exotic species that become invasive. Government agencies were directed to pursue programs that prevent new introductions, expand and improve detection and monitoring, provide resources to ensure compliance with laws and regulations, and promote the use of native species for ornamental purposes. A key step in achieving these goals is public education and the development of environmental ethics in the general public. The ESCAPE website furthers these goals through exploration of case studies.

Key features

The ESCAPE website was designed to contain all of the information necessary to complete the exercise. Unlike Web Quests that direct students to gather information from other web sources, this site provides a wealth of content for students to explore. External links are used only to facilitate extended investigation. Missing or broken links are minimized and do not affect the user's ability to meet the learning goals. The site's non-linear navigational layout allows users to access information in any sequence desired, so students

can actively choose to view first the subjects they find most interesting.

questions, which they glean from a series of quizzes that are structured to give positive feedback for both correct and incorrect responses. These quizzes ask students questions about selected native and exotic species and test their knowledge of the species origin, importance, management, etc. Correct answers lead to either another question about the same species or a list of links to further information. Incorrect answers reveal the reason the selection was not the correct response and supply hints that lead the user toward the correct choice. This design allows students to test their knowledge without penalty for guessing or choosing incorrect responses. The pre-test and post-test are authentic assessments in that they present students with the same task as the quizzes, to select the correct response from a list of choices. The pre-test assesses the students' pre-conceptions, engages their initial understanding, and assists them in assimilating the new information by activating the framework of knowledge they already possess. The post-test assesses the students' learning gained from exploring the ESCAPE site materials.

The quizzes use information on real examples of exotic species introductions, as well as a few native species that might be mistaken for exotic. These examples cover a broad range of taxa (insects, vertebrate animals, and plants) and include both familiar species like dandelion and more obscure examples, such as the Jerusalem cricket (Figure 1). The quizzes present a variety of scenarios, so students hopefully learn that species introductions can result in very different outcomes. Some species are clearly beneficial, such as wheat and corn, while others are major pests, like leafy spurge. In some cases, the problems and benefits of introduction are not so clear-cut.

For example, one quiz focuses on the mosquitofish, *Gambusia affinis*. Students are asked about the distribution of the fish (native to the southern U.S., but widely introduced outside of its original range), which allows them to address whether a species native to one region of a continent is considered exotic when introduced to other parts of that continent. The students are also asked to hypothesize about the reasons for mosquitofish introduction (biological control of mosquitoes) and its impacts on target and non-target organisms (mosquitofish are generalist predators which often cause more problems than good outside of their native range).

As another example, students explore information about purple loosestrife (*Lythrum salicaria*). Purple loosestrife is native to Europe. The reasons for its introduction are unclear but most likely it became established as a contaminant of ballast soil. Students are asked how they think that early scientists

The post-test encourages students to find the correct answers to a set of multiple choice questions recognized that purple loosestrife was an introduced species. The answer (by observing its rate of spread) helps students to understand that native species usually have defined ranges because of competition and natural enemies. Then students are asked to discover the properties of loosestrife that make it invasive (many seeds, fast growing) and its ecological effects (obstructing waterways) as well as its potential benefits (as a nectar source for honey production).

As these examples indicate, students who work through the ESCAPE web site are engaged in cross-disciplinary, problem-solving exercises. As they discover the correct answers to the quiz questions, they gain insights into the complex issues surrounding exotic species introductions.

Effectiveness of ESCAPE as a learning tool

The ESCAPE web site was evaluated with two classes of undergraduate biology and education students. A class of 17 upper-division non-Biology majors was given the task of using the ESCAPE site as an in-class activity. A similar take-home assignment was given to a class of 25 upper-division elementary education majors. Students received points for taking the pre- and post-tests and for providing feedback about their ESCAPE experience.

Improvement of test scores

There were dramatic increases in the number of correct answers from pre-test to post-test for both in-class and take-home assignments. On the pre-test, both classes had similar background knowledge, averaging 39% (range 20% to 60%) correct answers for in-class users and 37% (range 25% to 60%) correct for take-home users. On the post-test, in-class students improved to 77% (range 45% to 100%) correct and take-home students improved to 72% (range 25% to 100%) correct. Thus, post-test scores increased 95% and 101% over pre-test scores on in-class and take-home assignments, respectively.

Time requirements

During the in-class exercise, students spent an average of 34 minutes exploring the ESCAPE site, with a range of 22 to 54 minutes between pre-test and post-test submission. Time spent on the exercise was partly constrained by the 75-minute class period. Students who explored the website as a take-home assignment averaged 48 minutes between tests with a range of 7 to 122 minutes. Although student scores on the post-test were weakly correlated with time spent on the site, some students chose to explore the external links for more information, and users who explore these links require more time to explore the site's content.

Exotic Species Quiz

Test your knowledge about non-native species in North America. Each answer will link to a new page containing more information. Links at the bottom of the page will allow you to return here. Good luck!! For a challenge, you can keep track of how many you got right on the first try.



[Dandelion](#)



[Leafy Spurge](#)



[Mosquito Fish](#)



[Honey bee](#)



[Purple Loosestrife](#)



[Colorado Potato Beetle](#)



[Jerusalem cricket](#)



[Corn](#)



[Wheat](#)



[Home](#)



[Intro](#)



[Ecology](#)



[About](#)



[Glossary](#)

Figure 1. Exotic species quizzes feature a diversity of taxa and include species that are native, that are exotic but beneficial, that are exotic and harmful, and which have mixed positive and negative impacts.

LESSON PLAN FOR USING ESCAPE IN THE CLASSROOM

Audience: This activity is designed for use with undergraduate college students. The topics covered are relevant to a number of courses, including general biology, ecology, pest management, and geography. This exercise could also be adapted for a high school biology class or a graduate course in environmental studies, ecology, or biogeography.

Previous Knowledge Needed: Background knowledge in biology and ecology is helpful but not necessary. The web site provides a brief introduction to the topic, necessary background information, and a glossary.

Objectives: After completing this exercise, students will be able to:

- 1) Distinguish between exotic and native species.
- 2) List reasons for the introduction of exotic species.
- 3) Explain why some exotic species are beneficial, some are neutral, and others are harmful.

Time Requirements: This activity can be completed in a 75-minute class period or assigned as a take-home project.

Materials: Students will require individual computers with access to the Internet and a web browser, such as Internet Explorer or Netscape. Additional resources for enrichment might include newspaper articles on exotic and/or invasive species, pictures, readings from the bibliography, etc.

Procedure:

1. Direct students to the ESCAPE website at <http://www.unk.edu/ESCAPE>.
2. Click on the "Quizzes" button on the left of the screen and select the "pre-test" link.
3. The pre-test will ask students twenty multiple-choice questions about plant and animal species found in North America.
 - A. Direct students to choose the best answer for each question.
 - B. At the end of the test, students enter their name and the instructor's email address. Upon submission, the quiz is corrected and emailed to the instructor. Students will then be directed back to the ESCAPE site via a link.
4. Students explore the ESCAPE web site to learn about the species featured in the quizzes.
 - A. The "Introduction" page contains information about exotic species and their ecological and financial impacts in North America.
 - B. The "Ecology" page provides information about the role an organism plays in an environment, where it occurs, and what limits its population size.
 - C. The "Quizzes" page contains links to a series of self-tests over 12 species. Students can explore the quizzes in any order they choose and may follow external links for further information on species of interest.
 - D. The "About ESCAPE" page provides information about the project and the authors, as well as email addresses for the authors.
 - E. The "Glossary" page provides definitions for terms that are used throughout the site.
5. After exploring the site, students return to the "Quizzes" page and take the "post-test". Again, students should enter their name and instructor's email at the bottom of the test page to submit their scores.

Follow-Up and Discussion Suggestions:

- For species featured on the exotic species quiz, classify the effect of introduction on U.S. economy as positive, negative, or undetermined.
- What ecological and life-history features of the problem exotic species make them so detrimental?
- Are humans an exotic species in North America? Why or why not?
- What procedures might be used to prevent the introduction of invasive species to new areas?
- How does knowledge of exotic species biology help us to design means of controlling those species?
- As an extra challenge, ask students to research and write a quiz for a species not covered on the ESCAPE web site.

Additional Resources:

- Devine, Robert S. 1998. *Alien invasion: America's battle with non-native animals and plants*. National Geographic Society, Washington, D.C.
- Elton, Charles S. 1958. *The ecology of invasions by animals and plants*. University of Chicago Press, Chicago.
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GENERAL DESIGN CONSIDERATIONS

We believe that the design features of the ESCAPE website allow users to explore ideas, test hypotheses, and learn efficiently. Websites of similar design could be created to deliver many types of biology concepts. Should a professor decide to enhance his or her course with web-based, active learning exercise, there are a few important points to consider.

Choosing a theme

The first step in creating an online learning module is to choose a theme. A theme or central question provides the framework for developing the rest of the site. The theme should be broad enough to present unresolved biological questions and multiple examples with contradictory answers. Because of the interdisciplinary nature of biology, the theme of the site can cut across sub-disciplines and include social and ethical components as well as basic biology. Moreover, by using multiple examples that provide different answers, students can better understand the reason hypotheses are not proven, studies are repeated, and scientific debates are often fierce.

Specific Learning Goals

Whereas the theme of a website can be very broad, open-ended, and imaginative, the learning goals and assessment must be specific to avoid overwhelming or confusing students. Both the information presented and the assessment tools should be closely linked to the selected learning goals. The website should provide enough background material for users to understand the concepts, regardless of their prior experience, but should be succinct and understandable by the intended audience.

Assessment

Online quizzing and student feedback require either expertise in programming languages or the use of freely available Internet resources. For this website, the Discover Center's quiz-making program was used. This program is user-friendly and the resulting quiz is hosted free of charge from the Discovery channel website (<http://school.discovery.com>). This allowed construction of a multiple-choice quiz, with multiple options for correction and reporting. On this website, student answers and resulting scores for both the pre- and post-tests are reported via email to the instructor and to the student.

Copyrights and page elements

Enhancements to the site such as pictures of a specific organism or habitat greatly improve student comprehension and enjoyment. While traditional Web Quests do not require attention to copyright law, developers of self-contained Internet sites must either use public-domain materials, obtain permission to use copyrighted images, or generate their own pictures. For his site, copyright-free materials from the United

States Department of Agriculture were used and pictures were created using a digital camera. Additional enhancement to the site can be the inclusion of external links. However, the key elements of the site should be self-contained, providing users with all the information necessary to discover the answers to the post-test. This is an important feature because it avoids the problems of broken links that result from changing servers, changing web addresses, and removal of information from the World Wide Web.

User-friendly style

A user-friendly website is easy to navigate, avoids excessive jargon, and defines terms that are unfamiliar to users. Sites that are visually pleasing and provide an appropriate amount of graphics invite exploration. In developing a new website, one may wish to obtain style and layout ideas from other sites or consult a good reference book, such as Lynch and Horton, 1999. Site designers must also ensure that their code is compatible with at least the two major browsers, Netscape and Internet Explorer (Niederst, 1999).

CONCLUSION

The Internet offers the opportunity to create classroom and laboratory experiences that encourage students to think critically, and enjoy self-paced exploratory learning. Although a growing number of online exercises exist, design limitations constrain their easy adoption across a broad curriculum. Among these limits are differences in site design that prevent ready integration with existing course materials, difficulty in assessment, and lack of clear educational goals. As such, these limits often result in a view that online exercises or educational websites offer little for most biology classrooms. This website involves the students in a learning atmosphere where they are the investigators. In addition to the results of the pre- and post-tests, students were asked about their experience. Use of this website resulted in high student enthusiasm, an almost doubling of knowledge from pre- to post-tests, and a desire from students to have more exercises of this type.

This approach to web-based exercises encourages critical thinking and provides a mechanism for students to experience the multi-disciplinary nature of biology. Moreover, by allowing students to explore the topic, they learn to think like scientists and experience the joys of intellectual inquiry.

ACKNOWLEDGEMENTS

The development of this web site was supported by a grant from the USDA Cooperative State Research, Education, and Extension Service (Project Award No. 2001-38411-10784), by the University of Nebraska at Kearney, and by the USDA Agricultural Research Service. We appreciate suggestions for improvement from Drs. Charlie Bicak and Leon Higley on an earlier version of this manuscript.

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Call for Nominations Honorary Life Award

The **ACUBE Honorary Life Award** is presented to ACUBE members who have made significant contributions and/or service to ACUBE and the advancement of the society's mission. The award is presented at the annual fall meeting of the society.

If you wish to nominate a member of ACUBE for this award, send a Letter of Nomination citing the accomplishments/contributions of the nominee and a *Curriculum Vita* of the nominee to the chair of the Honorary Life Award committee:

Dr. William J. Brett, Department of Life Sciences, Indiana State University
Terre Haute, IN 47809, Voice -- (812) 237-2392, FAX (812) 237-4480
E-mail -- lsbrett@scifac.indstate.edu

Call for Reviewers

We are looking for persons who are willing to review manuscripts for *Bioscene*. We need reviewers for a wide variety of subject areas. Reviewers should be willing to provide in depth reviews and detailed suggestions for authors concerning revisions necessary to improve their manuscript for possible publication. Reviewers should be willing to provide a rapid turn-around time for the manuscripts they review. If you are interested in reviewing for *Bioscene*, please send an email that includes your phone number, FAX number, and a list of the areas for which you are willing to review to: William Brett, Chair of the Editorial Board, at lsbrett@scifac.indstate.edu.

Manuscript Guidelines for *Bioscene: Journal of College Science Teaching*

A publication of the Association of College and University Biology Educators

Manuscripts submitted to the Bioscene should primarily focus on the teaching of undergraduate biology or the activities of the ACUBE organization. Short articles (500-1000 words) such as introducing educational resources provided by another organization, reviews of new evolution software, suggestions for improving sampling methods in a field activity, and other topics are welcome as well as longer articles (1000-5000 words) providing more in depth description, analyses, and conclusions for topics such as introducing case-based learning in large lectures, integrating history and philosophy of science perspectives into courses or initiating student problem solving in bioinformatics.

Please submit all manuscripts to editor(s):

Ethel Stanley
Department of Biology
Beloit College
700 College St.
Beloit, WI 53511
stanleye@beloit.edu
FAX: (608)363-2052

Timothy Mulkey
Department of Life Sciences
Indiana State University
Terre Haute, IN 47809
mulkey@biology.indstate.edu
FAX: (812) 237-2418

We prefer receiving manuscripts as Rich Text Format or RTF files to facilitate distribution of your manuscript to reviewers and to work on revisions. You can mail us a disk or attach your file to an email message with the subject line as **BIOSCENE**. All submissions should be double-spaced and may follow the style manual for publication you are currently using such as APA. You will also need to include:

title
author(s) information:
 full names
 name of your institution with the address
 email address, phone number, and/or fax number
brief abstract (200 words or less)
keywords
references in an appropriate format

Please refer to issues of the Bioscene from 1998 or later for examples of these items. You can access these issues at: <http://acube.org/bioscene.html>

Graphics are desirable! Lengthy sections of text unaccompanied by tables, graphs or images may be modified during layout of the issue by adding ACUBE announcements or other graphics. While tables and graphs may be included in the manuscript file, images should be submitted as individual electronic files. If you are unable to provide an image in an electronic format such as TIFF for Macintosh or BMP for Windows, please include a clear, sharp paper copy for our use. At this time, graphics will be printed as grayscale images with a minimum resolution of 300 dpi and a maximum resolution of 1200 dpi. Cover art relating to an article is actively solicited from manuscript contributors.

Upon receipt of your manuscript, an email or fax will be sent to the author(s). The editor will forward your manuscript to the chair of the editorial board. Within the next two weeks or so, your manuscript will be sent to two reviewers. You should receive comments when changes are recommended from the reviewers prior to publication of the article. Manuscript format is usually retained as accepted; however, limits of publishing the issue may affect the length of an article. Graphics may be added by the editors when lengthy sections of text are unaccompanied by tables, graphs or images. Previously published work should be identified as such and will be reviewed on a case-by-case basis. Your article will appear in the Bioscene and then on the ACUBE website: <http://www.acube.org> shortly after the issue date.



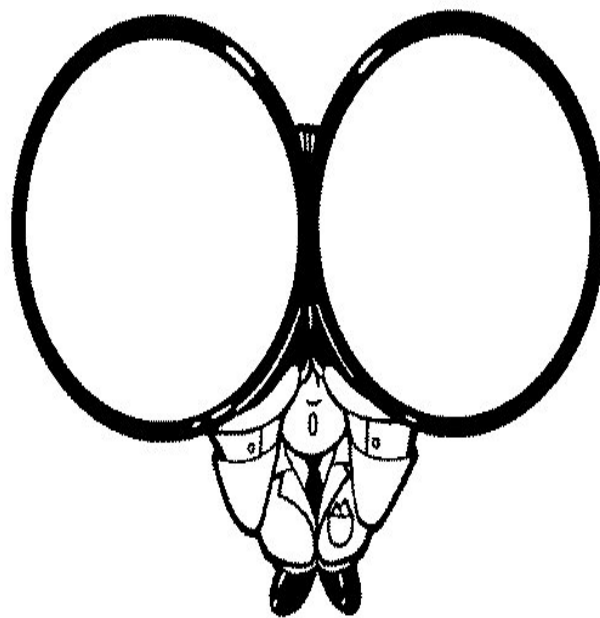
Rear View Mirror -- Looking Back

Edward Kos
ACUBE Historian

The Annual Meeting of ACUBE for 2003 will be held at Truman State University, in Kirksville, Missouri on October 9-11. The theme for this meeting is "Biology for Contemporary Living". Please mark this on your calendars as a must meeting; its content is always germane, and we encourage you to bring a friend or two. Check *Bioscene* for more details or the website, <http://acube.org>. The theme for the 2003 Annual Meeting can be found in many of the presentations of past meetings, since how we teach is always a function of how we live, and under what societal shifts and changes.

The Seventh Annual Conference of AMCBT (parent of ACUBE) took place at Purdue University, Lafayette, Indiana on October 11 and 12, 1963. This meeting followed the format of the earlier meetings in that it consisted of a series of Panel Discussions on a variety of topics in which the membership participated. Panels on Introductory Biology, Genetics, Structure-Function, Ecology, Cell Biology, and Developmental Biology were held over the two days, along with exhibits by various suppliers of biological materials, equipment, and books. A high point of the meeting was the introduction of the newly fashioned A-V method of handling the Introductory Biology lab sections. Dr. S. Postlethwait pioneered this methodology to handle the hundreds of students in the introductory lab sections. Labs ran 24 hours-a-day/7 days-a-week and consisted of a series of stations with self-explanatory observational and experimental exercises. The labs had assistants to facilitate the student's progress along with self-testing procedures for immediate feedback. For most members of AMCBT the A-V method was truly a unique experience.

The Seventeenth Annual Meeting of AMCBT took place at Iowa Central Community College, Ft. Dodge, Iowa on September 21-22, 1973. The theme for this meeting was "Biology Recycled", recognizing that we somehow always manage to go back for something in our past teaching experience to use today. This meeting was one in which the format was starting to change. It began with a series of Special Topics papers: Determination of Bacterial Populations using Side-arm Cuvettes; Use of Photography in Biology Classes; Marine Biology with Field Experience for Midwestern Schools, and; Multisensory Approach to Elicit Appreciation. Five Group discussed the Luncheon Speaker's topic, "Liberal Arts vs. Career Education". A special addendum after these group sessions covered the topic, "Group vs. Individual



Testing in Ecology Class". Saturday's sessions included Group Discussions of: Writing Behavioral Objectives; Career Opportunities in Allied Health Programs; A Workshop on Simulations/Games for Biological Instruction; Computer Simulations in Biology; Career Opportunities in Horticultural and Environmental Technology; BIO-TECH Modules; and a repeat of the Simulations/Games session. A new feature of the meeting was the Film Festival in which many of the then newly produced films for biology instruction were shown in a continuous sequence throughout the two days of the meeting.

The Twenty-Seventh Annual Meeting of AMCBT was held at St. Olaf College, Northfield, Minnesota on September 30 and October 1, 1983. The theme was "Déjà vu (Here We Go Again)". I remember how it seemed in the planning, that we kept going back to the same problems in biology education and again for the reason that educational administrators don't seem to fully understand the meaning of the words used in their titles. Opening the meeting was a series of field trips (which were one of the newer features to work their way into our meetings) along with a Computer Workshop presented by John Jungck of Beloit College. That afternoon there were a series of concurrent sessions held in groups of 3. These covered: Observing and Recording Skeletal Muscle Contractions with Oscilloscope and Camera; Improving Learning Skills in Biology Majors; Informal Discussion of the Small College Biology Curriculum; Update on Developments in Immunology; Photography: Evolution of a Hobby into a Teaching Aid; The Inquiry Approach to Teaching Non-Majors General Biology. The following day also had a similar distribution of Concurrent Sessions: Plant Tissue Culture as a Teaching Tool; Change; Training of Biology Teachers (emphasis of Special Methods course at Univ. Wis.-Eau Claire); Confronting the Creation Science/Evolution Issue in Education; Crisis in Science

Education; and, Non-Traditional Labs. A Film Festival was also part of this meeting as well as Exhibitors of

The Thirty-Seventh Annual Meeting of AMCBT was held at Millikin University, Decatur, Illinois on October 28-30, 1993. By this meeting, the format was formalized and represented how the meetings are structured today. The theme of the meeting was "Communications and Technology in Biology". The first evening generally consists of an opening session, having a reception, welcome and a speaker. The following morning had concurrent sessions scheduled in groups. Session I consisted of: Teaching Infectious Disease by the Case Method; Organizing a Tropical Ecology Course; How to Win at Science Fairs. Session II had: Regional Science Fairs; Mountain Ecology: A New Field Course at Loras; Interactions of activated Macrophages with Malignant Tumor Cells; and Using Automated Technology Systems in Undergraduate Microbiology. These were followed by a Session sharing Posters, Videos, Software, etc. Field trips and a series of workshops: Fast Plants for Slow Biologists; Using Humans to Teach Human Physiology; So You Want to Use Multimedia? Hands on Workshop; and, Digital Video Microscopy were offered in the

educational materials.

afternoon.. On Saturday morning, Concurrent Session III consisted of: Comparing the Scopes Trial of 1925 with the Little Rock "Balanced Treatment" Trial of 1981; Hypermedia in Biology Education; The Teaching of Reading and Studying Biology Textbooks; and, Hydrothermal Vent for Midwesterners: Deep Sea as the Largest Habitat on Earth. Concurrent Session IV consisted of: "Pass the Videocam, Please"; Methods of Developing Student Awareness of Ethics and their Role in Decision Making in Biology; Science as a Way of Knowing: An Interdisciplinary Course; and Developing and Implementing an In-Service Program in Biotechnology for Secondary Science Teachers. Following the meeting, a special Workshop on "BioQUEST", a program developed at Beloit College, was held for those who wished to participate.

As you can see from the above, we biologist, as well as the systems we study, recycle. We refashion old programs, reprise old themes, and reeducate ourselves to meet the challenges of the present. Come join us "geezers" and "geezerettes" and see what of the past comes up at the Forty-Seventh Meeting.

Call For Resolutions

The Steering Committee of ACUBE requests that the membership submit resolutions for consideration at the 2003 Annual meeting to the Chair of the Resolutions Committee. Submit proposed resolutions to:

Dr. Richard Wilson, Dept. of Biology, Rockhurst University, 1100 Rockhurst Rd
Kansas City, MO 64110, Phone (846) 501-4048, wilson@vax1.rockhurst.edu

Call for Nominations

***Bioscene* Editorial Board**

We are soliciting nominations for four (4) *Bioscene* Editorial Board positions (term through-2006). Board members provide input concerning the publication of *Bioscene* to the Editors. Board members provide rapid review of manuscripts as requested. Board members are expected to assist in the solicitation of manuscripts and cover art for *Bioscene*. Board members are expected to provide assistance in proofing the final copy of *Bioscene* prior to publication. If you are interested in serving a three-year term on the Editorial Board, please e-mail the editors

Ethel Stanley -- stanleye@beloit.edu
Timothy Mulkey -- mulkey@biology.indstate.edu

Presidential Address: A Retrospective

Malcolm P. Levin

Past President 2001-02

Professor of Biology and Environmental Studies
University of Illinois at Springfield

I have been an active member of ACUBE for about 22 years. During this nearly quarter of a century, ACUBE has facilitated my teaching and learning. My goal, in this address, is to convey what ACUBE has meant and means to me and to keep my remarks relevant and short. I am planning to retire at the end of this academic year (after 30 years at the University of Illinois at Springfield [UIS], formerly Sangamon State University), much older and perhaps somewhat wiser. I became a university professor because I believed learning and teaching are paths to a better society. Accordingly, I have devoted most of my professional career to the application of scientific knowledge to issues of society and public policy. In this historical context, I have some concerns about the future, concerns for ACUBE, for education and for society.

I prefer to think about these concerns as opportunities for members of ACUBE, opportunities to make a difference in the lives of students and thus, opportunities to bring about improvements in the educational system and in society.

Some of my remarks may not be relevant to all of you, but I hope that they are relevant to most. We now attempt to educate about 55% of the high school graduates in higher education, quite a different picture from when I graduated high school in 1961; only about 12% went to college. Moreover, many of our students read nothing but what we assign, they are used to television. These students most often don't read for fun, for general knowledge or for education. Moreover, many have an inadequate secondary education, don't read well, don't comprehend well, and hence, don't write well.

That said, we have an opportunity to shape, re-shape and turn-on a significant number of our students (even a few can make the difference): for us a rewarding career; for the student, a rewarding career and life-long learning; and for society, a better world.

I have listened to my colleagues at ACUBE for the last quarter of a century (that's about correct). Perhaps I should have been listening and learning more than I have; nevertheless, here is my "two cents worth". To get our students to read, to learn and to write, (something they will have to do if they are to have meaningful careers) we have to turn them on to what we have already determined is a meaningful body of knowledge, the biological sciences.

At our recent 46th annual meeting and other ACUBE meetings, I have listened to presentations and participated with my colleagues in workshops on case based learning. I have also eavesdropped on discussions in the halls between presentations, another way to acquire information and learn about my colleagues. During our meetings at Columbia College Chicago, we heard about the failings of the news media - the press, radio and television. I would like to suggest that we all need to think about ways to engage our students in the learning process, to impact on them more positively and make biology more relevant. Toward that end, I offer one example that combines case based learning and our observations about the failings of the media. Consider structuring a class around a thought provoking newspaper article about a new revelation in biology. Use the local newspaper and choose an article about the same topic from a major newspaper, which can be found on the web; it is free if you retrieve it the day it hits the press. Then retrieve an article on the same topic from a scientific journal. Have your students compare the three articles, assist them in critically analyzing the articles. Guide them in preparing a written critique of their findings including an assessment of the applications and implications of the new knowledge, and the role of the press in bringing the new knowledge and its significance to the public. I have ACUBE to thank for this and many other



excellent teaching techniques. I also want to acknowledge the many discussions that I have had with Ann Larson, a friend and former biology colleague at UIS.

In this address, I also want to reiterate the importance of this organization and to convey the thoughts and best wishes of Dick Wilson, a long time active member and officer of ACUBE. Dick asked me to let people know that he is alive and well and that he expects to attend future meetings of ACUBE. A knee replacement prevented his travel this past September. I couldn't think of a better way to express the importance of AMCBT/ACUBE than to transmit Dick Wilson's message.

Here is what Dick had to say and I quote,

"I found in the organization not only great information to help me become a better teacher, (I can honestly say I never came back from the meeting with less than one new idea for class) but also a place at which I could contribute by giving papers.

"I was able to find a group to whom I could provide service professionally and make lifelong friendships, such as with you. I think I served on the Board 22-24 years, was secretary nine years, president one term, Acting Executive Secretary on two occasions for two years each, and gosh only knows how many years I was chair of the Resolutions Committee. Additionally, my work/study students and I transcribed about 15 years of the old journals and documents from the 50s and 60s, which are now available on the web site. All of this let me feel like I belonged to and helped AMCBT/ACUBE and made it one of the most important organizations to which I belonged.

"Translation - it is an organization in which you can have an impact from a small school!"

(Emphasis added.)

I thank you for allowing me to serve as your president for the 2001-02 academic year and I hope that I have done an acceptable job. I want to see ACUBE continue to be an important influence on biology teaching and for ACUBE to do so; we need a strong and active membership. I encourage each of you to work at ACUBE's continued success and I look forward to our next annual meeting.



ACUBE

Web Site

<http://acube.org>

The Association of College and University Biology Educators (ACUBE), placed the organization's rich archive of materials online for the benefit of the members and interested biology educators. Nearly 48 years of the society's publications and resources are currently accessible.

Featuring the Online ACUBE archives:

Bioscene: Journal of College Biology Teaching (1975-present)
AMCBT Newsletter (1964-1974)
AMCBT Proceedings (1957-1972)

ACUBE Organizational Information:

ACUBE Executive Committee
Editorial Board of Bioscene
ACUBE Annual Meeting Information
Meeting Abstract Submission Form
Searchable Membership Database
Online Membership Application
Scientific Meetings of Interest
ACUBE in the News
Sustaining Member Links

ACUBE Steering Committee Meeting Minutes

ACUBE ANNUAL MEETING First Steering Committee Meeting September 12, 2002

Place: Room 503, 623 S. Wabash, Columbia College

Time: 1 P.M.

Present: Jerry Adams, Austin Brooks, Abour Cherif, Tom Davis, Lynn Gillie, Malcolm Levin, Kathy Marr, Tim Mulkey, Ethel Stanley, Robert Wallace, Margaret Waterman.

I. Call to Order: Malcolm Levin

II. Approval of the Agenda: Approved with the understanding that order will be modified to accommodate any changes needed.

A short discussion followed regarding what constitutes a winter meeting.

The Executive Handbook calls for presence of the President, the President-elect, the local arrangements chair and someone who has past experience in organizing a meeting. The Constitution calls for a winter meeting.

III. Minutes of 1/26/02 were approved as amended/corrected.

IV. Standing Committee Reports (are out of order from the agenda)

A. Local Arrangement, *Cherif and Adams*

1. Everything was in order for the annual meeting as of 12 P.M.
2. Questions arose as to whether a recorder/reporter was to be present at all sessions.
3. A form will be available to all presenters such that a letter from the association secretary could be sent recognizing the presentation of a paper or poster.
4. A financial accounting of this year's meeting expenses is needed by January.
5. Margaret Waterman will write a conference evaluation form for distribution to the membership in attendance.
6. Abour Cherif expressed sincere thanks to other members of the program committee.
7. Questions arose as to whether a photographer might be available to document the meeting. There will be.

B. Program Chair, *Wallace*

1. Abstracts this year were scattered. Problems included hand-written vs word-processed. Those e-mailed were not always readable. Some confusion existed as to what defines a workshop vs a paper.
2. Scheduling of workshops against papers posed a problem.
3. The format of the program changed after Bioscene was published. The current program committee needed to work with Bioscene, and not local arrangements. Other problems resulted because of multiple postings (web, program chair and local arrangements).

C. Nominations, *Gillie*

1. 2 presidential nominees are required according to the constitution. This has been a problem in the past. Ethel Stanley was nominated.

D. Bioscene Editors, *Mulkey and Stanley*

1. The May issue was delayed due to trouble getting information on travel for this year's meeting.
2. Some problems with payment arrangements resulted as Pres Martin, Executive Secretary was out of town and the printer would not deliver until he had been paid for the May issue.
3. Editorial Schedules were distributed.
4. A list of articles presently in the loop was distributed.
5. The Bioscene on CD was also distributed. Suggested price for members is \$3 with \$10 for non-members.

6. Present editors; Tim Mulkey and Ethel Stanley will stay on at the pleasure of the Executive Committee.

E. Constitutional Committee, *Waterman*.

1. Changes were made and published via e-mail.
2. Substantial changes cannot be voted on until the next Annual Meeting.
3. The Constitution on the web needs to be updated, presently it is the 97 version.
4. Margaret Waterman will address the present changes at the Dinner Business meeting this year. A voice vote should be sufficient.
5. Copies of final changes will be published May 2003 issue of Bioscene.
6. The Executive Committee Handbook needs to be updated and approved.
7. It should also be available to the Internet Committee.
8. A discussion of the Constitutional aspects of a Winter Meeting followed. The consensus was that the Executive Committee is acting prudently with respect to reducing the number of individuals who actually meet in Winter. The concept of a virtual meeting was also discussed. Standing committees could report at midterm this way. The President would then publish an interim report in Bioscene.

F. Honorary Lifetime Membership and Carlock Committee, *Mulkey for Wm. Brett*
Nominees were discussed. Presently there was no Carlock nominee.

G. Membership, *Davis*.

1. A discussion took place regarding the rule that members are the only ones to vote at Business Meetings, and a plan was made to give ballots only to members.
2. Development of a Membership Brochure was discussed.
3. McGraw- Hill was discussed as a possible sponsor.. It was offered that they would send out membership information on our behalf every year.
4. Suggestion was made that we send the *Bioscene* CD out to schools as well as distribute it at the NABT conference. Stanley and Waterman agreed to handle the NABT distribution.
5. Bob Wallace and Austin Brooks will serve as joint chairs of the Membership Committee.

V. Old Business

A. Future Meetings

- 2003 -- Truman University, Nancy Sanders local program chair.
- 2004 -- Wabash College, Austin Brooks local program chair
- 2005 -- Cape Girardeau
- 2006 -- Carroll College

B. Membership re-addressed

1. Renewal or addition of relationships with other organizations (AIBS, ERIC) was addressed. NABT and NSTA relationships need to be strengthened. There have been temporary agreements in the past with ASM as well.
2. Legal aspects of incorporation were discussed. Clarification was put off until Pres Martin, Executive Secretary could clarify.

Meeting was placed on hold until after evening opening activities. The Meeting was re-convened at 9:35 P.M. in the Best Western Lobby.

Discussions that followed included:

1. Since the Resolutions Chair will not be in attendance this year, Buzz Hoagland will write this years resolutions.
2. A call for regular meetings of the Internet committee was made. Buzz Hoagland will facilitate. Buzz will also post the current Constitution on website.
3. Executive Secretary, Pres Martin presented the financial report. He reports that membership is up and ACUBE is solvent. The website costs \$35/year and is paid every 5 years, The ACUBE incorporation is in Iowa and there is no annual fee. A yearly report is filed with the IRS. The Executive Secretary handles that. Winter Meeting expenses for 4 would be more cost efficient. A contingency plan to make sure funds are available for Bioscene was established.
4. Honorary Lifetime membership nominee was voted on and unanimously approved.

5. Further discussion took place on membership with a strong agreement to find ways to revive the membership. Austin Brooks will replace Tom Davis as chair. The concept of regional captains was discussed. Suggestion was made that Executive committee members could place a footer on their e-mails to advertise ACUBE. Letters to Science Education Departments were discussed as well. ACUBE information could be distributed at the upcoming Gordon Conferences. All ACUBE distributions should emphasize that we are a teacher-friendly organization.
6. Page charges in *Bioscene* for non-members were discussed.
7. Library subscriptions can also be made available as we now have an ISBN. There was a discussion concerning whether we should notify all members to encourage their libraries to subscribe. A fee of \$50.00/year seemed reasonable.
8. The theme for next years meeting will be *Biology for Contemporary Living*.
9. Margaret Waterman asked if we should work to establish formal affiliations with other organizations. She suggested that we get someone from NABT to be part of our program as well. We should also request that our meeting be placed on other's annual calendars.
10. A discussion followed regarding the ACUBE logo. A committee might be appointed for review of submitted and newly submitted logos with a deadline of October 15. Margaret Waterman offered to organize. However, no consensus was arrived at and the discussion was tabled to future meetings.

Meeting was adjourned at 10:53 P.M.

ACUBE ANNUAL MEETING

First Business Meeting

Columbia College

September 13, 2002

I. Announcements:

- A. Volunteers needed to serve on the Membership Committee
Contact Austin Brooks or Malcolm Levin.
- B. ACUBE would like to encourage University and College Libraries to subscribe to *Bioscene*.
- C. Program changes were noted.
- D. The next Annual Meeting will be at Truman State University. More information will follow. Nancy Sanders will be the Local Program Chair.

II. New Business:

- A. Nominations were presented for the position of President Elect. Terry Derting and Ethel Stanley were previously nominated, no new nominations came from the floor. Nominations closed.
- B. Nominations for Steering Committee Members were presented: Abour Cherif, Karl Kastor, Randy Moore, Megan Thomas. Neil Grant was nominated from the floor. Nominations closed.
- C. Margaret Waterman introduced the "Out of this World Teaching Idea Contest"

III. Luncheon Program

- A. Speaker Jeff Lyon
- B. Topic "Gone in 60 Seconds: The Evanescence of News"

The meeting adjourned at 1:40 pm

ACUBE ANNUAL MEETING

Second Business Meeting

The Congress Hotel, Chicago

September 20, 2002

I. Announcements:

- A. Paper Presenters were reminded that a form must be submitted to Secretary Kathy Marr if individuals wish acknowledgement sent to their institutions.

- B. Papers can also be listed in the ERIC database. Forms are available in the Speakers Folders.

II. New Business:

- A. Presidential Elect nominee Ethel Stanley spoke on behalf of Terry Derting. Lynn Gillie, nominations Committee Chair handled the ballot casting. Terry Derting was elected President-elect.
- B. Steering Committee members elected were: Abour Cherif and Neil Grant.
- C. Margaret Waterman reminded members of the "Out of the World Teaching Idea Contest".
- D. The Honorary Lifetime Membership Award was presented by former president Neil Baird to Norman Jensen for his service to ACUBE. A plaque was presented in recognition, as well.
- E. Malcolm Levin recognized first-time attendees.
- F. Abour Cherif, Dr. Cannon and Jerry Adams presented an award of appreciation to the evening's speaker, Dr. Helen Davies.

III. Presentation

- A. Dr. Helen Davies
- B. Teaching & communicating about integrative issues of health & disease: An evening of song.

Meeting Adjourned.

ACUBE ANNUAL MEETING Third Business Meeting Columbia College, Chicago September 14, 2002

I. Resolutions

- A. Buzz Hoagland presented a resolution thanking Columbia College for the hospitable reception afforded to ACUBE this year.

II. Reports

Bioscene

Tim Mulkey reported that current issues of *Bioscene* are in the mail.
He also reported that since we now have an ISBN number it will be more accessible to college and university libraries.
CD versions including all past issues are also available.
The editorial board met that morning and are updating board information.

Executive Secretary

Pres Martin presented the financial report. He noted that changes in the *Bioscene* mailing process have made the cash flow more efficient.

III. New Business

- 1. Lynn Gillie presented the "Out of this World Teaching Idea" award to Nancy Sanders for the use of hand puppets in student research shows.

IV. Outgoing President Remarks

Malcolm Levin, departing president, addressed the general membership. He emphasized the idea that we as members of ACUBE have a major opportunity to influence our student's lives. He commented that we should emphasize a case-based approach in encouraging students to explore a meaningful body of knowledge. He made particular mention of Jeff Lyon's Friday's luncheon speech. Dr. Levin further encouraged members to bring colleagues, particularly that junior faculty to meetings in the future. He emphasized the importance of paper presentations on teaching and how this organization can be especially important to the smaller schools.

V. Closing Remarks incoming president

Margaret Waterman thanked Columbia College for their hospitality. She also thanked the steering committee and welcomed new members. Announcement was re-iterated that our next meeting would be at Truman State University with Local Arrangements being Nancy Sanders and Program chair being Lynn Gillie. Travel information and background materials on Kirksville were distributed. A final thanks was

extended to all presenters and participants with a reminder that the Afternoon Tea and Shedd Aquarium Trip were to take place post-meeting activities.

Meeting was adjourned at 12:00 P.M.

**ACUBE ANNUAL MEETING
STEERING COMMITTEE MEETING
Second Meeting
Columbia College, Chicago
September 14, 2002**

Members present: Bill Brett, Austin Brooks, About Cherif, Janet Cooper, Lynn Gillie, Neil Grant, Malcolm Levin, Kathleen Marr, Pres Martin, Tim Mulkey, Nancy Sanders, Ethel Stanley, Robert Wallace, Margaret Waterman.

I. Meeting was called to order at 12:10-*Margaret Waterman*.

II. The Meeting Agenda was approved with the addition of a discussion of the membership directory.

III. Old Business

A. Review of immediate past meeting: Local Arrangements. About Cherif.

1. Columbia College put forth a group effort that was not just the Biology Dept but the whole Science and Math Division as well the College in general.
2. Problems with meeting and abstract information were discussed.
3. It was suggested that in the future 2 copies of an abstract should be submitted one to the program chair and one to the local arrangements chair so that local arrangements can plan rooms and AV equipment needs.
4. Abstracts need to be more complete.
5. Program decisions should not be made by the local arrangements committee.
6. About Cherif stated he would get an e-mail out to the president and secretary with respect to how many presenters there were as well as an itemization of who were members vs non-members.
7. Financial Reporting of the income from registrations vs. the expenses are due to the executive secretary by Dec. 1, 2002. Cherif said that Jerry Adams would help him prepare that report.
8. Discussion followed as to whether at least one author on a paper should be a member.
9. Discussion followed regarding fee delineation for members vs. nonmembers. Three categories were arrived at: Members who would pay a flat registration fee, non-members who would pay regular fee plus 30.00, non-members who would pay registration fee plus dues for new membership. Motion was made, seconded and carried to approve such a fee system. **m/s/a**
10. Keynote speakers will receive an Honorarium.

B. 2003 Annual Meeting. Presentation by Nancy Sanders

1. Bill Brett thanked Nancy Sanders for her preparedness.
2. Tentative dates for the 2003 meeting are October 9-11, 2003.
3. Meals would be served in the Georgian room Building 21 (Student Union)
4. The Medical School is willing to donate Facilities for the Friday evening banquet.
5. Violette Hall would be a good poster area as it has a slate floor.
6. Mac and PC labs will be accessible
7. The following speakers were discussed:
 - a. Philip Wilson on Eugenics and Pre-natal care
 - b. Sneed Collard III, children's author, animal books
 - c. Edie Witter, Sr. Scientist at Harvard Branch Marine Lab
 - d. Ted Goslow,- Flight in Birds
8. Field Trips were also discussed including:
 - a. Dog and Gun Collar auction- possible post-meeting
 - b. Tour of Organic Farms

- c. Frank Overly Photo Prairie
 - d. Coal Mining Museum
 - e. Limestone Quarry
 - f. MEGA Pork Processing Plant
 - g. Amish Driving Tour
 - h. Savon Lake Birding Trip
 - i. Savannah Restoration Project Hike
9. The notion of a late- registration penalty was discussed at this point.
 10. Lynn Gillie, Margaret Waterman and Nancy Sanders were going to look into the issue of a logo with the publication department at that university.
 11. The Local Arrangements committee brought up the idea of meeting souvenirs.
 12. Mention of a T-shirt with the “new” ACUBE logo was made.
- C. Nominating Committee
The Nominating Committee will be Austin Brooks, Neil Grant and Janet Cooper.
- D. Interim Committee Reports need to be to Margaret Waterman by January 15, 2003.
Because there will be no full board meeting in the winter, the board agreed to provide interim reports to the President by January 15. These will be summarized and circulated to the Executive committee for comment. The summary will be printed in *Bioscene*.
- E. Bioscene Editorial Committee
1. New board members joining as of this meeting are: Lyndell Robinson, David Cox, and Steven Daggett. Margaret Waterman is giving up her position on this committee in lieu of her job as President.
 2. Steve Brewer will be re-writing manuscript and reviewer guidelines
 3. Motion was made, seconded and carried that there will be a page charge for non-members submitting articles for publication in Bioscene. **m/s/a**
- F. Minutes of the Business and Steering Committee Meetings will be submitted via e-mail to for review around Oct 15. Members are asked to review and submit changes for final copy to Bioscene by Nov 15th.
- G. Membership-*Brooks*
The membership brochure needs to be updated and made less time-sensitive. We should have a firm 5 members from each state.
- H. Internet Committee- *Hoagland*
Buzz will be sending descriptions of duties to all committee members. New images will be added to the website. Austin Brooks will add some photographs. Our address will remain at the same server site. Bioscene will be separate but will link the reader to the ACUBE website. Buzz will develop a checklist and communicate in the next few weeks. Internet committee is currently an *ad hoc* committee.

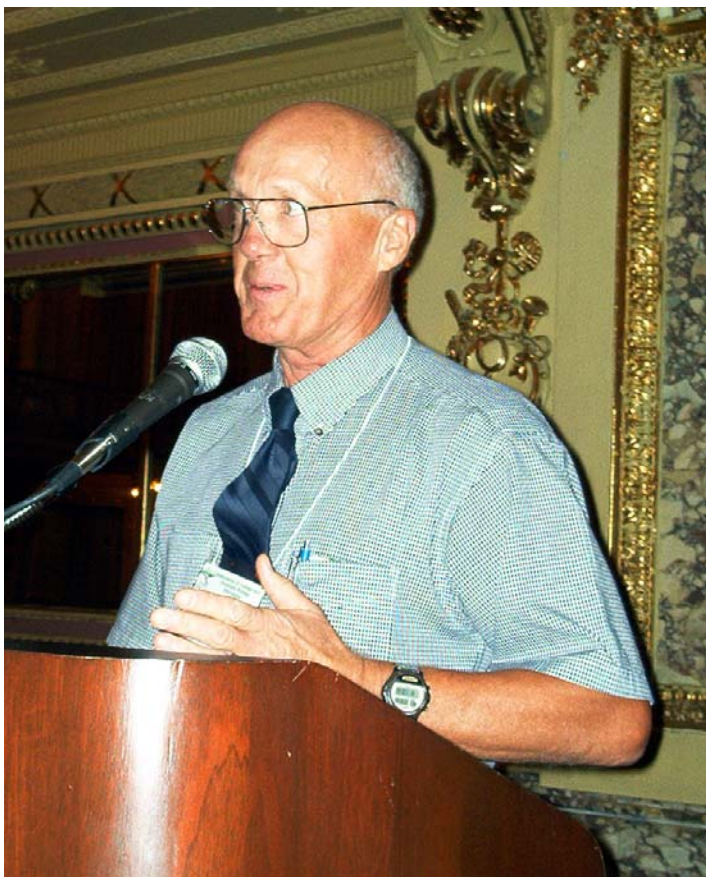
IV. New Business

1. Publication of the membership needs to be updated and released. Pres Martin will handle this. He will make it available in an Excel format and e-mail it. A print-ready copy could be mailed with the March 15th issue of Bioscene.
2. Both the out-going and in-going president will write a newsletter.
3. New Graduate students would be invited to the next annual meeting.
4. Hamline University was suggested for the 2006 Annual meeting. We still need a Drake connection due to our origination roots.

Meeting was adjourned at 2:50 P.M.

Respectfully submitted
Kathy Marr
Secretary of ACUBE

Approved Feb. 21, 2003



Norm Jensen

Honorary Life Member

Association of College and

University Educators

2002

Dr. Jensen has been an active member of ACUBE since 1975. He has served as president of the organization and local arrangements chairman when the meeting was held at Millikin. He has served on the steering committee for three years and has been on the annual program several times.

Dr. Jensen retired in 1999 after 29 years of service at Millikin University. He is a broadly trained ecologist with emphasis on vertebrate ecology. He has been active in our local Audubon Society for 25 years and has recently served as the group's president.

Dr. Jensen served as chairman of Millikin's Biology Department during the 78-79 academic year as well as from 1983 to 1990. For many years he was a member of the preprofessional advisory committee and the teacher education committee. He also served as

advisor for Millikin's environmental affairs committee. Over the years, Dr. Jensen has made numerous presentations on environmental issues in the Decatur area.

Call for Applications -- John Carlock Award

This Award was established to encourage biologists in the early stages of their professional careers to become involved with and excited by the profession of biology teaching. To this end, the Award provides partial support for graduate students in the field of Biology to attend the Fall Meeting of ACUBE.

Guidelines: The applicant must be actively pursuing graduate work in Biology. He/she must have the support of an active member of ACUBE. The Award will help defray the cost of attending the Fall meeting of ACUBE. The recipient of the Award will receive a certificate or plaque that will be presented at the annual banquet; and the Executive Secretary will provide the recipient with letters that might be useful in furthering her/his career in teaching. The recipient is expected to submit a brief report on how he/she benefited by attendance at the meeting. This report will be published in Bioscene.

Application: Applications, in the form of a letter, can be submitted anytime during the year. The application letter should include a statement indicating how attendance at the ACUBE meeting will further her/his professional growth and be accompanied by a letter of recommendation from a member of ACUBE. Send application information to:

Dr. William J. Brett, Department of Life Sciences, Indiana State University, Terre Haute, IN 47809; Voice -- (812) 237-2392 FAX (812) 237-4480; E-mail -- lsbrett@scifac.indstate.edu

If you wish to contribute to the **John Carlock Award** fund, please send check to: Dr. Pres Martin, Executive Secretary, ACUBE, Department of Biology, Hamline University, 1536 Hewitt Ave., St. Paul, MN 55104.



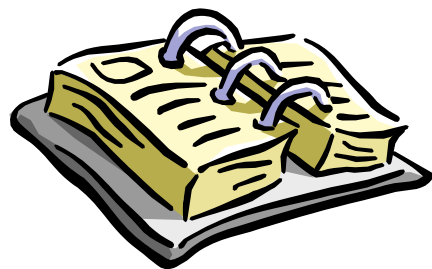
ACUBE 47th Annual Meeting

Truman State University

Kirksville, MO

October 9-11, 2003

Biology for Contemporary Living



Housing Preview

47th Annual ACUBE Fall Meeting
Truman State University
Kirksville, MO
October 9-11, 2003

Lodging: Block of rooms has been reserved at the Days Inn and Shamrock Inn for meeting participants; remember to request the ACUBE block and rate. **IMPORTANT:** Please note there is a Bluegrass Festival in Kirksville on the same weekend, so PLEASE BOOK EARLY

Days Inn

Phone: 660-665-8244

800-329-7466

\$45 (plus tax) single occupancy

\$50 (plus tax) double occupancy

Request ACUBE block and rate.

Shamrock Inn

Phone: 660-665-8352

800-329-7466

All rooms \$50 (plus tax)

Request ACUBE block and rate.

Super 8 Motel

Phone: 660-665-8826

Most rooms about \$55 (plus tax) per night

Holiday Inn Express Hotel and Suites

Phone: 660-627-1100

800-HOLIDAY

Most rooms \$75 and up (plus tax) per night

Thousand Hills State Park Cabins

Phone: 660-665-7119

Cabins run \$55 - \$70 (plus tax) per night

Note - these cabins overlooking the lake and book very early; cabins typically have two double beds, some with kitchens.

Camping

For the adventurous, this are camping sites available at the Thousand Hills State Park

Truman State University

Site of the 47th Annual Meeting Association of College and University Biology Educators October 9-11, 2003

Truman State University, formerly Northeast Missouri State University, is Missouri's premier statewide public liberal arts and sciences university. Founded in 1867, Truman State University has a long history of being nationally recognized for its innovative assessment program and commitment to providing a high-quality education at an affordable price. *U.S. News and World Report* consistently ranks Truman State University as the number one public university in the Midwest region - Master's category - as well as the 8th best university in the Midwest region. Truman is the only public university in Missouri to appear on their top 15 listing. *Money* magazine has also recognized Truman for six consecutive years as one of the nation's top ten best educational values. More than 6200 students attend Truman State University. Truman now offers 43 undergraduate and 9 graduate areas of study in 12 academic divisions. Commitment, uniqueness of purpose, and concentration on student learning has brought Truman to its present mission. Designed to bring a new sense of coherence to each student's educational experience, and to impart the qualities of mind and spirit which distinguish educated persons, the programs and environment of the University are the latest examples in Truman's history of creative, responsive, and innovative planning.



Kirksville, Missouri

Located in northeast Missouri, Kirksville was founded in 1841 as the county seat of Adair County. Kirksville has prospered through the years in large part due to the exceptionally diversified local economy. Agriculture, industry, medicine and education all employ many Kirksville citizens and have helped the community to mature into the economic and cultural center of Northeast Missouri. Kirksville's particular assets include a nationally recognized public liberal arts university, a medical college and long-standing industries. Kirksville has a population of 17,286 and is located 168 miles northeast of Kansas City, 204 miles northwest of St. Louis and 92 miles north of Columbia.

ACUBE

Association of College and University Biology Educators

NAME: _____ DATE: _____

TITLE: _____

DEPARTMENT: _____

INSTITUTION: _____

STREET ADDRESS: _____

CITY: _____ STATE: _____ ZIP CODE: _____

ADDRESS PREFERRED FOR MAILING: _____

CITY: _____ STATE: _____ ZIP CODE: _____

WORK PHONE: _____ FAX NUMBER: _____

HOME PHONE: _____ EMAIL ADDRESS: _____

MAJOR INTERESTS

- ☐ 1. Biology
- ☐ 2. Botany
- ☐ 3. Zoology
- ☐ 4. Microbiology
- ☐ 5. Pre-professional
- ☐ 6. Teacher Education
- ☐ 7. Other _____

SUB DISCIPLINES: (Mark as many as apply)

- ☐ A. Ecology
- ☐ B. Evolution
- ☐ C. Physiology
- ☐ D. Anatomy
- ☐ E. History
- ☐ F. Philosophy
- ☐ G. Systematics
- ☐ H. Molecular
- ☐ I. Developmental
- ☐ J. Cellular
- ☐ K. Genetics
- ☐ L. Ethology
- ☐ M. Neuroscience
- ☐ N. Other _____

RESOURCE AREAS (Areas of teaching and training): _____

RESEARCH AREAS: _____

How did you find out about ACUBE? _____

Have you been a member before: _____ If so, when? _____

DUES (Jan-Dec 2003) Regular Membership \$30 Student Membership \$15 Retired Membership \$5

Return to: Association of College and University Biology Educators, Attn: Pres Martin, Executive Secretary,
Department of Biology, Hamline University, 1536 Hewitt Avenue, Saint Paul, MN 55104

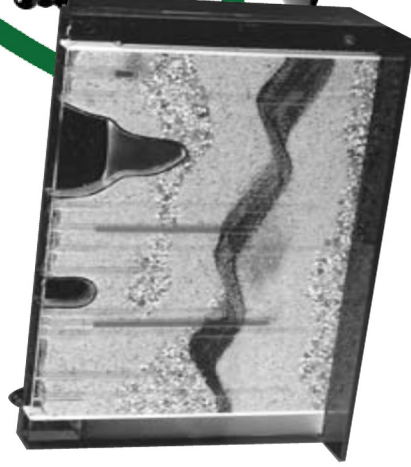
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