

Bioscene

Journal of College Biology Teaching



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Bioscene

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University Biology Educators**

Co-Editors:

Timothy Mulkey
Indiana State University

Ethel Stanley
Beloit College

An archive of all publications of
the Association of College and
University Biology Educators
(ACUBE) can be found at
<http://acube.org>

Bioscene is normally published
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manuscripts by November 1,
2001 for consideration in the
next issue.



Cover image: Photograph of
morels by Donald M. Huffman.
Look for "Morels and False
Morels of Midcontinental U.S."
by D.M. Huffman and L.H.
Tiffany in the December issue of
Bioscene.

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Bioscene: Journal of College Biology Teaching

Co-Editors:

Timothy Mulkey

Department of Life Sciences
Indiana State University
Terre Haute, IN 47809
mulkey@biology.indstate.edu
FAX: (812) 237-4480

Ethel Stanley

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

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Helena, MT 59625

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La Crosse, WI 54601

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Biology Department
Millikin University
Decatur, IL 62528

Conrad Toepfer
Biology Department
Millikin University
Decatur, IL 62528

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Deadlines for Submissions

November 1, 2001 for the December 2001 Issue

February 1, 2002 for the March 2001 Issue

Use of Web-based Testing of Students as a Method for Evaluating Courses

Harry Roy

Department of Biology
Rensselaer Polytechnic Institute
Troy, NY 12180
Email: royh@rpi.edu
FAX: (920) 465-2769

Abstract: Educational innovation, like other educational processes, requires a tool for measurement of its effect on student learning. This is especially important when it involves new techniques. The testing of students both before and after a class (pre- and post-testing) is an established method for measuring student progress. This is useful because it normalizes the results by effacing some of the variability in preparation of the students. Automated test administration and grading makes it much easier to implement pre- and post-testing. I used the WebCT quiz tool to administer pre- and post-tests to students in 5 successive semesters of a course in Genetics and Evolution, and I collected data on course grades for 12 semesters of the same class, containing from 10 to 60 students each. Students showed a gain in learning $\langle g \rangle$ ranging from 0.54 ± 0.32 to 0.88 ± 0.21 . Course grades were weakly negatively correlated with class size ($r = -0.37$). Based on these results and published literature, I suggest that the gain in learning will vary with discipline, teaching technique, and student background, and that automated pre- and post-testing could be useful for comparisons between different instances of the same class containing large numbers of students.

Keywords: computerized testing, gain in learning, automatic assessment, evaluation

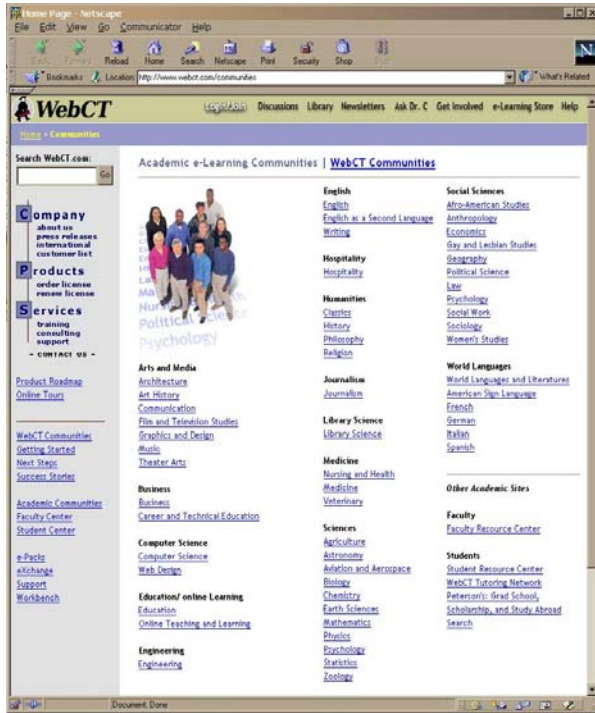
Introduction

Evaluating courses is important. One can evaluate the performance of students by giving tests and one can evaluate the reactions of the students to courses by soliciting their evaluations. But class size, limits on faculty time, the variability among students and faculty, and other factors make educational experiments hard to design, hard to implement, and hard to interpret when completed. In a dynamic institution, there will be new ideas proposed for teaching. But skeptics both on the faculty and in the administration may ask, "Is it worth the effort? Do students really learn better with these methods?" The answer will affect the allocation of resources for improving instruction at our university and at many others.

Robert Hake (1998) introduced a measurement called $\langle g \rangle$, the gain in learning, which was calculated from the results of pre- and post-tests of about 6000 college physics students at many universities in the

United States. This study documented that American students show about a 20% improvement in performance on tests of basic physics concepts upon completion of a year of college physics, taught in the traditional manner, as characterized by those faculty supplying the data. (A startlingly low figure!) Cummings et al. (1999) used this measurement to evaluate the effectiveness of studio physics, as compared with interactive lecture demonstrations. (Studio physics is an interactive learning approach that integrates lecture, recitation, and lab in a single classroom; interactive lecture demonstration is a method that requires students to make predictions about the results of demonstrations, view the demonstrations, and then draw lessons from the comparisons). The results of testing students on basic physics concepts yielded a value of $\langle g \rangle = 0.35$ for interactive lecture demonstrations. This was significantly higher than that obtained either for studio physics or for standard classes, consisting of lectures,

labs, and recitations ($\langle g \rangle = 0.2$). It would appear from this that interactive lecture demonstrations provide the most effective learning situation; but what interests me here is the effort involved in getting this kind of information.



Conducting pre- and post-testing is nothing new. But for most teachers, it is a lot of extra work. Gathering the kind of data required for testing hypotheses about educational innovation (or effectiveness of instructors, or student aptitude) would be a lot easier if the testing could be automated. Fortunately, at least for large enrollment courses or courses that are taught repeatedly, this has become a lot easier. At Rensselaer, for example, we use a software package called WebCT to organize internet materials for courses. One of the most interesting resources of WebCT is the quiz tool, which enables instructors to set up quizzes that the students can take, either as homework, class quizzes, or full examinations. A WebCT quiz can be made as secure as any written examination, and in some respects even more secure, (since students never have an opportunity to revise their answers fraudulently in appealing a grade). The examinations themselves can be placed under password protection, and access to them can be restricted to a specific time and place. Questions can be written with a word processor and uploaded to a WebCT server, or they can be written within WebCT. The grades are automatically recorded in a password-protected database on WebCT, and statistical analyses of the tests are easily obtained from these data.

I use the WebCT quiz tool to provide automatically graded homework assignments to my students in Genetics and Evolution, and to administer term examinations. Since I teach the class using a studio format, with a limit of 25 students per section, I have to teach it several times a year in order to handle all the students enrolled each year. Learning of the work of Cummings et al. (1999), it occurred to me that I could easily obtain data on the effectiveness of my teaching basic concepts in Genetics and Evolution, from one semester to the next. I was curious about the magnitude of the gain in learning $\langle g \rangle$ that I might expect. Also I wondered if this technique might provide an objective measure that could be compared from one semester to the next, as opposed to student evaluations. Rightly or wrongly, student evaluations seem to so many of us an unreliable way to evaluate teaching. The results indicate to me that quantitative evaluation is marginally useful for small classes, but could be very useful for large ones.

Methods

I had already set up a database of genetics and evolution questions, including multiple choice, matching, and problem solving questions, using the WebCT software (<http://www.webct.com>). The multiple choice questions included many with different values assigned for different answers, depending on the errors that were likely to produce them. The matching questions allow a longer list of answers on one side, so that simple elimination is not sufficient for completing the question. The calculation questions generate slightly different versions of the same question for each student, and allow the instructor to specify limits for an answer, which is a big advantage over more traditional fill-in questions that require an exact match. From this database, I chose representative questions on each of 15 topics, questions that covered basic concepts in the field. Each member of a pair of questions was judged to be of equivalent difficulty. I assigned a member of each pair to either the pre-test or the post-test. I weighted all questions equally, and each test had a total of 100 points. I modified the tests from one offering of the course to the next by replacing questions with others of comparable difficulty. After training the students in the use of the software, I administered the pre-tests on the first day of class. I told the students that they were expected to do their best, but that the examination was designed to set a base line for the post-test, not to have an effect on their grade. I treated the post-test as a final examination, and it counted for a significant portion of the grade. I allowed plenty of time for each exam; and few students used all the available time. I calculated the value of $\langle g \rangle$ for each student by the formula: $[(\text{Post-test}) - (\text{Pretest})] / [100 - (\text{Pre-test})]$. In other words, the measurement $\langle g \rangle$ assesses the extent to which each student improves. This testing regime was implemented for five

successive presentations of my sophomore Genetics and Evolution course.

Results and Discussion

Using pre-tests and post-tests that were graded automatically using WebCT, I obtained the results shown in Table I for my class in Genetics and Evolution. The parameter $\langle g \rangle$, the gain in learning, ranged from 0.54 ± 0.32 in the first attempt, to a high of 0.88 ± 0.21 . In experiments with interactive lecture demonstrations in physics, a lower gain in learning ($\langle g \rangle = .35$) was reported (Cummings et al. 1999), but it was significantly higher than that reported for traditional physics classes that did not use interactive learning techniques ($\langle g \rangle = .2$) (Hake, 1998). The absolute values of the gain in learning reported for my course are probably not directly comparable to those reported for physics (Cummings et al. 1999). One possible reason is that in their study, the post-test did not count toward the students' grades, and thus, they may not have prepared as well as mine did. Another possible reason is that the two subjects may differ in the ease with which the subject matter may be learned. The usefulness of this testing technique may lie in its ability to detect changes in the effectiveness of the same basic course when taught at different times, by different instructors, or using different pedagogical methods. For example, it seems as if the course taught in the spring produced a lower learning gain despite the small class size. A T-test suggests that at a level of $p = .05$, the spring class is not just a subset of the fall class (not shown). What could be the reason for this? Well, the spring edition of the class has a higher proportion of non-majors (not shown here). The ease with which such students may learn the material could be less than that of biology majors. On the other hand, teaching assistants were provided for the fall course,

but not for the spring course. This could be a crucial factor. The point is not to explain the difference here, but to show that data obtained this way can be used to formulate hypotheses.

The use of automatic grading of standardized questions avoids objections that the grading would be biased by differences among the instructors. Also, having a measurement that is so easily obtained, and that relies on objective criteria, could be a useful supplement to the commonly used student evaluations, which are widely regarded with suspicion by faculty. One important factor is the amount of data on students, both for objective tests and for student evaluations. The sensitivity of any method will depend on the numbers of students enrolled. Small numbers of students yield high standard deviations, enabling the detection of little but the greatest differences. The evaluation of small classes thus remains problematical, regardless of the methods used.

A large number of values of $\langle g \rangle$ for different size classes was not available, but I did have class averages for 12 offerings of the same course taught to different numbers of students over a 3-year period. These classes covered the same material, used similar test questions, and had, for the most part, similar populations of students. The class averages were based on homework, examinations, and term papers. The data in Figure 1 show a slight negative correlation ($r = -0.37$) with class size. When two small classes of highly select pre-medical students were pulled from the data set, there was still a correlation of $r = -0.32$. Student performance increases, as measured by grades, with smaller class size. This is no surprise. However, the scatter of the data is great, indicating that many factors other than this are affecting the outcome.

Table I. Gain in learning in five runs of Genetics and Evolution

Term	$\langle g \rangle \pm \text{S.D.}$	Enrollment
Spring 99	0.54 ± 0.32	13
Summer 99	0.87 ± 0.09	17
Fall 99	0.88 ± 0.21	24
Spring 00	0.54 ± 0.32	11
Fall 00	$0.78 \pm 0.21^*$	59

*- 3 students out of 59 did not take one of the pre or post-tests.

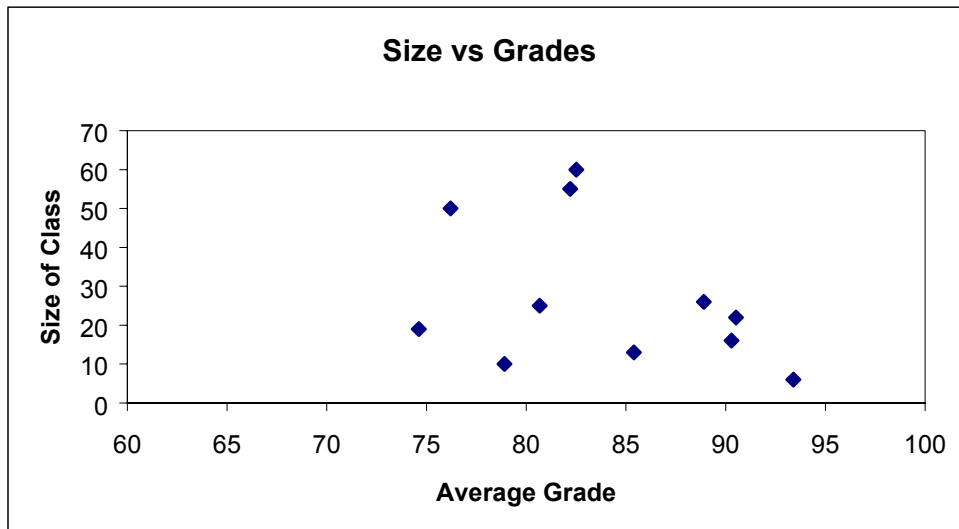


Figure 1. Correlation of Grades and Class Size for Genetics and Evolution Fall 1996 to Fall 2000. These are negatively correlated with a correlation coefficient of -0.37 . However two of the small classes were populated by a highly select group of pre-medical students, taking the class together during the summer. When the summer students are taken out of the analysis, the correlation coefficient of class size vs. grades is -0.32 .

Conclusion

Apparently, automated testing offers an inexpensive, easily maintained objective tool for evaluating courses. Such a method is likely to be accepted by faculty who are comfortable with computers. This may well offer a good way to measure differences between courses with large numbers of students. On the other hand, it is clear that small classes offer advantages for learning. Unfortunately, the statistical significance of comparisons among small classes is low, unless one can accumulate results from many successive offerings of the class.

The WebCT software is easy to use, especially considering the benefits that it offers. Students seem to accept the testing method very well, based on the fact that I received no complaints about it. The uniformity of the grading, the speed with which the exams are graded, and the feedback that is often customized to the student's answer, may be seen as better than "hand grading." The WebCT software comes with a sample test that can be used for quickly training the students in the use of the testing tools. I used WebCT not only for pre- and post-testing, but also for quizzes and mid-term examinations. Thus, the students were quite familiar with the system by the time they took the post-test. For term examinations only, the students also submitted written responses to the questions. In grading these examination papers, I had only to look at the handwritten versions of answers that were scored as being incorrect by the computer. This saved time, and I was able to judge whether to assign partial credit, overriding the grade assigned by WebCT. This resulted in extra points for most students on most tests.

Thus, the speed of computer grading was combined with the analytical judgment of the instructor. I believe this is a useful practice, which is judged as being fair by the students. Their experience with taking the tests this way is likely to have made it easier for the students to accept automated testing on the final examination. (Incidentally, by adopting a policy of not returning the originals of written exams, I avoided having to deal with a large number of appeals for re-grading of examinations. Students who needed a hard copy to prepare an appeal were provided a photocopy on request).

The pre- and post-tests differ in that the latter counts toward the student's grade. I believe most faculty would think it unfair to include the pre-test in the students' grades. Some may think it better to exclude the post-test score from the final grade, in order to keep students from stockpiling exams. (It is possible to print them). However, over time I have not noticed any improvement in the absolute scores on post-tests, suggesting that stockpiling has not been a problem. The use of electronic examinations minimizes the amount of paper circulating, and probably helps to maintain the integrity of the examination process. The other possible objection to including the post-test in the final grade is that the magnitude of the value of $\langle g \rangle$, the gain in learning, may be exaggerated. However, as long as the methods are not changed from one semester to the next, the comparisons should remain valid. On balance, I think the policy of including the post-test in the final grade encourages students to remember more of the course material, and thus serves a useful purpose, with no serious disadvantages.

Literature Cited

- Cummings, K Marx, J, Thornton, R, and Kuhl, D (1999) Evaluating innovation in studio physics, American Journal of Physics, Supplement 1 to Vol. 67, No. 7, pp S38-S45.
- Hake, R.R. (1998) Interactive-engagement versus traditional methods: a six -thousand - student survey of mechanics test data for introductory physics courses. American Journal of Physics. 66: 64-74.

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.

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



Neil Baird

2000 Honorary Life Member

Association of College and University Educators

Neil Baird received his B.A. from Millikin University and his Ph.D. from the University of Minnesota. He became a faculty member at Millikin in 1970 where he presently holds the rank of Associate Professor of Biology. Neil teaches introductory biology, comparative and developmental anatomy, histology, neuroanatomy, and a special topics course. His professional interests center on the nature of science and on the area of creationism/evolution. For relaxation, he enjoys jogging, reading, gardening, church work, listening to music, conversation, and travel.

Neil attended his first AMCBT (ACUBE) meeting in 1972 at the invitation of Jim Smithson. Since then he has been very active in ACUBE having served as President in 1985, co-host of the 1980 meeting at Decatur, IL, and steering committee member for 6 years. He has made eleven presentations at annual meetings, published in the official journal, and served on panel discussions. Those of us who have attended the annual meetings know Neil for a regular attendant and a full time participant. He has and continues to be one of the organizations strongest supporters.



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 45 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)

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A Reanalysis of the Origin of Modern Humans Using the Mitochondrial Control Region

Jeffery D. Noll

Department of Biology and Microbiology
South Dakota State University
Brookings, SD 57007-0595
E-mail: J_D_Noll@hotmail.com
FAX: 605-688-5624

Abstract: With the explosion of molecular techniques and computational biology (bioinformatics), biologists have developed tools enabling the approach of scientific problems from unique perspectives. This experiment uses bioinformatics in an attempt to reconstruct the phylogeny of modern humans and Neanderthals based on mitochondrial DNA (mtDNA) sequence data. Phylogenetic analysis of mtDNA provides support for the hypothesis that all modern humans are descended from a common African ancestor which is on a separate evolutionary branch from Neanderthal. In only one case did phylogenetic analysis yield results contrary to this hypothesis.

Keywords: bioinformatics, human evolution, molecular phylogenetics, mitochondrial control region, mtDNA, Neanderthal

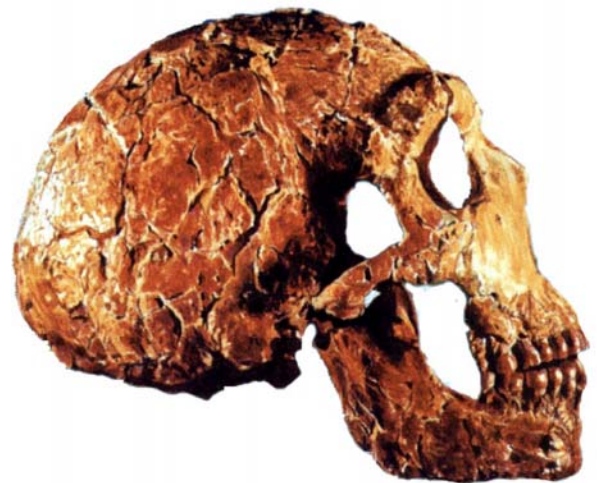
Introduction

The evolution of modern humans has been feverishly debated for centuries. How modern humans relate to extinct hominids has been of paramount importance in the debate. With the chance discovery of an unusual skeleton in the Neander Valley, more questions regarding human origins were raised. Anthropologists have since attempted to determine the evolutionary relationship of this “Neanderthal Man” to modern humans. Until recently, the only means of inferring hominid phylogeny was through the comparison of fossil morphology. Quite often, with the incomplete fossil record and subjectivity of morphology interpretation, results were regarded as ambiguous. Recently, molecular techniques have been developed enabling a refined testing of evolutionary hypotheses.

Currently, two main factions exist in the field of human evolution. Proponents of the single-origin hypothesis (Cann et al., 1987; Stringer and Andrews, 1988), also called the “Out of Africa” or “Noah’s Ark” model, allege that *Homo sapiens* originated from a single African locality, followed by a subsequent radiation to other continents. Under this hypothesis, Neanderthal is a separate, distinct lineage of ancestral hominids that later became extinct.

Conversely, proponents of the multiple-origin hypothesis (Wolpoff et al., 1984), also called the

“Multiregional” or “Candelabra” model, support a parallel origin of *Homo sapiens* in different, unconnected locations. According to the multiple-origin hypothesis, the separate hominid populations experienced gene flow through interbreeding, and maintain Neanderthal represents the ancestor to modern Europeans.



In 1997, Krings et al. successfully extracted and sequenced a segment of the mitochondrial control region (mtDNA) from a Neanderthal skeleton. The

379 base pair segment from the Neanderthal was compared to a homologous region from modern humans to elucidate their evolutionary relationships. Krings et al. (1997) found that the Neanderthal mtDNA sequence was significantly different from modern humans (difference between modern humans and the Neanderthal sequence of 27.2 ± 2.2 nucleotide substitutions compared to the differences among modern humans of 8.0 ± 3.1 nucleotide substitutions). In addition, phylogenetic analysis demonstrated a monophyletic assemblage of all modern humans separate from that of Neanderthal, and African sequences occupied a basal position in the phylogeny.

Recently, two additional Neanderthal mtDNA control regions were successfully sequenced (Ovchinnikov et al., 2000; Krings et al., 2000) and compared to both the DNA of modern humans and the existing Neanderthal sequence. Krings et al. (2000) found that the diversity of the three Neanderthal mtDNAs was comparable to that among modern humans (3.73% and $3.43 \pm 1.21\%$ respectively) [Variation is expressed as the percentage of sequence positions that have changed in trees relating three mtDNA sequences (Krings et al., 2000).] and that again, the Neanderthal sequences were significantly different from modern human sequences (difference between modern humans and the three Neanderthal sequences of 34.9 ± 2.4 substitutions). Phylogenetic analysis grouped the three Neanderthal sequences into a clade separate from that of all other modern humans. Again, all modern humans appear monophyletic with African being ancestral. The results of these later experiments further support the conclusion for a single-origin of *Homo sapiens* from the initial investigation of Krings et al. (1997).

The objective of this experiment is to utilize bioinformatic tools to reanalyze a portion of mtDNA

sequence data from Krings et al. (1997) and determine if the single-origin hypothesis of modern humans is supported using different phylogenetic analyses. An estimation of the time of divergence between various modern humans and Neanderthal is given and phylogenetic analyses performed using PAUP* (Swofford, 2000) and the Biology Workbench.

Methods

Sequences used for the analyses were obtained from the website of the DNA Learning Center at the Cold Spring Harbor Laboratory (<http://vector.cshl.org/sequences/>). Chimpanzee, Neanderthal, and five modern human sequences (African, Asian, Amerind, Australasian, and European) were utilized for these analyses.

Estimations for the time of divergence between Neanderthal and modern humans were performed according to the protocol in Laboratory 1: Human DNA Polymorphisms, pages 25-26 (courtesy DNALC, 1999).

The seven sequences were imported into the SDSC Biology Workbench 3.2 (<http://workbench.sdsc.edu/>) for alignment and phylogenetic analysis (data matrix may be obtained from author upon request). Alignment was carried out employing CLUSTAL W (Thompson et al., 1994) with default parameters. To achieve optimal alignment, CLUSTAL W (Thompson et al., 1994) may create insertions to ensure that sequence homology is maximized. A gapped position is a point in the sequences where the program has placed an insertion. Table 1 demonstrates a portion of the mtDNA sequences where CLUSTAL W (Thompson et al., 1994) has placed an insertion forming a gapped position.

Table 1. Example of a gapped position in the mtDNA sequences used in the phylogenetic analysis. The gapped position is caused by the presence of a unique adenine residue in the Neanderthal sequence.

Lineage	mtDNA Sequence
African	CCCCT-CACCC
Asian	CCTCT-CACCC
Australasian	CCCCT-CACCC
European	CCCCT-CACCC
Amerind	CCCCT-CACCC
Neanderthal	CCCTTACACCC
Chimpanzee	CCCCT-CCCC

Following alignment, four phylogenetic analyses utilizing parsimony were performed. First, a heuristic search was performed in PAUP* (Swofford, 2000) with gaped positions excluded from the analysis. One hundred random addition replicates were performed using TBR (tree bisection-reconnection) branch swapping. A second heuristic search was then performed in PAUP* (Swofford, 2000) using the same parameters except the gaped positions were included. Third, an analysis was performed utilizing DRAWGRAM, which uses the phylogenetic program PHYLIP (Felsenstein, 1993) from the SDSC Workbench. DRAWGRAM was set to exclude gaped positions. All other analysis parameters were at default settings. The last analysis performed was exactly the same as the third with the exception of including the gaped positions. Bootstrap analyses were also performed using PAUP* (Swofford, 2000) to determine branch support. 1000 replicates were

performed utilizing the same heuristic search settings as the parsimony analyses.

Results and Conclusions

The results of the time of divergence are summarized in Table 2. The average value from this reanalysis (538,000 years ago) is on the lower end of the 550,000 to 690,000 time of divergence calculated by Krings et al. (1997). These values lend support to the single-origin hypothesis. All modern humans appear to have diverged from Neanderthal at about the same time. For the multiple-origin hypothesis to be supported, the divergence times for hominids considered more closely related to Neanderthal would be more recent than that for distantly related hominids. For example, the expected divergence time of European from Neanderthal would be significantly more recent than that for all other modern humans and Neanderthal.

Table 2. *Estimated divergence time of modern human from Neanderthal.*

Lineage	Divergence Time From Neanderthal (years ago)
African	560,000
Amerind	507,000
Asian	565,000
Australasian	507,000
European	550,000
Average	538,000

Figure 1 is the tree produced from the PAUP* (Swofford, 2000) maximum parsimony analysis excluding gaped positions. The tree in Figure 2 (PAUP* (Swofford, 2000) analysis including gaped positions) demonstrates the same basic topology as Figure 1 with the minor exception of an unresolved Asian/Australasian. Most importantly, both trees possess a monophyletic clade comprised of the modern humans with African as the basal lineage. In both analyses, this clade has the highest support and bolsters the single-origin hypothesis.

Figures 1 and 2 support the hypothesis that all modern humans share a common ancestor of African descent. To support the multiple-origin hypothesis a trichotomous tree (with chimpanzee as the ancestral species) with the following branches would be expected: 1. Neanderthal/European, 2. African, and 3.

Asian/Australasian. It is clear in both analyses that Europeans are not more closely related to the Neanderthals than any other modern humans. From the phylogenies, it can be inferred that all modern humans share a common African ancestor, and that this African ancestor is a lineage separate from Neanderthal.

Figure 3 represents the phylogeny inferred by the Biology Workbench analysis with the gaped characters excluded. Similar to the PAUP* (Swofford, 2000) analyses, a monophyletic modern human clade with an African derivation is found. Again, this supports the single-origin hypothesis. Figures 1, 2, and 3 all resemble the phylogeny produced in the Krings et al. (1997) study. Krings et al. (1997) also found a monophyletic modern human clade where the African sequences were found to be ancestral.

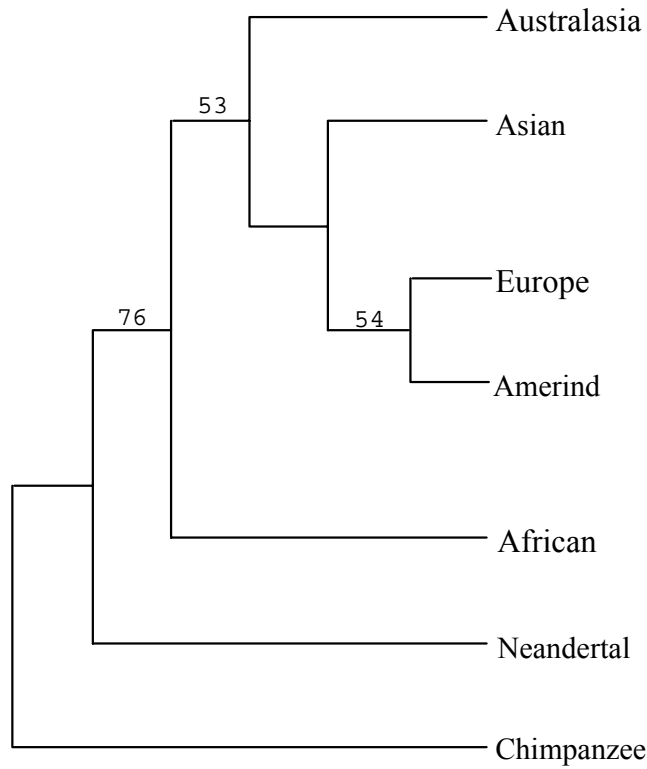


Figure 1. PAUP* single most parsimonious tree with gaped positions excluded, numbers above the branches represent bootstrap values from 1000 replicates (branches without numbers have values < 50).

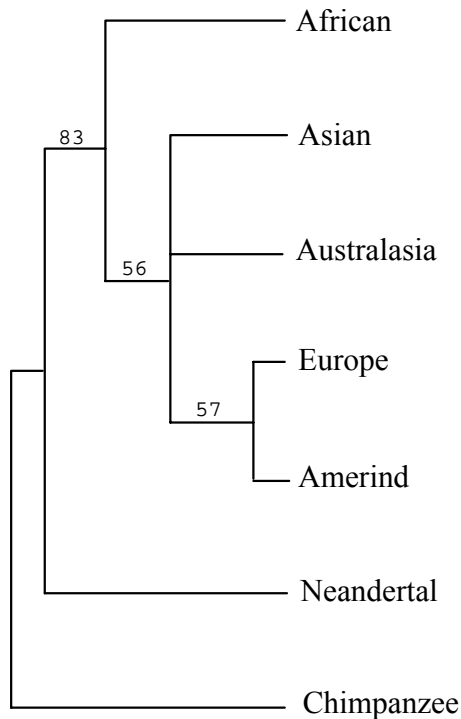


Figure 2. PAUP* strict consensus of two equally most parsimonious trees with gaped positions included, numbers above the branches same representation as in Figure 1.

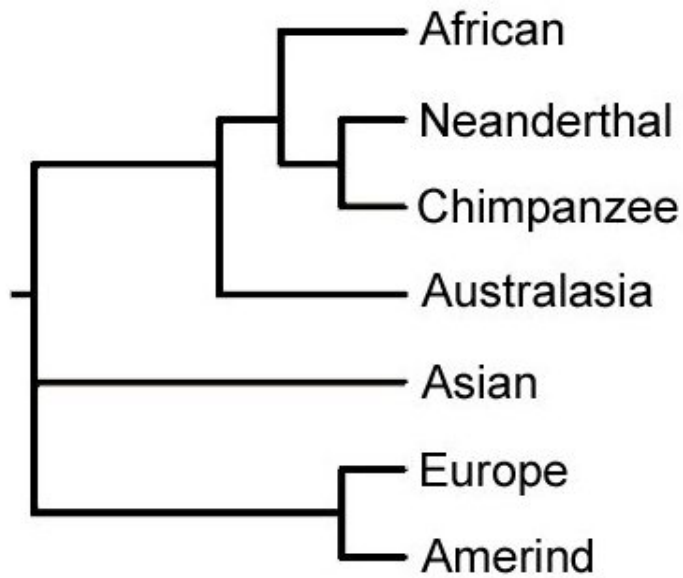


Figure 3. DRAWGRAM phylogenetic tree with gaped positions excluded.

Figure 4, however, appears to be highly divergent from any of the other phylogenies. The inclusion of gaped positions in DRAWGRAM appears to alter the phylogenetic analysis generating a phylogeny different from that when gaped positions are excluded. The modern humans still form a monophyletic clade but with Amerind as the ancestor. In fact, African appears to be one of the two most derived (or least ancestral)

sequences in the analysis. Also, the European sequence demonstrates a closer relationship to Neanderthal than in the previous analyses. The phylogeny produced from this analysis supports the multiple-origin model due to the fact that the African sequence is not basal and the European sequence appears more similar to that of Neanderthal.

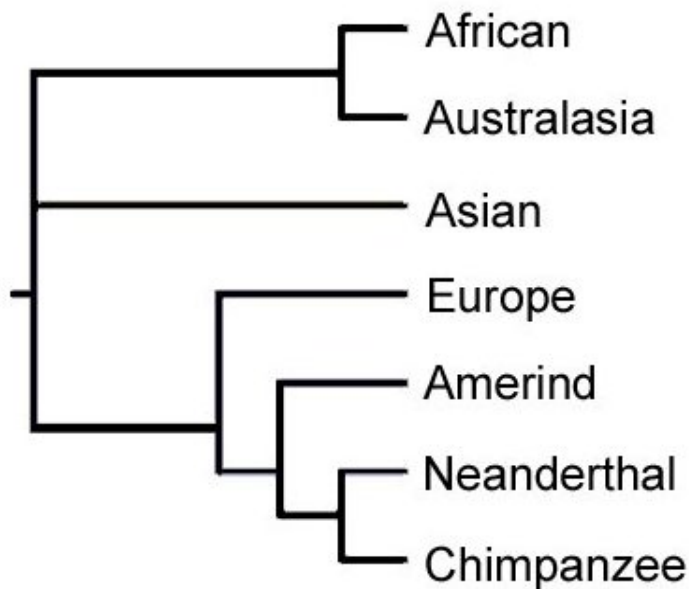


Figure 4. DRAWGRAM phylogenetic tree with gaped positions included.

One possible explanation for the apparently aberrant phylogeny may be sequence length variation. The Neanderthal and Amerind sequences are the two shortest sequences in the analyses and, in the DRAWGRAM analysis including gaped positions, appear to be more closely related. This result is not found in any other analyses and points to the possibility that DRAWGRAM could be sensitive to sequence length variation.

Overall, these reanalyses agree with the results of Krings et al. (1997), with the exception of the final analysis, and support the single-origin hypothesis of human evolution. As more Neanderthal sequences become available and bioinformatic tools become

further refined, more robust results may be obtained and a confident hypothesis of modern human evolution can be produced.

Acknowledgements

The author wishes to thank Fedora Sutton for the helpful comments and insightful discussion. I would also like to thank the DNA Learning Center at the Cold Spring Harbor Laboratory for providing the mtDNA sequences and the Biology Workbench for publicly offering the bioinformatic tools used in the analysis (except PAUP* which was purchased from Sinauer Associates).

Literature Cited

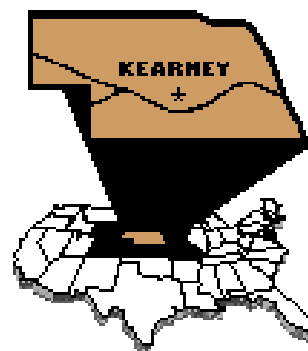
- Cann, R., M. Stoneking, and A. Wilson. 1987. Mitochondrial DNA and human evolution. *Nature*, 325:32-36.
- DNA Learning Center. 1999. Laboratory 1: human DNA polymorphisms. Cold Spring Harbor Laboratory. Cold Spring Harbor, New York (<http://vector.cshl.org/sequences/>).
- Felsenstein, J. 1993. PHYLIP (Phylogeny Inference Package) version 3.5c. Distributed by the author. Department of Genetics, University of Washington, Seattle.
- Krings, M., A. Stone, R. Schmitz, H. Krainitzki, M. Stoneking, and S. Pääbo. 1997. Neanderthal DNA sequences and the origin of modern humans. *Cell*, 90:19-30.
- _____, C. Capelli, F. Tschentscher, H. Geisert, S. Meyer, A. von Haeseler, K. Grossschmidt, G. Possnert, M. Paunovic, and S. Pääbo. 2000. A view of Neanderthal genetic diversity. *Nature Genetics*, 26:144-146.
- Ovchinnikov, I. V., A. Götherström, G. P. Romanova, V. M. Kharttonov, K. Lidén, and W. Goodwin. 2000. Molecular analysis of Neanderthal DNA from the northern Caucasus. *Nature*, 404:490-493.
- Stringer, C., and P. Andrews. 1988. Genetic and fossil evidence for the origin of modern humans. *Science*, 239:1263-1268.
- Swofford, D. L. 2000. PAUP*. Phylogenetic Analysis Using Parsimony (*and Other Methods). Version 4.0b4a Sinauer Associates, Sunderland, Massachusetts.
- Thompson, J.D., D.G. Higgins, and T. J. Gibson. 1994. CLUSTAL W: improving the sensitivity of progressive multiple sequence alignment through sequence weighting, positions-specific gap penalties and weight matrix choice. *Nucleic Acids Research*, 22:4673-4680.
- Wolpoff, M., Wu Xin Zhi, and A. Thorne. 1984. Modern *Homo sapiens* origins: A general theory of hominid evolution involving the fossil evidence from east Asia. In *The Origins of Modern Humans*. F. Smith and F. Spencer (eds). Pp. 411-483. New York: Alan R. Liss.

ACUBE

45th Annual Meeting
University of Nebraska at Kearney
Kearney, NE

October 11-13, 2001

Biology in the Light of Evolution





University of Nebraska at Kearney

Department of Biology

Kearney, Nebraska

Site of the 45th Annual ACUBE Fall Meeting

October 11-13, 2001

History: The University of Nebraska at Kearney began as the Nebraska State Normal School in 1905. In 1921, the name of the institution was changed to Nebraska State Teacher's College at Kearney. In 1963, it became Kearney State College. Both names were a part of system-wide changes for the state. In 1989, however, legislative action moved the institution from the State College System to the University of Nebraska System. The university community is in its 10th year as a NU System campus.

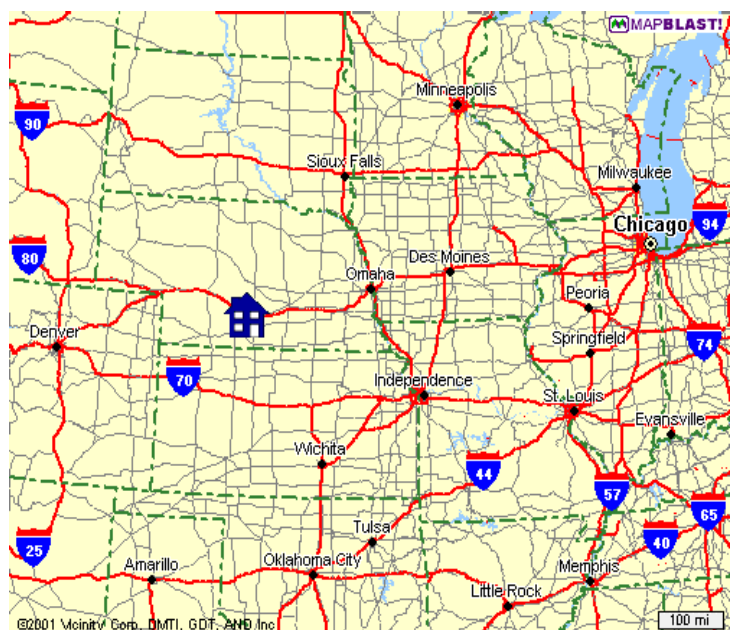
Mission: Today, UNK is a comprehensive residential university distinguished by its commitment to be the state's premier institution for undergraduate education. The university pursues the preservation, enrichment, and transmission of knowledge and culture across a broad scope of academic disciplines. It places the highest priority on programs of instruction and learning that educate students to be lifelong, independent learners. UNK has 350 faculty, 7000 students, and about 30,000 living alumni. UNK has 176 undergraduate programs, and offers masters degrees in several disciplines.

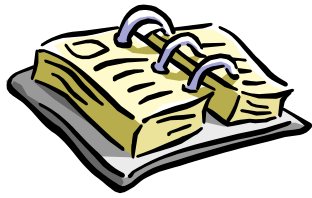
Department of Biology: The Department of Biology has 15 tenure track faculty, 3 full time lecturers, and about 250 majors. The Department also offers the thesis-focused M.Sc. degree as well as an M.Sc. science teaching (MSST) degree. The Department stresses both the content and processes of biology in seven emphasis areas; the comprehensive major, agricultural emphasis, environmental emphasis, environmental health emphasis, molecular emphasis, wildlife emphasis, and secondary biology education. All students complete an extended independent research project that culminates with a scientific research report written in the conventional fashion, a 20 minute oral presentation in the format of a scientific meeting, and submission of a poster. Student posters adorn the halls of the Biology floors celebrating the accomplishments of recent graduates.

The faculty typically teach "across the curriculum" with most involved in both majors and general education biology courses as well as lower and upper division offerings. Active faculty "groups" in prairie ecology and molecular biology have formed in recent years. This dynamic clustering of 3-5 faculty in each instance has enhanced undergraduate research opportunities.

Geography: The city of Kearney lies just north of the Platte River; the key water resource for wildlife and agricultural production across central Nebraska. Renown for the annual spring migration of some 500,000 sandhill cranes, the central "Big Bend" region of the Platte River harbors other migratory waterfowl in the spring, bald eagles in the winter, and an abundance of other wildlife. The Department of Biology utilizes or manages classic tallgrass prairie preserves in the lowland areas along the river and mixed grass prairie preserves in the upland loess hills minutes north of Kearney.

Kearney, a city of 30,000, is home to the Museum of Nebraska Art (MONA), the Great Platte River Road Archway Monument, a Cabela's sporting goods outlet, and Fort Kearny State Historical Park. The Fort adjacent to the Platte River along the Oregon, Mormon, and California Trails was a major staging ground for pioneers heading west.





Travel and Housing Preview

45th Annual ACUBE Fall Meeting

University of Nebraska at Kearney

October 11-13, 2001

Travel by Air

- Kearney has four arrivals and departures daily via United Express. All flights connect with Denver International Airport, the hub for United Airlines.
- Lincoln is just under 2 hours to the east of Kearney and is served by TWA, Northwest, United, and US Air Airlines. Omaha is just under 3 hours to the east with non-stop service several times a day from St. Louis (TWA), Chicago (United – O’Hare and Southwest – Midway), Minneapolis (Northwest), Milwaukee (Midwest Express), and Indianapolis (United).
- Eppley Express, a shuttle service, has three daily departures and arrivals from both the Omaha and Lincoln airports to Kearney. The fare is \$34 one way from Lincoln and \$42 from Omaha. The drop point in Kearney is the Country Inn Suites.

Travel by Car

- Kearney is 5 hours by car from Kansas City, 5 hours from Denver, 7 hours from Minneapolis, and 10 hours from Chicago.

Lodging

Kearney has 20 motels; several of which are on the Second Avenue corridor just off Interstate 80 and about one mile south and one mile east of the University of Nebraska at Kearney campus. Among those motels with tentative arrangements expressly for ACUBE meeting participants are:

Holiday Inn

110 2nd Ave.
 P. O. Box 1925
 Kearney, NE 68847
 308-237-5971 or 800-248-4460

Hampton Inn

118 3rd Ave.
 Kearney, NE 68847
 308-234-3400 or 800-426-7866

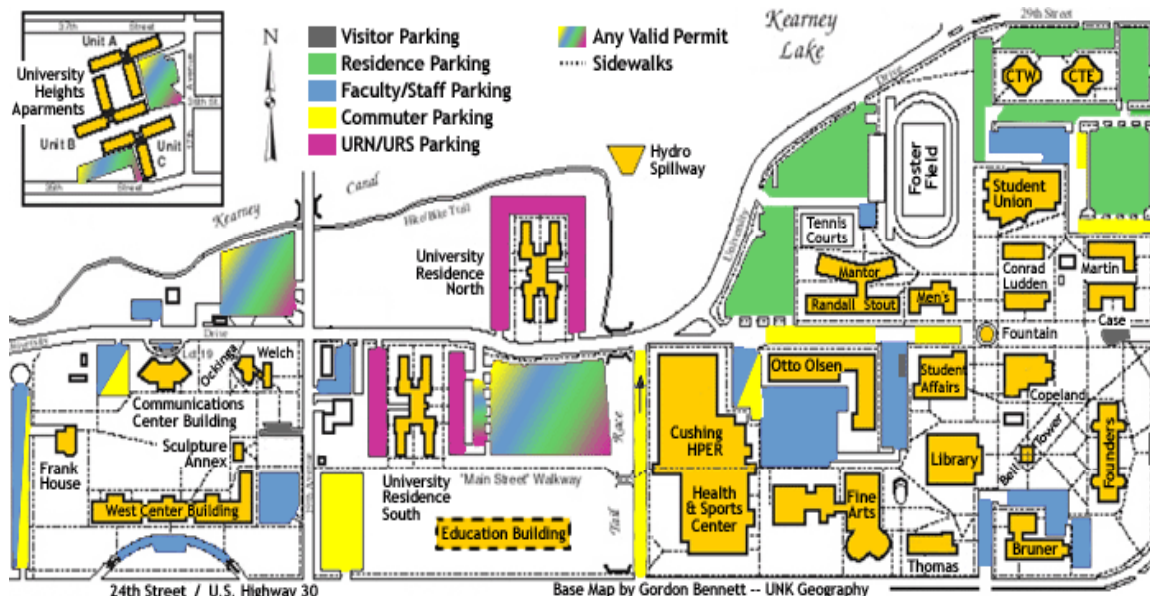
Wingate Inn

108 3rd Ave.
 Kearney, NE 68847
 308-237-4400 or 800-800-8000

Country Inn & Suites *

105 Talmadge St.
 Kearney, NE 68847
 308-236-7500 or 800-456-4000

* Location of the Eppley Express shuttle drop.



Laboratory Safety in the Biology Lab

Donna Ritch
Jane Rank

Human Biology
University of Wisconsin-Green Bay
Green Bay, WI 54311-7001
Email: ritchd@uwgb.edu

Abstract: Laboratory safety has or should become an important issue in the science curriculum. At the University of Wisconsin-Green Bay, a Chemical Hygiene plan has been developed, laboratory instructors participate in a lab safety orientation program, a lab safety video has been produced, and a Laboratory Safety course has been introduced into the science curriculum. To improve our efforts in training students in the science labs, we wanted to determine if the students possess and comprehend basic safety knowledge. In an attempt to do this, we developed a lab safety survey, which was administered to five Biology courses (two introductory and three upper level courses) and the Laboratory Safety course. The results of our survey show a significant increase in the amount of safety knowledge gained when students are exposed to various topics in laboratory safety and are held accountable for learning the information as is required in our Laboratory Safety course.

Key Words: Laboratory safety; biology laboratories; undergraduate science curriculum; assessment

Introduction

Laboratory safety has or should become an important issue in all high school, college, and university science curricula. Like many other schools, the University of Wisconsin-Green Bay has made an effort to meet regulatory mandates and provide a safe laboratory experience for faculty, staff and students. Our Chemical Hygiene Plan, first developed in 1991 and updated annually, covers all aspects of the campus lab safety program and delegates responsibility for student lab safety training to the lab instructor. All lab instructors attend a half-day lab safety orientation program, which includes a section on the elements of the campus Chemical Hygiene Plan. A recently updated campus-produced lab safety video is available for instructor's use as an introduction to students on the topic of laboratory safety. A one-credit Laboratory Safety course has been part of the curriculum since 1993. The only prerequisite for this course is a science laboratory course. It serves as a prerequisite for only a single science course; that is Analytical Chemistry. Therefore, all Chemistry majors/minors and many Human Biology majors take this Laboratory Safety course at various points in their academic careers.

Although we believe the University of Wisconsin-Green Bay has made solid progress in student lab safety training, we decided it was time to evaluate our efforts by seeking answers to three questions: 1) Do students possess basic lab safety knowledge?, 2) Do students comprehend safety knowledge conveyed?, and 3) Do students apply safety practices in the lab?

The Laboratory Safety Survey

We began our evaluation with an assessment of student safety knowledge and decided to target what we perceived as our weakest area – laboratory safety in our biology courses. The lower level chemistry courses consistently use the campus produced lab safety video (its content slanted toward the physical sciences) as part of the lab safety introduction. Students in upper level chemistry courses typically have completed the one credit Laboratory Safety course. In contrast, biology lab instructors have received less guidance as to types of safety topics to cover because of the wide variety of content covered in the various biology labs.

Biology Safety Survey

1. The most likely way a hazardous chemical enters the body is by:
a) ingestion. b) skin absorption. c) inhalation. d) injection.
2. An AB fire extinguisher can be used on fires involving:
a) flammable metals. b) electrical equipment. c) flammable liquids. d) b. and c.
3. The best way to extinguish a clothing fire is:
a) stop, drop and roll on the floor. b) drenching a person with nearest water.
c) wrapping a person in a fire blanket. d) all of the above are "best" methods.
4. In general, the lower the PEL for a chemical:
a) the greater the inhalation hazard. b) the lower the inhalation hazard.
c) the greater the ingestion hazard. d) the lower the ingestion hazard.
5. Ethanol, a commonly used specimen preservative, has a flash point of 55° F. This means:
a) it is a potential fire hazard at room temperature.
b) it will only burn at temperatures less than 55° F.
c) it must always be used in a fume hood.
d) it must only be used in a room equipped with explosion proof equipment.
6. If a corrosive material splashes in your eye, you should first flush the eye thoroughly for a minimum of:
a) 60 seconds. b) 3 minutes. c) 10 minutes. d) 15 minutes.
7. Which of the following correctly matches color with the hazard it represents in the NFPA 704 labeling system used in our laboratories?

<u>A</u>	B	C	D
blue-health	blue-reactive	blue-health	blue-health
red-fire	red-fire	red-reactive	red-fire
yellow-reactive	yellow-health	yellow-fire	yellow-special
white-special	white-special	white-special	white-reactive
8. In case of a hazardous chemical spill the first line of action is to:
a) clean up spill using available spill materials. b) inform others and evacuate if necessary.
c) contain the spill to minimize danger. d) call 2300 (Public Safety) for guidance.
9. There are seven basic rules of biosafety. Which of the following is not one of these seven basic rules?
a) Do not mouth pipette.
b) Wash hands following all laboratory activities.
c) Do not eat, drink, store foods or smoke in the laboratory.
d) All of the above are one of the seven basic rules of biosafety.
10. Four Biosafety Levels (BSLs) have been established for activities involving infectious microorganisms and laboratory animals. BSL 1 practices, safety equipment and facilities would be appropriate for work with:
a) agents not known to cause disease in healthy adults.
b) agents associated with human disease where route of infection is from needle sticks or mucous membrane contact.
c) agents that our indigenous or exotic where potential route of transmission is from aerosol transmission and agent may have serious or lethal consequences.
d) Agents are dangerous or exotic and pose high risk of life-threatening disease.
11. An MSDS:
a) is a sheet summarizing health and safety information for a hazardous chemical.
b) stands for Metals and Solvents Data Sheet.
c) is only required for substances produced after 1999.
d) all of the above correctly describe an MSDS.



A



B



C



D



E

12. Which symbol from above indicates a hazard that is corrosive? C
13. Which symbol from above indicates a hazard that is an infectious agent? B
14. Which of the following is capable of transmitting a bloodborne pathogen (e.g. HIV or HBV) on contact?
a) semen and vaginal secretions b) feces c) sweat d) all of the above
15. Which of the following work practices is likely to produce aerosols?
a) mixing a culture by alternate suction and expulsion c) using a mark to mark pipette
b) using a mechanical pipetting aid d) pipetting a liquid with a plugged pipette

A survey comprised of 15 multiple-choice questions (see the box on the facing page; answers are underlined) was developed to assess basic laboratory safety knowledge. We did not attempt to define essential lab safety knowledge but instead focused survey questions on three areas important to us: knowledge of the campus hazardous materials labeling system used in our laboratories, knowledge of appropriate emergency response procedures, and knowledge of standard microbiological practice and knowledge of standard microbiological practice and blood borne pathogens.

Three hundred twenty six students in introductory biology courses (Principles of Biology I and Principles of Biology II) and upper level courses representing different focuses in lab content (Microbiology, Cell

Biology, and Comparative Anatomy), and the Laboratory Safety course completed the survey. If a student were enrolled in more than one of these courses during the semester, he/she was asked to complete the survey only once. Students were also asked to provide information on current and past courses completed.

Data

Figure 1 shows the course means of the survey when administered prior to safety training at the beginning of the semester and at the end of the semester.

Significant differences between the means were determined by a student's t-test. These are shown in Table 1.

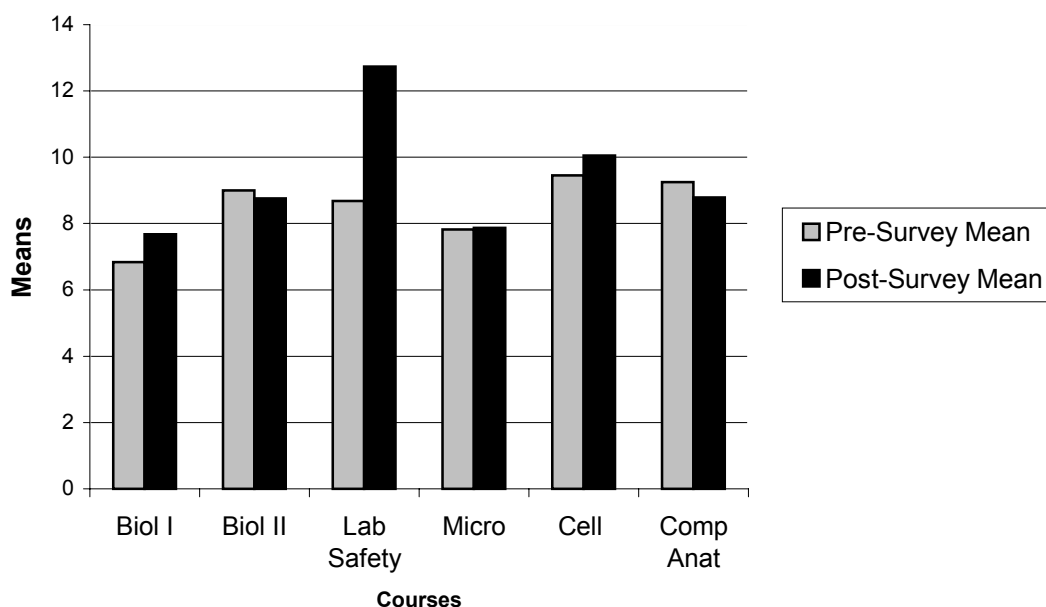


Figure 1: Pre- and Post-Semester Assessment Means.

TABLE 1: ANALYSIS OF SURVEY MEANS

Course	Beginning of Semester			End of Semester			N	Significant Difference
	Mean	Median	Range	Mean	Median	Range		
Principles of Biology I	6.84	7	2-12	7.68	8	1-13	163	*
Principles of Biology II	9.00	9	5-13	8.76	9	5-14	50	NS
Laboratory Safety	8.68	9	3-12	12.74	13	10-15	19	*
Microbiology	7.82	8	3-14	7.87	8	1-15	61	NS
Cell Biology	9.45	9.5	5-14	10.05	10	6-12	19	*
Comparative Anatomy	9.25	9	5-13	8.79	9	5-11	14	NS

n = number of students surveyed

*Denotes significant difference between means at 0.01 level (1%)

NS denotes means not significantly different at 0.05 level (5%)

Table 2 shows the results of student's t-tests of the post survey results from Principles of Biology I and Principles of Biology II compared to Laboratory Safety, Microbiology, Cell Biology, and Comparative Anatomy.

Although overall survey results were our primary consideration, we were also interested in survey results for individual questions. For this analysis we were interested in comparing overall responses to topics queried to determine on which topics biology students demonstrated adequate safety knowledge. We did not

look for differences in response rates between courses. Figure 2 shows results combined from all courses surveyed for each of the 15 questions both pre and post survey.

In addition to surveying the students, laboratory instructors were asked to complete a survey on the types of safety topics covered and what methods each instructor used to cover these topics in the laboratory. Results are summarized in Tables 3 and 4

TABLE 2: ANALYSIS OF POST SURVEY MEANS

	Principles of Biology I	Principles of Biology II
Principles of Biology I	—————	*
Principles of Biology II	*	—————
Laboratory Safety	*	*
Microbiology	NS	*
Cell Biology	*	*
Comparative Anatomy	*	NS

*Denotes significant difference between means at 0.01 level (1%)

NS denotes means not significantly different at 0.05 level (5%)

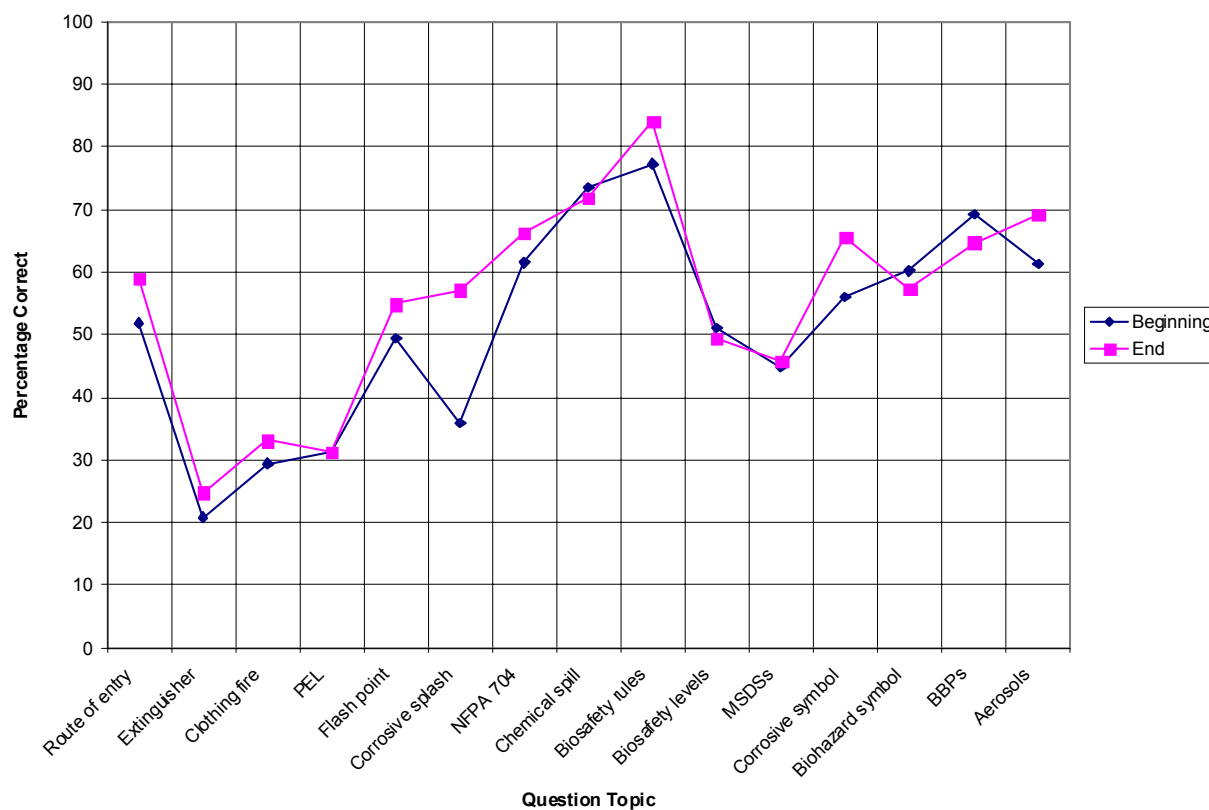


Figure 2: Question Analysis.

TABLE 3: TOPICS COVERED BY INSTRUCTORS IN BIOLOGY COURSES SURVEYED

<i>Course</i>	1	2	3	4	5	6	7	8	9	10	11
Biology I	X		X	X		X		X			
Biology II	X	X	X								
Lab Safety	X	X	X	X	X	X	X	X	X	X	X
Microbiology											
Cell Biology	X		X	X		X				X	X
Comparative Anatomy	X		X	X							

1 – Fire response

2 – Clothing fire

3 – Spill response

4 – Corrosive splash

5 – NFPA labels

6 – Hazard symbols

7 - MSDS

8 – Route of entry

9 - PELs

10 - BBPs

11 – Biosafety rules

TABLE 4: METHODS OF SAFETY TRAINING IN BIOLOGY COURSES SURVEYED

	Safety lecture beginning of semester	Verbal reminders during semester	Safety information part of lab manual	Safety questions included on quiz or test
Biology I	X	X		
Biology II	X			
Lab Safety	X	X	X	X
Microbiology		X	X	
Cell Biology	X	X	X	
Comparative Anatomy	X	X		

Discussion

The significant differences in post-survey means when comparing Cell Biology and Laboratory Safety with both Principles of Biology I and Principles of Biology II led us to question whether anything different was done in these two courses compared to the Principles of Biology I and II courses. Based on instructor self-reporting of safety topics covered and safety training techniques used, the Cell Biology and Laboratory Safety courses covered more of the safety topics than the other courses. In addition, they were the only two courses that used all three techniques: an introductory safety lecture, verbal reminders throughout the semester, and inclusion of written safety material in a laboratory manual. Course sequence may account for some of these differences in means. For example, the pre-requisite for Cell Biology is Principles of Biology II and Principles of Chemistry II. On the other hand, the pre-requisite for Laboratory Safety is only one science laboratory course.

One additional point stands out when looking at survey results. Laboratory Safety was the course that showed the greatest difference between the pre-survey mean and post-survey mean. Laboratory Safety had the highest post-survey mean (84.9%) of any course, but not the highest pre-survey mean (57.8%). This was

the only course in which all topics surveyed were covered and, maybe more significant, a grade in the course was solely determined by the student's level of safety knowledge.

Figure 1 also shows that there was either no significant increase or even a slight decrease in the means for three courses. Lab instructors covered fewer safety topics. In some instances, lab content may account for this. For example, the laboratory exercises in Principle of Biology II consist of primarily animal dissection and microscopy exercises with limited opportunities to apply the full range of safety topics covered in the assessment.

Conclusion

We have come to a very simple and probably predictable conclusion. To increase student laboratory safety knowledge the following should be done: 1) the instructor should adequately cover all topics deemed necessary in that laboratory, 2) the instructor should cover topics using a variety of techniques, and 3) the instructor should hold students accountable for knowledge acquisition; that is, incorporate laboratory safety issues into the evaluation process for the laboratory.

There is no doubt that other factors may account for some of the differences we found. Prior course experience by each student was not taken into consideration. We did not correlate each student in the upper level courses with the types of foundation courses they took (for examples, Principles of Chemistry I and II rather than General Chemistry) or where these courses were taken (at the University of Wisconsin-Green Bay or at another institution with a subsequent transfer to UW-Green Bay). The survey instructors used to self-report safety topics covered and techniques used to convey information was not detailed. Some laboratory course content (such as a large emphasis on animal dissections) did not provide natural opportunities to discuss safety issues. However, we still believe the way to improve student laboratory safety knowledge is not complicated: teach the material and test students on the material.

Survey results also provided information on specific topic knowledge. We did not establish an "acceptable" mean for overall survey results nor for individual question results. However, poor post-survey results overall for questions on fire extinguishers, emergency response to clothing fire, PELs (Permissible Exposure Limits), and emergency response to a corrosive splash concerned us. We will pay particular attention to topics on which students scored low on the survey when developing the next steps. These results also raised a few questions. Only one instructor reported covering PELs as a safety topic and over all post-survey response rate on the PEL question was only 30%, which follows one of our basic conclusions – a topic needs to be covered to increase knowledge base. Only one instructor reported covering the NFPA (National Fire Protection Association) labeling system as a safety topic and the over all correct response post-survey was 60%. Extensive signage explaining the NFPA labeling system is found in all our labs; no

information on PELs is posted. We then asked does signage really make this kind of difference and/or is signage a potential important tool to use in teaching safety knowledge? It may merit further investigation.

Based upon conclusions drawn from our survey results, we plan to implement several changes in our approach to teaching laboratory safety in biology laboratories. Although some campuses may have to deal with instructor resistance to covering safety topics or resistance to accepting suggestions for improving topic coverage, these are not issues at the University of Wisconsin-Green Bay. Therefore, we can focus our efforts on providing instructors with improved tools for use in teaching safety in the lab. We plan to do the following:

1. Provide laboratory instructors with a comprehensive list of topics that should be covered in an introductory lecture.
2. Consider developing a campus-produced video with an emphasis on safety issues in the biology lab to complement the introductory safety lecture. A campus-produced video is currently used extensively in our introductory chemistry courses. We are in the process of assessing the effectiveness of its use to see if it is worth pursuing this idea.
3. Investigate ways to include safety exercises or quizzes into the lab experience.
4. Begin the process of answering the other two questions posed at the beginning of this article: Do students comprehend safety knowledge conveyed and do students apply safety practices in the lab?

We would like to thank Drs. Kari Beth Krieger, Uwe Pott, Brian Merkel, Michael Morgan, and Tara Reed-Andersen for participating in this survey.

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.

ACUBE ELECTIONS 2001

Biographic Sketches of Nominees for President

MARC M. ROY

Department of Biology, Beloit College
email: roym@beloit.edu

Education

BA, Biology, 1982, Lawrence University
Ph.D., 1989, University of Wisconsin, Neuroscience,

Professional Experience

June 1998-present, Associate Dean of the College,
Beloit College
2001-present, Prof. of Biology, Beloit College
1995-2001, Associate Prof. of Biology, Beloit College
1995-1996, Robert Redfield Visiting Professor,
University of Chicago
1989-1995, Assistant Prof. of Biology, Beloit College

AMCBT/ACUBE Membership

Member since 1990
Steering Committee, 1993-1996
Executive Secretary, 1996-1999)

ACUBE Presentations

- Roy, M.M. (1991). Computerized Data Acquisition in Physiology Laboratories. Association of Midwest College Biology Teachers. Kansas City, Missouri.
- Roy, M.M. (1992). Teaching Sexual Differentiation: What We Teach and How We Teach. Association of Midwest College Biology Teachers. Chicago, Illinois.
- Roy, M.M., Moore, R., and Wallace, R. (1992). Does Writing about Biology Enhance Learning: Practical Aspects. Association of Midwest College Biology Teachers. Chicago, Illinois.
- Roy, M.M. and Manalis, R.S. (1993). Computerized Real Time Data Acquisition in Biology Labs. Association of Midwest College Biology Teachers. Millikin University, Decatur, Illinois.
- Roy, M.M. (1994). Student Designed Laboratories. Association of Midwest College Biology Teachers. Henderson Community College, Henderson, KY.
- Roy, M.M. and Fass, M.F. (1995). Teaching Human Biology: A Workshop Format. Association of Midwest College Biology Teachers. Alverno College, Milwaukee, WI.
- Roy, M.M. (1998). Teaching Sexual Differentiation: Beyond the Textbooks. Association of College and University Biology Educators. Rockhurst College, Kansas City, MO.
- Roy, M.M. (1999). Integrating Process and Content in a Workshop Human Biology Course. Association of College and University Biology Educators. University of Wisconsin-River Falls

Bioscene Publication

Roy, M.M. (1996). Time, Space, Turf, and Tradition: Pushing the Boundaries in Biology Education. *Bioscene: Journal of College Biology Teaching*. 22:19-20.

MARGARET A. WATERMAN

Dept. of Biology Southeast Missouri State Univ.
email: waterman@biology.semo.edu

Education

BS, Biology, 1973, Framingham State College
MS, 1977, Plant Pathology
Ph.D., 1982, Science Education, Cornell University

Professional Experience

2000 – Present, Associate Prof. of Biology, Southeast Missouri State University
1996-2000, Assistant Prof. of Biology, Southeast Missouri State University
1991-1995, Lecturer on Medical Education, Harvard Medical School
1988-1991, Director Office of Faculty Development, University of Pittsburgh
1983-1987, Assistant Professor of Biology, Emory University
1982-1983, Visiting Assistant Professor of Biology, Kenyon College

ACUBE Experience

Secretary of ACUBE, 1997-2001
First Vice President (Program Chair) for the ACUBE 2000 meeting at Indiana State University
Reviewer for *Bioscene* since 1997
Bioscene editorial board, 2000-2002
In addition I have consistently participated at ACUBE meetings since joining AMCBT in 1996, and have an article in *Bioscene*.

Publications

Numerous publications in college biology education, professional development, and plant pathology.

Bioscene Publication

Waterman, M.A. 1998. Investigative Case Study Approach for Biology Learning. *Bioscene: Journal of College Biology Teaching* 24(1):3-10.

Professional Presentations

Over 30 professional presentations, including several k-12 teacher workshops, on biology education. Presentations on Investigative Case-Based science learning at ACUBE (1996, 1998, 1999, 2000), NABT, NSTA, and the UNESCO sponsored BioED 2000 in Paris France.

Scholarship

NSF Division of Undergraduate Education. LifeLines OnLine: Accessible Biology for Community Colleges. \$296,712 Jan 00-Dec 02. Ethel Stanley, BioQUEST, co-PI. This grant funds a summer institute on investigative case based learning for biology faculty in two year colleges, as well as a web-based dissemination site, follow up activities and curriculum development.

ACUBE ELECTIONS 2001

Biographic Sketches of Nominees for Secretary

NANCY S. GOODFELLOW

Saint Xavier University

EDUCATION

Bachelor of Arts (with honors), 1962, Northwestern University, Evanston, Illinois
Master of Science, 1964, Northwestern University, Evanston, Illinois
Doctor of Education, 1999, Northern Illinois University, DeKalb, Illinois

AWARDS OR HONORS RECEIVED

NSF Undergraduate and Graduate Fellowships
Alpha Lambda Delta Honorary Society
The American Institute of Biological Sciences
Beta Beta Beta Honor Society
Saint Xavier University Service Award

PROFESSIONAL EXPERIENCE

Saint Xavier University, Chicago, Illinois 1978 to present;
Instructor 1978-1989 (part time); Assistant Professor 1990-1996; Associate Professor 1997- present

Elmhurst College, Elmhurst, Illinois 1988-1990, Adjunct Instructor

Mundelin College, Chicago, Illinois 1981-1988, Adjunct Instructor

Waubensee Community College, Kane County, Illinois 1978-1980, Adjunct Instructor

Pace University, Pleasantville, New York 1972-1977, Adjunct Assistant Professor

Milstead Laboratory of Chemical Enzymology, Sittingbourne, Kent, England 1965-1966, Technician
Northwestern University, Evanston, Illinois 1964-1965, Technician, Biology Department

RECENT PRESENTATION

Recognizing in Young Women An Early Passion for Science. Presented, Workshop May 1999, Center for Research on Women and Gender at University of Illinois Chicago.

ACUBE ELECTIONS 2001

Biographic Sketches of Nominees for Steering Committee

ABOUR H. CHERIF

Columbia College, Chicago, IL

Abour Cherif is professor of Biology and Science education and the Director of Biology courses at Columbia College Chicago. He is a member of the executive committee of the International Institute For Human Factor Development (IIHFD) and one of the two vice presidents of the U.S. Chapter.

Dr. Cherif teaches Biology courses at the Science and Mathematics Department and graduate courses in Science Education at the Department of Educational Studies, Columbia College.

Dr. Cherif holds a bachelor degree in Biology from Tripoli University in North Africa, a masters degree in Teaching Biology from Portland State University and a Ph.D. in Science Education from Simon Fraser University, British Columbia, Canada.

He is an active member of a number of professional organizations such as the National Association Biology

Teachers (NABT), The Association of College and University Biology Educators (ACUBE), National Science Teachers Association (NSTA), North American Association of Environmental Education (NAEE), The International Institute For Human Factor Development (IIHFD), National Association of Geoscience Teachers (NAGT), Association For Supervision and Curriculum Development (ASCD), to name a few.

Dr. Cherif is the founder of *Friends of Schools and Teachers Support Group*; a group of scientists and science educators who volunteer to respond to schools or science teachers requesting help in the areas of pedagogy and or science content. He is the founder and the managing editor of the **Forward To Excellence In Teaching & Learning News Letter** (FTE Newsletter). The goal of FTE is to report trends, news, research findings, exemplary programs, and available resources in teaching and learning science and mathematics. It is also a vehicle of communication in new ideas and educational materials for teaching science and

mathematics especially for art, media and communication students as well as non-science majors.

Dr. Cherif is also a member of the advisory board, editorial board and/or editorial review of a number of bi-review journals. For example, he is a co-editor of the **Journal of Human Factor Studies** and has been reviewing articles for **The American Biology Teachers**, to name a few. He is also a member of the advisory board of the **Journal of College Science Teaching**.

Dr. Cherif is also an educational consultant for a number of public school districts and publishing companies including Chicago Public Schools' office of accountability, and The NeoSciPublishing company, to name a few. He also published over 60 papers in various professional journals, magazines, and newspapers in various areas of teaching, learning, curriculum development, and student assessment in the areas of general Science, ecology, environment, and biology. He has also published a number of science lab kits and teaching techniques. He has presented and conducted numerous presentations, workshops, and/or mini-courses at state and national levels at NSTA, NABT, IHHFD, ACUBE, ISTA, WSTA, IASCD, MEEC and NCTM to name a few. He has also been conducting workshops for faculties at a number of colleges and universities on assessing students' needs in the classrooms, on teaching strategies and techniques, and promoting multiculturalism in classrooms through the teaching of science and mathematics. Dr. Cherif also developed numerous SCIENCELab Kits, and the author of the Biology: The Living World Around Us Student Laboratory Manual (2000), and the textbook, Biology: The Living World Around Us (in press 2002)

Dr. Cherif received a number of awards such as the 1999 ISTA Outstanding Preserve Science Education Award, and the 1998 IHHFD Outstanding Accomplishments and Leadership Award.

Dr. Cherif has been an advocate for helping and promoting graduate students and student-teachers in attending professional meetings and conferences and in publishing papers in professional journals.

Dr. Cherif's professional work includes Curriculum development and Reform, Instructional and Assessment Design, and Evaluation techniques in science areas.

JANET LEIGH COOPER

Rockhurst College
janet.cooper@rockhurst.edu

EDUCATION:

1980-1984 University of Nebraska-Lincoln, Lincoln, NE.
Major: Cellular and Molecular Biology and Genetics.
1977-1980_ Culver-Stockton College, Canton, MO. Major:
Biology. B.A. received May 1980 (summa cum laude).

EXPERIENCE:

8/98 to present: Rockhurst College, Kansas City, MO
associate professor, Courses taught include:
Microbiology, Introduction to Research, General
Biology and Biology Seminar.

8/95 to 8/98: Wayne State College, Wayne, NE associate
professor. courses taught include: Microbiology,
Immunology, Molecular Biology, Cell Biology,
Genetics, Biology Concepts, Biology for General
Education, Introduction to Research, Research Project,

Undergraduate Research and Laboratory Techniques.
Advisor: Medical Technology, Respiratory Therapy.
Research interests: Effects of heavy metal ions on frog
development in *Xenopus laevis*.

8/91 to 8/95: Wayne State College, Wayne, NE assistant
professor, courses taught: same as above.

8/90 to 8/91: University of Tulsa, Tulsa OK, visiting assistant
professor, Courses taught include Genetics and Genetics
/ Human Diversity.

2/89 to 8/90: University of Kansas Medical Center, post-
doctoral research: Protein interactions with chick
Metallothionein Promoter, funded by NIH. Spring
1990, taught Molecular Basis of Life at Penn Valley
Community College, Kansas City, MO

6/87 to 2/89: Cell Biology Group, Los Alamos National
Laboratory, Los Alamos NM. Staff member. Research:
Transformation and Differentiation in a mouse 3T3 Cell
Line.

8/84 to 6/87: Experimental Pathology Group, Los Alamos
National Laboratory, Los Alamos NM. Post-doctoral
research: Epidermal growth factor and SV40 T Antigen
and its Role in Neoplastic Transformation.

6/80 to 8/84: School of Biological Sciences, University of
Nebraska-Lincoln, Lincoln, NE. Research assistantship:
Ph.D. research: Somatomedins, Hormone-receptor
interactions.

8/77 to 5/80: Biology Department, Culver-Stockton College,
Canton, MO. Staff assistantship: assisted in the
Introduction to Biology and Microbiology laboratories
and in the maintenance of the stockroom and
greenhouse. Undergraduate research: Detecting
Carcinogenic Chemicals by a Modification of the Ames
Test.

ROSS ALAN JILK

Rockhurst University
ross.jilk@rockhurst.edu

EDUCATION

UNIVERSITY OF MINNESOTA. 1994-1997. Department
of Genetics and Cell Biology, College of Biological
Sciences. Postdoctoral research assistant

UNIVERSITY OF WISCONSIN. 1987-1994. Department
of Biochemistry, Ph.D. in biochemistry, minor in
bacteriology.

UNIVERSITY OF MINNESOTA. 1983-1987. College of
Biological Sciences, Bachelor of Science in
Biochemistry, *cum laude*.

EMPLOYMENT

ROCKHURST UNIVERSITY. 1998-Present. Assistant
Professor, Department of Biology

AUGSBURG COLLEGE. 1997-1998. Visiting Assistant
Professor. Department of Biology

UNIVERSITY OF MINNESOTA. 1996-1997. Teaching
Coordinator and Instructor. Department of Genetics
and Cell Biology

PROFESSIONAL MEMBERSHIPS

ASSOCIATION FOR THE ADVANCEMENT OF
SCIENCE. 1992 - present

THE ASSOCIATION OF COLLEGE AND UNIVERSITY
BIOLOGY EDUCATORS. 1999 – present
NATIONAL SCIENCE TEACHERS ASSOCIATION. 2000
– present
NATIONAL ASSOCIATION OF BIOLOGY TEACHERS.
2000 – present
MISSOURI ACADEMY OF SCIENCES. 2001 – present

CARL H. KASTER

SIENA HEIGHTS UNIVERSITY
chkaster@sienahts.edu

WORK EXPERIENCE

SIENA HEIGHTS UNIVERSITY (1982-present). 1999
promoted to Professor of Biology. Outstanding
Teacher Award, Siena Heights College, 1986.. 1994-
present serving as Program Coordinator of Science.
1994-present serving as Chair of Curriculum
Committee

ADRIAN COLLEGE (1987 - 1988) Adjunct Professor
INDIANA UNIVERSITY SOUTHEAST (1980 - 1982)
Adjunct Prof.

UNIVERSITY OF LOUISVILLE (1975 - 1980) GTA

EDUCATION

UNIVERSITY OF LOUISVILLE. Doctor of Philosophy in
Biology, 1987. Bachelor of Arts, Biology major, 1974.

MEMBERSHIPS

American Association for the Advancement of Science
(AAAS); American Institute of Biological Sciences (AIBS);
Animal Behavior Society; Association of College and
University Biology Educators (ACUBE); Beta Beta Beta;
Entomological Society of Washington; Michigan
Entomological Society; Michigan Mosquito Control
Association; Society for the Study of Evolution; Society of
Systematic Biologists

GARY M. LANGE

Saginaw Valley State University

EDUCATION

Bachelor of Science, Saginaw Valley State University,
major: biology; minors: chemistry, English

Master of Science, Central Michigan University,
Department of Biology

Doctor of Philosophy, Michigan State University,
Department of Zoology,

WORK EXPERIENCE:

2000 – present. **Associate Professor,** Saginaw Valley State
University, Department of Biology

1995 – 2000. **Assistant Professor,** Saginaw Valley State
University, Department of Biology. 1994 - 1995
Instructor, Lansing Community College, Department
of Science.

1988 – 1995, **Graduate Teaching Assistant,** Michigan State
University, Department of Zoology.

1991 – 1994 **Manager of Laboratory Animal Care,**
Laboratory of Dr. Lynwood G. Clemens, and the
Laboratory of Dr. James A. Asher, Michigan State

University, Department of Zoology. Duties: monitor,
assign, and regulate and instruct student workers in
the care and maintenance of rats, gerbils, and mice
under the guidelines given by the USDA, NIH, and
NSF.

1986 – 1988 **Graduate Teaching Assistant,** Central
Michigan University, Department of Biology.

1984 – 1986 **Student Worker,** Departments of Biology and
Chemistry, Saginaw Valley State (College)
University.

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

Animal Behavior Society; Association of College and
University Biology Educators; The Society of Behavioral
Endocrinology; The Council of Undergraduate Research;
The Internet Association of Biomedical Sciences (INABIS);
[**Councilor - 1999-2000**]; Michigan Academy of Science,
Arts, and Letters (MASAL); [**Vice-Chair of the Zoology
Section of MASAL 1996-1997**]; [**Chair of the Zoology
Section of MASAL 1997-1999**]; [**Vice-Chair of the
History of Science & Technology Section of MASAL
1998-1999**]; [**Chair of the History of Science &
Technology Section of MASAL 1999-2000**]; Michigan
Science Teachers Association; National Association of
Advisors for the Health Professions (NAAHP); National
Science Teachers Association; Society for College Science
Teachers (SCST); (a subgrouping of the National and
Michigan Science Teachers Association) (N/MSTA); Society
for Neuroscience

MAJOR WORKS IN PROGRESS:

Lange, G.M. 2000. **Monitor Lizard.** In: *Encyclopedia of
the World's Zoos* (ed. R. Salkin). Fitzroy Dearborn
Publishers: Chicago. *In Press.*

MAJOR WORKS PUBLISHED AND PRESENTED:

Over 13 major works published or presented in the last 3
years.

ABSTRACTS.

Over 32 presentations at regional and national meetings
and symposia.

ROBERT LEE WALLACE

Ripon College
WallaceR@Ripon.edu

EDUCATION

PhD, 1975. Dartmouth College, Hanover, NH 03755
(Biology; major areas Aquatic Ecology; Invertebrate
Zoology)

BS, 1970. University of Rhode Island, Kingston, RI 02881
(major Zoology; minor Chemistry)

PROFESSIONAL DEVELOPMENT (ABBREVIATED)

1998—present: Coordinator of Faculty Development
1996–1999: Chair, Department of Biology
1992–1997: Chair, Farr Hall (science building) Renovation
Committee.
1991—present: Professor, Department of Biology.

RECENT SCHOLARSHIP OF DISCOVERY (* = UNDERGRADUATE STUDENTS)

- _____ and Colburn, R.A*. 1989. Phylogenetic relationships within phylum Rotifera: orders and genus *Notholca*. *Hydrobiologia* 186/187: 311-318.
- Felix, A.* Stevens, M.E. and _____. 1995. Unpalatability of a colonial rotifer, *Sinantharina socialis*, to small zooplanktivorous fishes. *Invertebrate Biology* 114(2): 139-144.
- Bevington, D.* , White, C.* and _____. 1995. Predatory behaviors of *Cupelopagis vorax* (Rotifera, Collothecacea; Atrochidae) on protozoan prey. *Hydrobiologia* 313/314: 213-217.
- _____, Cipro, J.J*. and Grubbs, R.W*. 1998. Relative investment in offspring by sessile Rotifera. *Hydrobiologia* 387/388: 311-316.
- Verb, R.G., Vis, M.L., Ott, D.W., and _____. 1999. New records of *Vaucheria* species (Xanthophyceae) with associated *Proales werneckii* (Rotifera) from North America. *Cryptogamie Algologie* 20(2): 67-73.
- Segers, H. and _____. (in press) Contribution to a revision of Family Conochilidae (Rotifera; Monogononta; Flosculariaceae). *Zoologica Scripta*

RECENT SCHOLARSHIP OF INTEGRATION

- Nogrady, T., _____, and Snell, T.W. 1993. Rotifera: Volume 1 Biology, Ecology and Systematics. *Guides to the Identification of the Microinvertebrates of the Continental Waters of the World* (Dumont, H.J., ed.). SPB Academic Publishers bv, The Hague, The Netherlands. 142 pp
- _____, 1999. Phylum Rotifera. Pages 118-129, in *Encyclopedia of Reproduction*, Volume 4. E. Knobil and J.D. Neill (eds.), Academic Press. San Diego, CA.
- _____ and Snell, T.W. Rotifera. (in press). Chapter 8. in *Ecology and Classifications of North American*

Freshwater Invertebrates, 2nd edition. (J. Thorp and A. Covich, eds.). Academic Press. New York.

RECENT SCHOLARSHIP OF APPLICATION

- _____ 2000. Book review: *The Biology of Calanoid Copepods* (J. Mauchline), *Advances in Marine Biology*, 33; Academic Press. *BioScience* 50(9): 827-829.
- Wallace, R.L. 1994. On the current debate over the destruction of variola - the smallpox virus: (U.S., Russia can work together to destroy last smallpox virus. *The Oregonian*, 12 May 1994; *The Houston Post*, 16 May 1994); (It's time to put a mass killer - smallpox - to death. *The Milwaukee Journal*, 26 June 1994).
- Department Chair (3 appointments; 1984-1987, 1987-1990, 1996-1999):
www.ripon.edu/Faculty/Wallace/ &
www.Ripon.edu/dept/biology/DEFAULT.HTML
 Coordinator of faculty Development (1998-present):
http://www.ripon.edu/faculty/fac_dev/default.html

RECENT SCHOLARSHIP OF TEACHING

- _____. 1988. Use of a local information retrieval system (DATATRIEVE) by undergraduates. *Bioscene* 14(1): 31-33. <NB: a peer reviewed, regional journal dedicated to college biology teaching.>
- _____ and Taylor, W.K. 1997. *Invertebrate Zoology*, 5th ed. Prentice Hall, NJ. ISBN 0-13-270026-3
- _____. 1997. Problems and Issues for the classroom: What works in generating class discussions using the method of Shared Inquiry. *Bioscene* 23(3): 9-11.
- _____. 2001. *Instructor's Manual and Test Bank* to accompany James W. Nybakken, *Marine Biology: An Ecological Approach*, Fifth Edition. Addison Wesley Longman, Inc. ISBN: 0-8053-4214-1.

Call For Resolutions

The Steering Committee of ACUBE requests that the membership submit resolutions for consideration at the 2001 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

Association of College and University Biology Educators

45th Annual Meeting

October 11-13, 2001

University of Nebraska at Kearney
Kearney, Nebraska

Biology In The Light of Evolution

REGISTRATION FORM: Please use one per person officially registering

Name _____
 School Address: School _____
 Department _____
 Street _____
 City, State, Zip _____
 Office Phone _____ FAX _____
 Email Address _____

Are you a member of ACUBE? Yes _____ No _____ Wish to join? _____

Fees

Make separate checks to **UNK-Biology**:

Meeting Registration* (before September 21, 2001)	\$80.00	_____
Meeting Registration (after September 21, 2001).....	\$90.00	_____
High School Teacher, College Student, Grad Student.....	\$30.00	_____
Guest Banquet Fee	\$20.00	_____

*Meeting registration fees include all meals, refreshments at breaks, and the Tallgrass Prairie/Platte River field trip.

Please check the workshops/field trip in which you would like to participate on the list below. Indicate **1st and 2nd choices**. If more than one person will be participating (i.e. spouse, friends), please note in second column.

Friday Morning Field Trip and Workshops

Field Trip: Audubon Platte River Sanctuary..... _____ _____
 The New Bioquest Library VI..... _____ _____
 Using ESCAPE, Web-Based Interactive Learning..... _____ _____
 Measuring a Fitness Component in Students..... _____ _____
 Assessing Student Needs in the Classroom

Friday Afternoon Workshops

ACUBE: Are We Meeting Our Objectives?..... _____ _____
 Action Research Guidelines..... _____ _____

Saturday Afternoon Field Trip (Following the meeting)

Mixed Grass Prairie: Loess Hills of Central Nebraska..... _____ _____

Mail this form and check by **Sept. 21, 2001 to:** Tiffany Hoback, Department of Biology, 905 W 25th St., University of Nebraska at Kearney, Kearney, NE 68849

Association of College and University Biology Educators 45th Annual Meeting

AIRPORT SHUTTLE SERVICE:

Departing from Lincoln:

	Leave	Arrive	Run	Frequency	Fare
Lincoln to:					
Omaha	8:40am	10:00am	992	Mon-Fri	\$22
	11:55am	1:15pm	994	Mon-Sat	\$22
	3:25pm	4:45pm	998	Sun-Fri	\$22
Kearney	12:25pm	2:40pm	993	Mon-Fri	\$34
	3:50pm	6:10pm	995	Mon-Sat	\$34
	7:30pm	9:40pm	999	Sun-Fri	\$34

Departing from Kearney:

	Leave	Arrive	Run	Frequency	Fare
Kearney to:					
Lincoln	6:15am	8:30am	992	Mon-Fri	\$34
	9:25am	11:45am	994	Mon-Sat	\$34
	1:00pm	3:15pm	998	Sun-Fri	\$34
Omaha	6:15am	10:00am	992	Mon-Fri	\$42
	9:25am	1:15pm	994	Mon-Sat	\$42
	1:00pm	4:45pm	998	Sun-Fri	\$42

FIELD TRIPS:

Two field trips are planned for the annual ACUBE meeting. One is scheduled the morning of Friday, October 12 and the other is scheduled following the adjournment of the regular meeting on Saturday afternoon, October 13.

Field Trip: *Friday Morning* - October 12, 2001 7:30AM-10:30AM; No additional cost

This trip will take participants about 10 miles east of Kearney to the Lillian Annette Rowe Sanctuary. This preserve, managed by the Audubon Society rests along the Platte River in the center of the flyway for the migratory Sandhill cranes. While the cranes may pass over the area in the fall, rarely do they descend to spend time on the ground. Their fall destination is Port Aransas on the Gulf Coast of Texas. The Rowe Sanctuary represents classic tallgrass prairie, riparian woodland, and associated wetland in the area. There is an abundance of wildlife as several ecosystems intersect in the area. The Rowe Sanctuary is home to at least two of the endangered animal species, piping plover and least tern, identified in the Tri-State Cooperative Agreement. In addition, whooping cranes, in small numbers, have been sighted nearly every spring during the migratory season. The Cooperative Agreement, as forged among the U.S. Fish and Wildlife Service and the states of Nebraska, Colorado, and Wyoming, is intended to ensure adequate water in the Platte River for these endangered bird species. However, like other riverine systems in the western U.S., there is intense multiple use pressure on the river: pressures for urban development, irrigation, and industrial development.

Come and join us on an exploration of this famous river, the pathway of the wagon trains west along the Oregon and Mormon Trails!

Field Trip: *Saturday Afternoon* - October 13, 2001 1:00PM-4:00PM; No additional cost.

This trip will take participants about 15 miles northeast of Kearney to the Pearl Harbor Memorial Prairie, sometimes called the Juhl Prairie. We'll hike through a classic upland mixed grass prairie. The hills of the region were formed as the consequence of windblown loess soils following the most recent ice age. They display an interesting composition of warm season and cool season grass species by virtue of latitude and tall- and shortgrass species by virtue of longitude, perhaps 40 miles east of the 100th meridian. The combination of temperature and precipitation conditions this creates, leads to a prairie rich in ecological diversity and evolutionary history. With regard to the latter, there is a small herd of bison on site. With a little luck, we ought to be able to see half a dozen bison. Some grassland researchers have long contended that bison and selected grass species co-evolved across the Great Plains.

OTHER LOCAL POINTS OF INTEREST

For those of you who would like to explore other features of the Kearney area, the following are within a few minutes drive of the UNK campus and the hotel area:

The Great Platte River Road Archway Monument. Admission: \$8.00. This eight story arch spans Interstate 80 two miles east of Kearney. The Arch chronicles the history of the region including the trials and triumphs of the trappers, pioneers, the 49ers, and the Pony Express that moved along the Platte River Valley.

Museum of Nebraska Art (MONA). Admission: Free. MONA holds the state's only collection of paintings, sculptures, drawings, and prints created solely by Nebraskans or artists concerned with Nebraska as the subject. The facility is a gracious renaissance revival museum building on Central Avenue in Kearney.

Cabela's Outdoor Sports. Admission: Free. Cabela's is the world's foremost outfitter. The store includes one of the most impressive trophy collections of deer, elk, moose, bobcats, cougars, and fish west of the Smithsonian.

Pioneer Village. Admission: \$6.00. Located in Minden, NE, 15 miles south of Kearney, Pioneer Village is one of Nebraska's leading attractions. There are over 50,000 historic items depicting the technological progress in the United States since 1830.

Fort Kearny State Historical Park. Admission: Free. Located 6 miles southeast of Kearney, Fort Kearny was an oasis during the grueling journey west for thousands of pioneer wagon trains. The park includes an interpretive center, the blacksmith-carpenter shop, powder magazine, and split stockade.

Call Nominations

***Bioscene* Editorial Board**

We are soliciting nominations for four (4) *Bioscene* Editorial Board positions (term 2002-2004). 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 by October 1, 2001.

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

ACUBE 45TH Annual Meeting

October 11-13, 2001

University of Nebraska at Kearney
Kearney, NE

Biology in the Light of Evolution

Preliminary Program

Thursday, October 11th

6:00 - 8:00 PM	Registration and Reception	Bruner Hall Lobby (Science Building)
8:00 - 9:00 PM	Opening Session Welcome to ACUBE: ACUBE President: <i>Tom Davis, Loras College, IA</i> Welcome to University of Nebraska at Kearney: Dean <i>College of Arts and Sciences</i> Program Chair: <i>Mary Haskins, Rockhurst University</i> Local Arrangements Chair: <i>Charles Bicak, University of Nebraska at Kearney</i> OPENING ADDRESS (Public Welcome to Attend) <i>Biology of Sandhill Cranes</i> Presenter: <i>Paul Tebbel, Manager of the Audubon Sanctuary, Kearney, Nebraska</i>	Mary Morris Lecture Hall (in Bruner Hall)
9:15 - 10:15 PM	Executive Committee Meeting	Bruner Hall Reading Room (3 rd floor)

Friday, October 12th

7:00 AM - 5:00 PM	Registration table will be open all day Please check your membership; Inquire about audiovisual needs. General information.	Bruner Hall Lobby (Science Building)
7:00 - 8:00 AM	Buffet Breakfast (by Interest Group)	Cedar Room (Nebraskan Student Union)
7:30 - 10:30 AM	Field Trip: Platte River & Audubon Rowe Sanctuary	TBA
9:00 AM - Noon	SUSTAINING MEMBER EXHIBITS (refreshments provided)	Bruner Hall (2nd Floor Lounge)

8:15 - 9:45 AM	CONCURRENT WORKSHOP SESSIONS I	
	W.I.1 The New BioQUEST Library VI: Tools & Simulations for Biological Problem Solving , Ethel Stanley and Robin Greenler, Beloit College	TBA
	W.I.2 Using ESCAPE, a Web-Based Interactive Learning Environment for Exploring Introduced Species Concepts . W.W. Hoback and Kerri M. Skinner, University of Nebraska at Kearney	TBA
	W.I.3 Measuring a Fitness Component in Students: Fluctuating Asymmetry . Buzz Hoagland, Westfield State College	TBA
9:50 - 10:20 AM	POSTER SESSION I (Refreshments available Bruner Hall, 2 nd floor lounge)	Bruner Hall (3 rd floor hallway)
	Using Theme Concepts and the One-Minute Paper in Invertebrate Zoology , Robert L. Wallace, Ripon College	
	Thirty-three Year Daily Weather Data Analysis Lock & Dam 21, Quincy, IL, 1968-2000 , Alfred F. Pogge, Quincy University	
	Evolution Lab with Living Organisms , Mark Salata, Gordon College	
	Digital Photography Austin Brooks, Wabash College	
	The Evolution of a Successful Peer Led Study Groop Claire Sandler, University of Michigan	
10:30 AM - noon	CONCURRENT WORKSHOP SESSIONS II	
	W.II.1 The New BioQUEST Library VI: Tools & Simulations for Biological Problem Solving , Ethel Stanley and Robin Greenler, Beloit College	TBA
	W.II.2 Using ESCAPE, a Web-Based Interactive Learning Environment for Exploring Introduced Species Concepts . W.W. Hoback and Kerri M. Skinner, University of Nebraska at Kearney	TBA
10:30 - 11:15 AM	CONCURRENT PAPER SESSIONS I	
	P.I.1. Student-Designed Labs in Physiology - What Really Happens? Tom Davis, Loras College	TBA
	P.I. 2. A Strategy for Teaching Evolution . William R. Bowen, Jacksonville State University	TBA
	P.I.3. The New Science and Mathematics Building at Doane College, Crete, NE C. Robert Wikel, Doane College	TBA
11:20 - 12:05 AM	CONCURRENT PAPER SESSIONS II	
	P.II.1. Radioactive Materials & Radioactive Dating . Gerald Adams and Abour Cherif, Columbia College Chicago	TBA
	P.II.2. Council on Undergraduate Research - a Help in Organizing Undergraduate Research , Dick Wilson, Rockhurst University	TBA
12:15 - 1:00 PM	Luncheon and First Business Meeting <i>First and Final Call for Nominations!!</i>	Cedar Room (Nebraskan Student Union)
1:00 - 1:45 PM	Luncheon Program <i>"Brains Versus Bugs: Evolution's Role in Humanity's War Against Insects"</i> Leon Higley, University of Nebraska-Lincoln	

2:00 - 5:00 PM	SUSTAINING MEMBER EXHIBITS (refreshments provided)	Bruner Hall (2nd Floor Lounge)
2:00 - 2:45 PM	CONCURRENT PAPER SESSIONS III	
	P.III.1. There's more to digestive physiology laboratories than spitting in test tubes. Gregory M. Grabowski, MS, PhD and Jelena Holt,	TBA
	P.III.2. Evolution of Assessment. Steve Brewer and Buzz Hoagland, UMASS Amherst & Westfield State College	TBA
	P.III.3. Teaching About the Creationism / Evolution Issue in the College Biology Classroom. Neil Baird,	TBA
	P.III.4. Teaching About the Creationism / Evolution Issue in the College Biology Classroom. Steve Daggett and Jeffrey Myers, Avila College	TBA
2:50 - 3:20 PM	POSTER SESSION II (Refreshments available Bruner Hall, 2 nd floor lounge)	Bruner Hall (3 rd floor hallway)
3:30 - 5:00 PM	CONCURRENT WORKSHOP SESSIONS III	TBA
	W.III.1. ACUBE: Are We Meeting Our Objectives? Tom Davis, Buzz Hoagland and Margaret Waterman	TBA
	W.III.2. Action Research Guidelines to Improve the Scholarship of Teaching in Biology Classrooms. About Cherif and Mary Patt Garr, Columbia College, Chicago, IL	TBA
	W.III.1. The Case It! Launch Pad – a New, Integrated System for International Collaboration in Case-Based Learning. Mark Bergland and Karen Klyczek, UW-River Falls	
5:05 - 5:45 PM	Web Page Committee Meeting	Bruner Hall Reading Room (3 rd floor)
6:00 - 7:00 PM	Social (resumes of candidates available for review)	Alumni House (located south of Bruner Hall)
7:00 - 9:00 PM	BANQUET and Second Business Meeting (two-minute speeches prior to banquet; balloting after dinner presentation)	Cedar Room (Nebraskan Student Union)
	Dinner Presentation : “The Evolution of HIV” Marcia Kalish, PhD., Centers for Disease Control and Prevention	

Saturday, October 13th

7:30 - 8:45 AM	Buffet Breakfast (by Interest Group)	Cedar Room (Nebraskan Student Union)
7:45 - 8:45 AM	Bioscene Editorial Board <i>Ethel Stanley and Tim Mulkey, Co-Editors, presiding</i>	Oak Room (Nebraskan Student Union)

9:00 - 9:45 AM	CONCURRENT PAPER SESSION IV	
	P.IV.1 The Promises and Challenges of Teaching “Science of Nutrition”: An Online Course for Non-Science Majors Charles Cannon, Columbia College-Chicago	TBA
	P.IV.2. Hands-on Demonstration of the Principles of Plate Tectonics to Introductory and Evolution Classes. Dick Wilson, Rockhurst University	TBA
	P.IV.3. Reconstruction of an Introductory Biology Curriculum using Inquiry-Based Approaches. Terry Derting, Murray State University	TBA
	P.IV.4 Evolution of a Plant Morphology Course. Austin Brook, Wabash College	
9:45 - 10:00 AM	Morning Break	Bruner Hall Lounge (2 nd floor)
10:00 - 10:45 AM	CONCURRENT PAPER SESSIONS V	
	P.V.1. Analyzing the Creation/Evolution Debate or What Students Should Know About the Nature of Knowledge, of Science, of Evolution, and of Creationism. Malcolm Levin, University of Illinois-Springfield	TBA
	P.V.2. “This isn’t Club-Med”: Field Ecology in the Bahamas. Lynn Gillie, Elmira College	TBA
	P.V.3. Kimchee: Exploring Microbial Ecology from Cultural Understanding to Real-time Data Acquisition. Robin Greenler, John Greenler, Theresa Johnson, Beloit College	TBA
	P.V.4. Meals to Molecules. Abour Cherif, Columbia College-Chicago	
11:00 AM - 12:15 PM	Luncheon and Third Business Meeting	Cedar Room (Nebraskan Student Union)
	BUSINESS MEETING Election Results: <i>Lynn Gilley, Elmira College</i> Resolutions: <i>Dick Wilson, Rockhurst University</i> Executive Secretary Report: <i>Pres Martin, Hamline University</i> Bioscene: <i>Ethel Stanley, Beloit College & .Tim Mulkey, Indiana State University</i> Presidential Address: <i>Tom Davis, Loras College and Malcolm Levin, SIU-Springfield</i> 2002 Meeting: <i>Columbia College, Chicago</i> <i>Abour Cherif, Columbia College</i>	
	ADJOURNMENT OF REGULAR MEETING Join us on Sunday for your choice of several optional field trips: (hiking in a prairie, visiting several museums, or shopping at Cabela’s)	
12:30 - 1:15 PM	Steering Committee Meeting Includes newly elected Steering Committee members!	Oak Room (Nebraskan Student Union)

1:00 - 4:00 PM

Join us for a hike in an after-meeting field trip to an upland mixed-grass prairie. We guarantee you will see bison! OR, on your own you could tour any of the local sites (Archway Monument, MONA, Cabelas Sporting Goods Store, or other sites of local interest).

**Juhl Prairie
&
other local sites of
interest**

Submit Your Abstract Today !!! Mail your completed abstract form, found in this issue, to: Mary Haskins, Biology Department, Rockhurst University, 1100 Rockhurst Road, Kansas City, MO 64110. Abstracts must also be submitted either on-line or via an e-mail attachment: on-line at http://acube.org/2001_meeting.html; e-mail: mary.haskins@rockhurst.edu. Deadline for papers and workshops is July 1, 2001. Deadline for posters is September 1, 2001. For additional information contact Mary Haskins @ 816-501-4006.

Abstracts of Presentations

WORKSHOPS

W.I.1. The New BioQUEST Library VI: Tools and Simulations for Biological Problem Solving. Ethel Stanley and Robin Greenler, Beloit College

This interactive session centers on new and revised tools and simulations dealing with undergraduate biology in areas such as metabolism, ecology, physiology, evolution, and microbiology. Modules that are PC compatible will be featured in session 1. Modules that are MAC compatible will be featured in session 2. See <http://bioquest.org/> for more information.

W.II.2. Assessing Student Needs In The Classroom, Abour H. Cherif, Columbia College-Chicago

There is a growing awareness among educators and educational psychologists that learning is strongly influenced by individual attributes. There is also a strong belief that assessing students' needs is essential for developing and delivering a learner-centered curriculum. In this workshop participants will have the opportunity to design appropriate assessment tools to evaluate their students' learning needs, which, in turn, might help them design effective teaching strategies and learning activities for their students.

This workshop consists of a number of exercises and activities that have been designed to achieve specific goals. The accumulation of these activities and their achieved goals might help you clarify what students needs are all about and how to help students meet those needs.

Dawna Markova (1992) once wrote: "Our students' educational needs are continuously changing but our methods of meeting those needs have not been. We have basically been doing what we've always done and getting what we've always gotten." (p. 30) We have been teaching them the way we were taught and not the way we wanted to be taught.

W.I.3. Measuring a Fitness Component in Students: Fluctuating Asymmetry, Buzz Hoagland, Westfield State College

Many students in our introductory biology courses substitute the concept of physical fitness for the important biological concept of evolutionary fitness. This is likely a result of the many evolutionary misconceptions that students bring into our biology classes. Another contributing factor to this misunderstanding is the lack of meaningful experience with measuring fitness in the laboratory. I propose one solution to this problem is to have students measure various left and right body parts and calculate a simple index of fluctuating asymmetry. Measurements include lengths of hands and feet, width of hands, lengths of digits, lengths of ears, and placement of ears. Equipment needs are simple: rulers, inexpensive calipers, and string. I have collected student-generated asymmetry data from greater than 150 students and made these data available through my web site at <http://biology.wsc.ma.edu/biology/experiments/symmetry/>. This site is listed by the National Science Teachers Association in their SCILINKS database.

Participants in this workshop will measure the above characters, enter the data into a spreadsheet, download data from the web, and conduct simple fluctuating asymmetry analyses.

W.II.1. The New BioQUEST Library VI: Tools and Simulations for Biological Problem Solving. Ethel Stanley and Robin Greenler, Beloit College

This interactive session centers on new and revised tools and simulations dealing with undergraduate biology in areas such as metabolism, ecology, physiology, evolution, and microbiology. Modules that are PC compatible will be featured in session 1. Modules that are MAC compatible will be featured in session 2. See <http://bioquest.org/> for more information.

W.II.2. Using ESCAPE, a Web-Based Interactive Learning Environment for Exploring Introduced Species Concepts. W.W. Hoback and Kerri M. Skinner, University of Nebraska at Kearney

We have developed web-based instructional materials to enhance student learning of exotic species biology as a foundation for scientific literacy, ecological understanding, pest management, and environmental ethics. In this site, we emphasize interactive hypothesis-based learning for teaching the fundamentals of exotic species biology to undergraduate students. We provide background information, a glossary, and online quizzes that allow self-paced learning about exotic species, their introduction and potential impacts. Our project addresses topics covered in multiple biology classes and provides a model project to educate students about exotic species. In the workshop, we will lead participants through our web site and associated learning exercises and provide sample lesson plans.

W.III.1. ACUBE: Are We Meeting Our Objectives? Tom Davis, Loras College; Buzz Hoagland, Westfield State College; and Margaret Waterman, Southeast Missouri State University

ACUBE has been in existence for over 40 years. Our constitution lists the objectives of our organization as:

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

Are we meeting these objectives?

In this session, we will initiate an informal discussion concerning the vision and future of ACUBE. We would specifically like to hear comments and feedback about how well the needs of our members are met by our website, our journal, and our meetings. Should there be more? What should ACUBE be doing in five years to help its members teach more effectively? Should there be regional meetings? Can the website be better defined to help answer specific questions that members or nonmembers have about a specific teaching topic or lab exercise? How can Bioscene better address the needs of our members? Please join us for this discussion as we try to improve the role of the only national association that focuses on the teaching of college biology.

W.III.2. Action Research Guidelines to Improve the Scholarship of Teaching in Biology Classrooms. Abour Cherif and Mary Patt Garr, Columbia College-Chicago

The use of research methods in one's own classroom to examine and improve his or her educational practice has been defined as teacher action or active research, and it has proven beneficial for both students and instructors. It is educational research that bridges the gap between the theory and practice in the teaching and learning processes with the aim of improving student learning through purposeful questioning, data collection, and analysis of curricular and/or instructional practices.

This workshop is divided into three areas: In the first part we discuss the philosophy behind the use of action research in the classroom, provide a workable framework of how to successfully conduct an action research effort in the classroom setting, and discuss how to utilize the results of your action research to improve your teaching, classroom management, etc. In part two of the workshop, we will share a few examples of action research that have been conducted in biology classrooms as well as in teacher education classes. In part three, we will engage the participants in hands-on activities to design action research projects and discuss how to use the anticipated outcomes of research to improve teaching practice, classroom management, students' learning, students' performance, etc. The Focus of Action Research is to provide a paradigm for both documenting teachers' efforts to improve their classes and communicating successes and failures to their peers, thus elevating teacher practice to a scholarly activity (Boyer 1990; Ria 1996). In doing so, action research provides avenues to simultaneously examine and improve instructional practices (Angelo 1991) and means to create a teaching portfolio that can be used by faculty and administration as tangible evidence of faculty success and professional development (Adams and Slater, 1998, p. 90)

W.III.3. The Case It! Launch Pad – a New , Integrated System for International Collaboration in Case-Based Learning. Mark Bergland and Karen Klyczek, UW-River Falls

This workshop presents new developments in Case It!, a National Science Foundation-sponsored project to enhance case-based learning in high school and university biology courses worldwide. Case It software modules enable students to analyze DNA sequences in preparation for Internet "poster sessions" where students discuss biological, ethical, and other issues associated with cases. A new, integrated web page editor / conferencing system was developed and successfully class-tested this past spring that enabled high school and university students in Wisconsin to interact with students at the University of London.

This workshop will give participants hands-on experience with this new integrated system, including administrative features that make it easier for faculty to manage student groups and track their progress. We welcome participation in the Case It! project, at no cost to high school and university educators.

PAPERS

P.I.1 Student-Designed Labs in Physiology – What Really Happens? Tom Davis, Loras College

I have used student-designed lab experiments for 6 years in an upper level, one semester human physiology course for majors. The semester is divided into several segments. The first two weeks cover introduction to the lab and practicing experimental design. Students in teams of 2 or 3 design their own experiments centered on Skeletal or Smooth Muscle physiology, Cardiovascular physiology, and Respiratory physiology. Each segment is three weeks in length. The first week they pose hypotheses and design their experiment together. The second week they do their planned procedures together. The third week they give an informal oral report to the rest of the class that explains their results. They also turn in a formal written laboratory report in the third week. This format gives the students direct ownership of their learning process and involves them directly in the process of the scientific method. For the most part students have enjoyed these labs. They enjoy doing something they have designed. They enjoy trying to work out the problems in design, results and interpretation. In this session, I will discuss other challenges of this teaching method and give specific examples of design, results and problems of student-designed labs in physiology. Session participants are encouraged to bring questions and their experiences with self-designed labs to contribute to a group discussion.

P.I.2. A Strategy for Teaching Evolution, William R. Bowen, Jacksonville State University

My relocating from Wisconsin to Arkansas in the 70's was a rude awakening for me when it came to teaching evolution. Judge Overton's ruling unfortunately did not help in the classroom where "evolution vs creation" was a confrontational issue for non-majors and even majors. My approach soon separated evolution from the origin of life, specifically addressing evolution first in 3 stages, two as "fact" with the third or evolutionary mechanism(s) as the only theoretical component. During the origin of life part, I did not ignore the "creationist" viewpoint. Instead, I used their language in presenting the two viewpoints on "origins" – that is, natural creation (biogeochemical) vs special creation. This opened the door for contrasting the nature of these views – that is,

religion (belief) vs scientific inquiry – at the beginning and especially at the end where I could raise questions without answers. Thus the issue remained one of personal decision and with much less student resentment. The details and success of this approach will be discussed.

P.I.3. The New Science and Mathematics Building at Doane College, Crete, Nebraska, C. Robert Wikel, Doane College

The process of constructing a new science and mathematics facility on the Doane College campus began with the selection of an architectural firm in the fall of 1995. The building cost \$10.2 million with the Lied Foundation as the largest single donor. The 60,000-square-foot building houses physics, chemistry, biology, geology, information sciences, and mathematics. Faculty were heavily involved in the planning process, not only with extensive input into the types and arrangement of spaces within the structure but even with the initial choice of architect. Faculty were emphatic in their desire NOT to have an "institutional" building but rather an attractive structure that would draw people to it. Emphasis therefore was placed not only on pleasing and "people-friendly" teaching and research space in the classrooms and laboratories, but also on study and social areas in an effort to promote out-of-class interactions among students and faculty. The building was constructed within a wooded ravine and is connected to the rest of the campus by a 200-foot bridge. It was first occupied during the academic year 1999-2000, and two years of experience in it has shown it to be an excellent teaching/learning facility. The architects produced an unusual triangular design that has won some awards, and other institutions who are planning new science buildings have sent delegations to inspect it. It is the third science building on the Doane campus, and the "evolution" of teaching styles and building design can clearly be seen in the three structures.

P.II.1. Radioactive Materials & Radioactive Dating, Gerald Adams and Abour Cherif, Columbia College-Chicago

In this workshop we will discuss various activities to help students understand radioactive dating that are already exist in literature. Second, we will engage the participants in hands on activity of measuring half-lives in a way that can be visualized and also quantified. Finally, we will describe the details of three different methods of radioactive dating that are used for archeological and geological materials, concentrating on how they differ and their uses.

P.II.2. Council on Undergraduate Research-a Help in Organizing Undergraduate Research, Dick Wilson, Rockhurst University

P.III.1. There's More to Digestive Physiology Laboratories than Spitting in Test Tubes. Gregory M. Grabowski and Jelena Holt, University of Detroit-Mercy

With the current focus on research-based education, physiology laboratories have to go beyond classical demonstrations to more inductive approaches to physiology. The focus of laboratories and manuals alike has been on demonstrations of human physiologic concepts that typically reinforce lectures using classical techniques. Traditional digestive physiology laboratories exemplify the demonstrative format through assays of digestive enzymes purchased from a chemical supply company or collection of salivary amylase in a test tube. The initial goal of the purposed laboratory is to attempt localization of digestive enzymes to specific digestive organs in cockroaches, and to develop general conclusions about their similarities to the functions of the mammalian digestive system. Of the organs of the digestive system, both cockroach and mammalian systems share salivary glands, liver (fat bodies), esophagus, intestines, and rectum. The crop and proventriculus of the cockroach provide storage and mechanical processing of food similar to the mammalian stomach. Pancreatic contribution to digestion in mammals is shared with the ceca and ventriculus of the cockroach. This approach to investigating the physiology of digestion not only demonstrates the application of lecture material to practical research endeavors in a controlled environment, but also provides a springboard for independent research opportunities for undergraduates.

P.III.2. The Evolution of Assessment, Steve Brewer and Buzz Hoagland; UMASS Amherst & Westfield State College

With the recent election of George W. Bush as our 43rd president, assessment has become a dominant theme in education reform. Unfortunately, the current emphasis is on high-stakes summative assessment and a report by Paul Black and Dylan William ("Inside the Black Box: Raising Standards Through Classroom Assessment," Phi Delta Kappan, October 1998) concluded that summative assessments such as standardized exams can actually be detrimental to learning. However, these authors provided strong evidence that formative assessment, properly implemented, is a powerful means to improve student learning. This paper briefly reviews formative and summative assessment and introduces a new formative assessment tool, entitled DUCK, developed by Steve Brewer. DUCK was developed out of a constructivist paradigm in contrast to commercially available quizzing programs which are developed out of the transmissionist paradigm. This program is part of the open-source software movement and runs on Linux.

P.III.3. Teaching About the Creationism / Evolution Issue in the College Biology Classroom, Neil Baird, Milliken University

Public opinion polls continue to report that 30-40% of the American public accepts literal creationism and rejects evolution. It seems that our students – especially in courses for non majors - share these views. Because evolution is the major unifying theme in biology, we biology professors need to help our students understand how science and religion are different domains of knowledge. Although the creationism / evolution issue is a complex interplay of scientific, religious, educational and constitutional issues, it is important for biology teachers to have enough background understanding in order to deal with this topic in the classroom. Fortunately, several recent worthwhile books and a number of useful web sites now exist to help clarify the issues for the biology professor. A discussion of various classroom strategies for dealing with this topic will make up the last part of the presentation.

P.III.4. Plagues: An Interdisciplinary Study of the History and Evolution of Infectious Disease Stephen S. Daggett and Jeffrey W. Myers, Avila College

In the 2000 and 2001 summer semesters, the authors taught a course that surveyed plagues in European history since the Middle Ages, using the disciplines of biology and history as interpretive guides. The course partially fulfilled the college core requirement that students take two interdisciplinary classes. The biological origins, modern preventatives, contemporary efforts of disease control, and the social impact of plagues, such as bubonic plague, typhus, and Spanish influenza were covered in readings, lectures, and discussion periods. Students were given short-essay assignments that prepared them for a comprehensive final examination consisting of an essay and an objective component. We will discuss the structure of the course, assessment, and whether students successfully integrated knowledge and skills from foundation courses in their approach to this topic.

P.IV.1. The Promises and Challenges of Teaching "Science of Nutrition": An Online Course for Non-Science Majors, Charles Cannon, Columbia College-Chicago

P.IV.2. Hands-on Demonstrations of the Principles of Plate Tectonics to Introductory and Evolution Classes. Dick Wilson, Rockhurst University

P.IV.3. Reconstruction of an Introductory Biology Curriculum using Inquiry-Based Approaches. Terry Derting, Murray State University

Retention of students in our biology major has traditionally been low. In addition, our majors are not well-prepared to succeed in upper level biology courses

in which problem-solving and research activities are common. We are in the process of reconstructing our biology curriculum using inquiry-based approaches: (1) improving student exposure of students to basic scientific concepts with significant opportunities for in-depth understanding through direct investigation, (2) placing a greater emphasis on concepts, processes, and active scientific inquiry, (3) developing the tools needed by students to grasp and explore new scientific topics at the outset of their undergraduate curriculum, (4) providing a supportive student-centered curriculum that facilitates the transition of students from a high school to an undergraduate level of study, and (5) enhancing the ability of faculty to adapt and introduce newly developed materials, pedagogical methods, and technologies into their courses. Development and implementation of the new curriculum will be discussed. Preliminary assessment data will also be presented.

P.IV.4. Evolution of a Plant Morphology Course, Austin Brooks, Wabash College

Traditionally plant morphology courses have presented the student with a survey of a group of plants. While the emphasis of most of these courses was the structure, reproduction and life history of an often-bewildering number of species, the central thread was evolution of the group. For the student there were information dense lectures that centered on botanical nomenclature and laboratories that made very heavy use of the microscope and dissections. Laboratory observations were recorded principally as labeled drawings and assessment took the form of hourly exams over the lecture materials, while the lab work was evaluated through the dreaded lab practical. The non-vascular and vascular plant courses I taught early in my teaching career fit this traditional pattern perfectly. Over the past three decades, evolution continues to be the central theme of my lower plant morphology course, but the course also has evolved chiefly as a result of new technologies. In this presentation, I will describe how my lower plants course has evolved since it was first taught in 1966 as a way of promoting conversation among participants of the session about course evolution in a broader sense.

P.V.1. Analyzing the Creation/Evolution Debate or What Students Should Know About the Nature of Knowledge, of Science, of Evolution, and of Creationism, Malcolm P. Levin, University of Illinois at Springfield

This presentation will examine the nature of truth and scientific and religious theories with the goal of understanding the similarities and differences in theory formation and development at a basic level. Using these basic distinctions, I examine aspects of evolutionary theory and creation science and assess their validity. I have used versions of this lecture in

my course, Evolution, and in a formal seminar to the Creation Club at the local community college.

P.V.2. "This isn't Club Med": Field Ecology in the Bahamas, Lynn L. Gillie, Elmira College

A travel/field course in Marine and Island Ecology can be used to introduce science majors and non-science majors to biological diversity. This course is team taught at the Bahamian field station on San Salvador Island each spring. Several strategies have been implemented to prevent students from treating the class like a vacation. Pre-trip interviews, daily journal writing, and mini-projects have all been extremely useful tools in guiding and assessing student learning.

P.V.3. Kimchee: Exploring Microbial Ecology from Cultural Understanding to Real-Time Data Acquisition. Robin Greenler, John Greenler, and Theresa Johnson, Beloit College

Kimchee is a traditional, fermented Korean food that can offer rich opportunities for hands-on student inquiry in microbiology. Extensive research on the biochemical, microbiological and nutritional aspects of kimchee provides a rich base for student-led exploration while real time data acquisition systems allow for rigorous quantification and data collection of experimental results. By constructing and monitoring kimchee fermentation chambers in the classroom, students can measure changes in pH, turbidity, CO₂ production, O₂ consumption, microbial populations, sugars and vitamins. The BioQUEST computer simulation, *Sim Chee*, (currently under development) will allow students to bridge the gap between wet-lab data collection and model construction.

P.V.4. Meals To Molecules, Abour H. Cherif, Columbia College-Chicago

Students in introductory biology classes, especially non-biology majors, often ask why they need to study chemistry in biology classes. Often, the reasons which we provide them for studying biology don't make sense to them, or don't make the connections between the relevancy of chemistry, not only in understanding biology, but also to their survival and well being. In this workshop we will demonstrate how the use of food and nutrition can be used as a starting point to introduce basic chemistry in biology classes, and is very effective in helping students understand the importance of chemistry in both understanding biology as well as the importance in their daily life. This paper integrates food and nutrition, atoms and molecules, periodic tables, chemical bonds, and chemical reactions as well as energy. The participants will be engaged in "hands on-mind on" activities, and they will be provided with ready to use in-the-classroom handouts.

POSTERS

Using theme concepts and the one-minute paper in Invertebrate Zoology, Robert Wallace, Ripon College

It is an understatement to say that Invertebrate Zoology (IZ) is an enormously diverse field. One major difficulty in teaching IZ resides in its vocabulary, which is both alien to common language and filled with obscure or confusing terms (e.g., the rotifer jaws are called trophi; the nematode pharynx is sometimes termed a muscular esophagus). Thus, while we may invite our students into this rich cognitive space, some quickly lose their bearings. What are we to do? While employing the fundamental principle that less-is-more, I use the theme concept approach within a format that integrates lecture and lab (i.e., three, 2-hour blocks per week). As the course progresses and key concepts are explored, I add them to our theme board. Themes include concepts such as Culture, Defense, Ecology, Economics, Evolution, Geodesic domes, Geology, Medicine, Reproduction, and Symbiosis. Once we have discussed a sufficient number of themes and have adequate examples for each, the students are ready to write one-minute papers (OMP). (Write for one minute on the theme of XYZ as it applies to IZ.) OMPs force students to focus on the big picture, while providing the instructor with timely information about whether individual students are grasping the concepts. OMPs may be employed with open book (notes), with study sheets, or without any aids.

Thirty-Three Year Daily Weather Data Analysis from Lock and Dam 21, Quincy, Illinois, 1968-2000, Alfred F. Pogge, Quincy University

The global increase in greenhouse gases in the atmosphere has been well documented. The related increase in global temperatures is still being debated. Thirty-three years of temperature and precipitation shows an increase of approximately 0.5 degrees F in the mean annual temperature. However, the mean annual high temperatures declined approximately 1.5 degrees F during the period while the mean annual low temperatures increased approximately 2 degrees F. The mean monthly temperature declined for seven months with the largest drop, approximately 2.5 degrees F occurring in April. Monthly mean low temperatures increased during all months except April which declined approximately 1.5 degrees F and December which remained the same. Annual precipitation declined during the period more than six inches.

Evolution Lab with Living Organisms, Mark Salata, Gordon College

Students tend to learn about evolution at the macro level through textbooks and at the micro level through games. Few laboratory exercises are created to teach evolution principles by using living organisms. This situation may lead students to think of evolution

as an abstract and untestable concept. In order to demonstrate certain aspects of evolution, a hands-on laboratory exercise was designed. Two distinct populations of *Drosophila*, wildtype and *ebony*, were used in the exercise. *Ebony* flies were chosen for three reasons: 1) they can be distinguished by the naked eye from the wildtype morph; 2) the allele causing *ebony* phenotype is recessive; and 3) they have a decreased fitness in comparison to wildtype flies. Each one of these characteristics help simplify the mechanics of the experiment. Given an introduction on raising *Drosophila*, Mendelian genetics, and population genetics, students were well prepared to conduct the exercise, predict the outcomes, and analyze the results. Students displayed their understanding of the semester long exercise by writing a journal article based on the results and an open discussion period about Mendelian genetics and population dynamics.

Digital Photomicrography, Austin Brooks, Wabash College

The light microscope is unquestionably one of the seminal tools of all time in understanding living systems. Its usefulness was enhanced dramatically with the development of photomicrography for then the observations of the microscopist could be shared easily. While a great variety of camera systems for the microscope have been developed, photomicrography has been used, for the most part, as a research tool because of the expense of film and processing as well as the time delay before a micrograph is available for viewing. Furthermore there is always an element of uncertainty regarding the quality of the image until the processing has been completed. Digital microscope cameras allow for inexpensive and immediate images, both essential features for a teaching lab. Additionally teachers and students can be assured that acceptable images of a unique specimen are not lost. A variety of digital photomicrograph systems are currently available but most are expensive (\$1000-\$6000) and hence not practical for teaching labs. This poster describes a simple, rapid, digital photomicrography alternative that employs a moderately priced (\$350) Olympus consumer quality digital camera.

The Evolution of a Successful Peer Led Study Group, Claire Sandler, University of Michigan

Over the past four years, the University of Michigan's Science Learning Center has developed a highly successful Peer Led Study Group Program targeting students in large enrollment introductory courses including Introductory Biology, Animal Physiology, Genetics, and Biochemistry. A team of 6 advanced undergraduate students help recruit, train, and support over 70 undergraduate students who serve as peer study group leaders. We'll present information about the organization of our program and what we've learned over time. We'll also present some preliminary results of our program evaluation.

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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

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Call for Presentations

Association of College and University Biology Educators (ACUBE)

45th Annual Meeting
University of Nebraska at Kearney
Thursday October 11- Saturday October 13, 2001

Biology in the Light of Evolution

Theodosius Dobzhansky stated, "nothing makes sense except in the light of evolution".

Evolution has, once again, claimed national attention because some states have either removed and/or downplayed evolution from the curriculum objectives in the K-12 system. Although the scientific community understands the distinction between science and religion, the public may not. The upcoming PBS television broadcast on evolution will continue to promote public discussion and controversy. How can we address our students' need, and the public's need, to understand this distinction?

Presentations, posters and workshops addressing other topics are welcome, but here are some examples of possible presentations:

Issues in teaching evolution to non-majors/majors (Creationism vs. Evolution; Simulation software used in lecture and/or labs; Investigative labs; Evolution of ideas and/or theories in scientific disciplines; Evolution of Scientific methodologies; Evolution of processes, Human practices and/or cultures; Analogies used in teaching evolution).

Many of you have addressed these issues in creative ways. Please consider sharing your ideas and techniques at the ACUBE 45th Annual Meeting in Kearny, NE in 2001.

Please email your abstract **AND** mail or FAX a hard copy of the abstract with the completed form BEFORE **July 1, 2001** (abstracts received after July 1, 2001 will be considered as the program permits) to:

Mary Haskins, Biology Department, 1100 Rockhurst Road,
Rockhurst University, Kansas City, MO 64110
Phone (816)501-4006 FAX: (816)501-4802 email: mary.Haskins@rockhurst.edu

Proposed Title: _____			
Presentation type:	Poster	45 minute paper	90 minute workshop
Name of presenter : _____			
Work address of presenter : _____			
Equipment/facilities needed:			
	<input type="checkbox"/> 35 mm slide projector		<input type="checkbox"/> Overhead projector
	<input type="checkbox"/> Macintosh projection system		<input type="checkbox"/> Macintosh computer lab
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	<input type="checkbox"/> Other: (explain) _____		
Phone No. presenter: _____ email _____			
Please include names and contact information for additional presenters and a 200 word abstract:			

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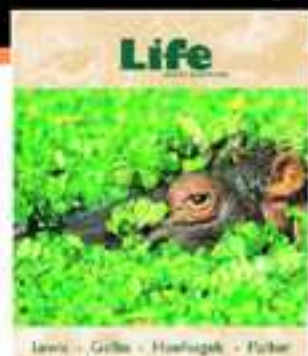
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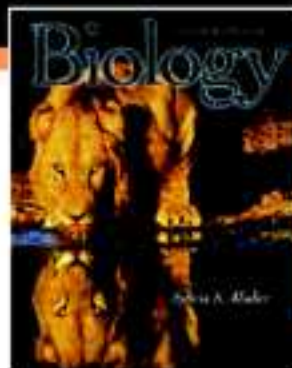


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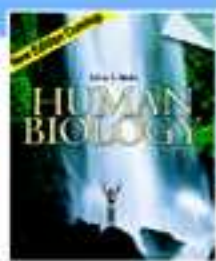


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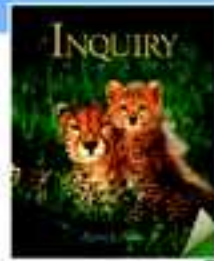


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