

MIDWEST BIOSCIENCE

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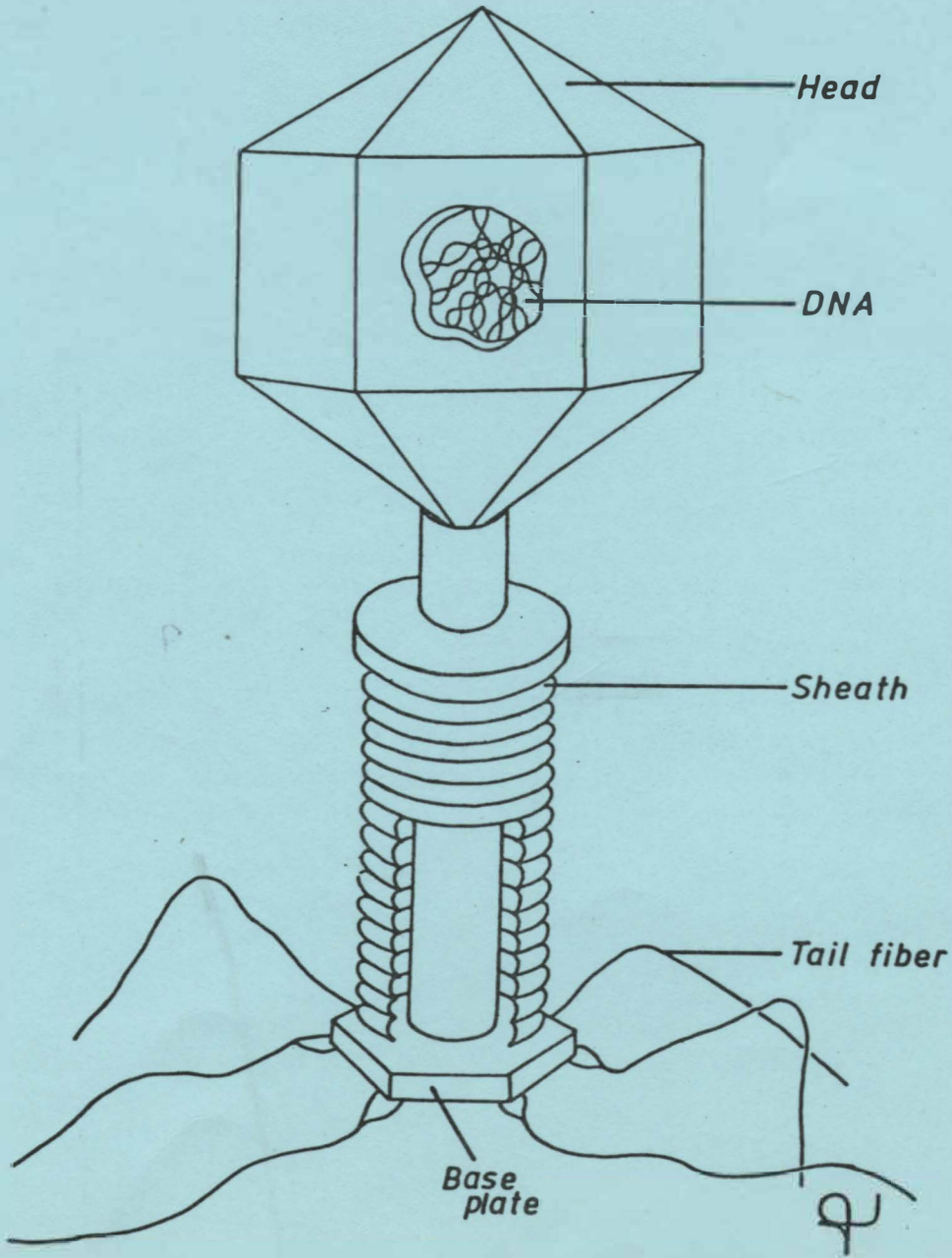
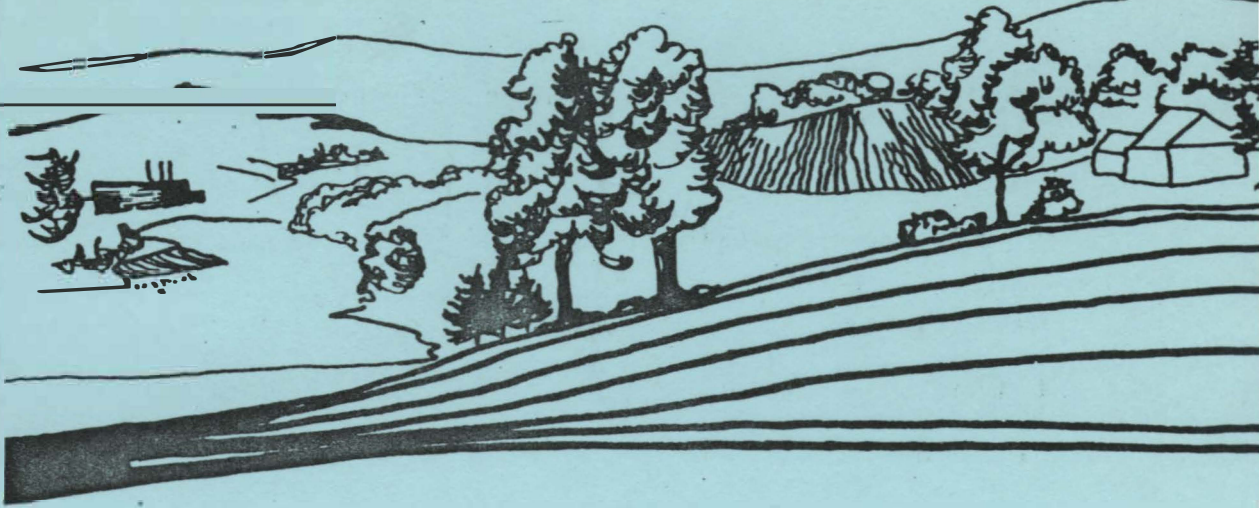


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TO THE MEMBERS OF AMCBT

Hopefully your holidays were filled with joy and happiness, and that you are all ready to return (or may already have done so) to the joys of the classroom.

All of you will be getting or should have gotten, a notice of dues renewal, unless you were paid in advance. Please tend to this as soon as you can, and save us the time and expense involved in further statements.

The Fall Annual Meeting was judged to be successful by the some 70 of you who attended. St. Xavier's in Chicago, is a very attractive urban college. The program and the field trips were especially enjoyable.

Getting ready for next year's meeting, the Steering Committee met at Augustana College in Rock Island, IL on December 1st to lay out some preliminary plans for the meeting. The central theme of the meeting is, "Biology -- An Experimental Science". It was considered that this would be an appropriate time to reemphasize the fact (which we in the business all know) that biology, despite what many schools and administrators would like to do about it, is and always has been an experimental science. This program promises to be especially rewarding. If you have any ideas on presentations, or want to volunteer your help, contact the Program Chairman, Harold Wilkinson, Department of Biology, Millikin University, Decatur, IL 62522. I'm sure he will welcome your assistance.

Last fall I received a couple of notes from long standing AMCBT members informing me of changes in their status. One note came from Fr. John Ostdiek, who is now completely out of teaching and is the director of the Alverna Retreat house in Indianapolis, Indiana. He keeps a little of his hand in science, however, in that he has been appointed to the Institutional Review Board at St. Vincent's Hospital reviewing clinical medicine proposals. He sends his best wishes to all AMCBT members.

The other note came from Charles Vaughn of Miami University in Oxford, Ohio. Charles goes back to the founding meeting of AMCBT along with Leland and Willis Johnson. Although he made emeritus professor in 1981, Miami hauled him back as Associate Dean for Research and Special Programs. As Charles points out, "...half time turned out 1/2 time in AM and 1/2 time in PM and assorted weekends." Also as of October 1983, he has been National President of Phi Sigma. As he says, he's too busy "...to be emeritus as in arthritis." Attaway Charles.

I hope that you will all have an excellent semester, and that you will respond to Harold Wilkinson's efforts to produce a quality program for our Annual Meeting. You all are the society, you all make it work...or not work!

Your ExecSec

EFFECTS OF A HIDDEN CURRICULUM ON WOMEN'S SELECTION OF SCIENCE COURSES

by

Faith Wilson

Vice Principal for Curriculum and Instruction, St. Teresa's Academy
Administrative Assistant, Department of Education,
University of Missouri-Kansas City

What effects can the conditioning of a hidden curriculum have on women's

selection of science courses at the secondary level? Hidden curriculum

is a phenomena that has only recently been investigated as an important and moving element in education and society. Apple (1979), Giroux (1981), Keddie (1971) and Vallance (1974) have defined and suggested ways of dealing with hidden curriculum since it was first uncovered in the early 1970's. The definitions of hidden curriculum differ as to function, amount of control and consequences for society. For example Apple (1979) describes the hidden curriculum as the tacit teaching of norms, values and dispositions to individuals simply by an individual living in, and coping with, the institutional expectations. Institutions here could be defined as schools or family units. According to Jackson (1970) as a child moves from home to school, specific assumptions (e.g. authority roles, sex roles) of the home are supplemented and complimented by the schools and vice versa. Regardless of the authors' individual perspective all agree that the hidden curriculum is important because of its capacity to shape and condition the attitudes of individuals. Also, because hidden curriculum is implicit it is particularly resistant to change. For the purposes of this discussion Apple's more general definition will be used since it allows for a conceptual transition between society and schools.

Sex roles and indeed sexual equality are sometimes shaped by the hidden curriculum, often as a result of rewards and sanctions. Males and females face very different sanctions on the expectation of what is a "good" person and in cognitive styles. Many of the behaviors rewarded, are linked to compliance with a specific role model and rewards and/or the sanctions occur with regularity between home and school. An important aspect of hidden curriculum is tied up in the social arrangement between schools and home. Dreeben (1976) suggests that children acquire models of thinking, social norms and principles of conduct from their prolonged involvement in this arrangement. The hidden

curriculum is so pervasive that those covert lessons are remembered far longer, than most of the overt teaching of society and schools (Bloom, 1972).

Sexual equality is a primary axiom in the educational system of most first world nations. The view that gender distinctions are artificial and unhelpful was an important segment of the Plowden Report (1967) of Great Britain. Despite these kinds of directives the hidden curriculum and occasionally the formal curriculum of primary and secondary schools separate the sexes. By the age of seven separate "boy and girl subjects" have begun to crystalize. Educational stereotypes, such as the one perceiving scientific fields as masculine, is supported by various informal structures within the educational system.

The impact of hidden curriculum effects on women in such areas as science and math have serious personal and societal consequences. Science and math participation at the high school level can be a filtering agent for occupational choices (Iker, 1980). The level of high school math and science courses chosen can limit the student's free choice of undergraduate majors, and subsequently, effectively narrow opportunities in the work world (Sell, 1967).

The dominance of numbers of males over numbers of females in science and math programs has been a serious concern for educators over the last several decades. A variety of reasons have been postulated regarding this marked difference in numbers. Only one reason, male superiority on tests measuring spatial relations indicate any physiological difference between males and females that could explain the males' greater facility in science or math. Recently, however, Linn's (1982) meta-analysis of spatial ability research, reveals no differences between males and females before, during, or after puberty.

In many homes and in most school systems, overt sex-role philosophies of previous generations have become hidden. The current messages that parents and educators communicate to children are subtle. Parents or teachers may not be aware of these subtleties, but children are. In school, women are still being rewarded for behavior that would best fit a housewife model. This is the consequence of a nonconscious ideology. The status of quality of homemaker, secretary or teacher as an occupational choice is not the issue, just as the choice of a man becoming a neurosurgeon would not be questioned, until it could be demonstrated that one-half of all men were becoming neurosurgeons. The fact is that, in spite of innumerable differences in personality and ability, the majority of American women become full time homemakers, secretaries or teachers and not scientists or mathematicians.

I do not believe that women's studies will or can change the course of women in math and science fields. Awareness of specific covert factors affecting women in math and science courses is the first step. Once these factors are isolated it would be possible to modify the reinforcement history of some females. Scholarly studies of hidden curriculum effects on special interests groups such as women is lacking. Progress in this area could be helpful in uncovering and restructuring stereotyping in such areas as math and science. Until some progress is made in uncovering and restructuring the conditioning of the hidden curriculum with respect to women the belief that education is the gateway to golden opportunities is mythical.

LETTER FROM THE PRESIDENT

The success of the AMCBT meeting at St. Xavier College in Chicago is yet vivid to me as I assume the office of President and begin working with other members in preparation for our next annual meeting. There are many persons on the Steering Committee and throughout the membership, to thank for their efforts. I will, however, mention a few: Sr. Marion Johnson, local arrangements, John Jungck for putting together an interesting and informative program and Edward Kos, our diligent Executive Secretary. Neil Baird, our past President, has done an excellent job in keeping our special committees and Steering Committee members working smoothly together in order to accomplish their goals.

During the several years of membership in AMCBT I have come to regard the annual meeting as a kind of family reunion. I feel a closeness among members whereby ideas and techniques can be shared, friendships can be formed and

a variety of interests are represented. Even during the months between meetings I have a network of friends who are only a phone call or letter away. While there is a diversity of interests among the members, our common bond is the teaching of biological sciences. AMCBT does have unique qualities.

Perhaps one of the main concerns for our organization is bridging the time gap between the annual meetings. How does the membership keep in touch? There can be only one main mechanism; The Midwest Bioscene. I want to extend the highest praise and commendation to our editor, William Doemel, for his superb job during the past year. The Steering Committee has plans for developing an editorial board that will solicit ideas and articles for publication. Please make a commitment to submitting an article for Bioscene during 1985. Only your contribution can make each issue our key to sustaining the interest and enthusiasm of our members.

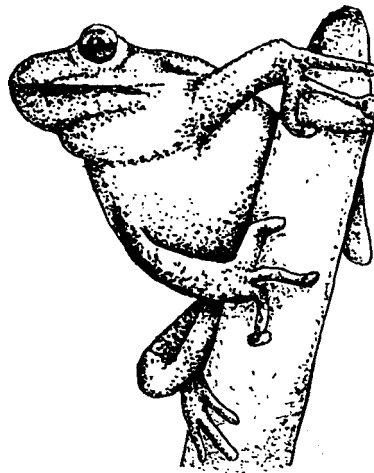
Other concerns for AMCBT involve recruitment of new members. While there are state recruiting chairmen among our members, each of us should make efforts to draw new members from our local areas. Why not resolve to bring a new member into AMCBT during 1985. During the past annual meeting someone mentioned that community colleges were under-represented among our membership. Perhaps this is a fertile field for new members who could greatly benefit themselves as well as our organization.

I look forward to serving AMCBT during 1985.

Ray Reed
AMCBT President

FROM THE EDITOR

Thank you for your patience. This issue of BIOSCENE is an experiment; one that was partially successful. At the request of many members, we decided to shift to a two column format. Both Mrs. Roth and I thought this should be an easy task - it wasn't. Our word processing system for the Rainbow is WordPerfect. While it allows for 2 column formatting, we do not understand yet how to easily couple documents together. As a result, we had to cut and paste. If we do not resolve our problems, the next issue will be in a single column format - suggestions are welcome. My deadline for the next issue is April 1 with publication by April 20.



Writers who use either an Apple II based system or a DEC based system may send us a textfile of their document on a floppy disk. We will return the disk to you. The output to the textfile cannot have special functions - underlining, bold, etc. - and should have two carriage returns between paragraphs, i.e., a line space between each paragraph.

BIOSCENE would not be possible without the patient help of Mrs. Sandy Roth, the Biology/Physics Department Secretary.

EFFECTIVE USE OF VIDEOTAPES IN LABORATORY INSTRUCTION:
COMPARATIVE VERTEBRATE ANATOMY

by
Frances A. Rogers
Associate Professor of Biology, Drake University

Videotapes on the shark circulatory system which were developed and used at Drake University were described in the BIOSCENE of April, 1981. Since that time a series of videotapes have been developed on the vertebrate brain. The first of these videotapes describes embryology of the vertebrate brain, the basic pattern of the vertebrate brain as seen in the dogfish shark, and the central cavity as it is modified into ventricles. The other presentations consist of a series of modules developed on the sheep brain. Both external and internal morphology are examined in detail, and finally a comparison is made between the shark, sheep, and human brains.

The videotapes have been presented in a variety of ways. Several have been shown in succession during a single class period as a review of structures that had been encountered in previous courses. In some cases, videotapes have been presented individually as preparation for laboratory work with very little accompanying discussion. On other occasions, each videotape was presented at the beginning of a laboratory period along with supportive materials such as diagrams and explanations of terms used in the videotape. In one instance, students were permitted to have preserved sheep brains in dissecting pans in front of them so that they could examine actual specimens as they viewed the tape. Each of the videotapes on the vertebrate brain contained self quizzes so that students could check themselves during the presentation on their mastery of information that had been given.

Student performance on tests and dissection exercises after viewing the videotapes was carefully examined.

An analysis of results obtained under the varying conditions of presentation of the videotapes revealed several distinct conclusions. Maximum benefit was derived from the tapes when they were presented individually and with supporting materials. Students grasped the evolution of the aortic arches much more rapidly when they were given diagrams representing the appearance of the arches from both side and ventral views. In this way, they were alerted to the views and types of sections they would be seeing in the videotapes. Lists of important structures were prepared and discussed ahead of time in the same sequence in which they would be encountered in the videotape.

This procedure eliminated the need for note taking and freed the student for careful viewing. Observation of actual specimens while viewing the tapes proved to be valuable reinforcement.

Many judgments concerning the value of the videotapes can be made only by the instructor or by laboratory assistants who have observed students working both with and without the use of the tapes. These persons have felt without exception that the benefits of the videotape presentations have been dramatic. Students are spared the frustration of not knowing what is expected of them. Dissections are accomplished much more quickly and the quality of performance is greatly increased. Students' enjoyment of laboratory work, their understanding of concepts involved, and their sense of accomplishment are noteworthy. The instructor's time and energy are multiplied many times because the need for repeated demonstrations is eliminated. This time can be given to individual students who would

otherwise need to wait much longer for help. Time saved by the use of videotapes also permits the addition of enrichment materials that would otherwise be eliminated by time constraints.

Excellent students can look forward, in many cases, to participating themselves in the production of videotapes. Future plans include preparation of tapes that would complement those already developed on the shark in order to make available

a complete demonstration of shark anatomy in relationship to the basic vertebrate pattern. In addition, it would be helpful to develop videotapes on cat anatomy that would parallel existing tapes on human anatomy that are used in medical schools. Such presentations on the shark and the cat would not only facilitate performance of traditional laboratory exercises, but would introduce major concepts of vertebrate adaptations as seen in the shark, the cat, and the human.

BIOLOGY AT AUGUSTANA COLLEGE

by
Ingemar Larson, Professor of Biology

Augustana College is located in Rock Island, Illinois, one of several cities in the industrial complex known as the Quad-Cities. The College was founded in 1860 and is affiliated with the Lutheran Church in America. Augustana is on the quarter academic calendar and the current full-time enrollment is about 2,100.

The Biology Department is housed in the Biology Building (former College Union renovated in 1979) and the adjacent Wallberg Hall (shared with the Chemistry Department). The department has three lecture rooms; nine teaching laboratories (botany, microbiology and genetics, general biology, ecology, invertebrate zoology, anatomy, vertebrate zoology, and physiology); smaller rooms for study and research (herbarium, seminar room, computer room, ecology, invertebrate zoology, cadaver room, animal room, electron microscopy suite, and several other research rooms); and a greenhouse.

The Department has nine faculty. It serves students in several curricula: departmental majors in Biology and Medical Technology; functional majors in Dentistry and Medicine; pre-professional studies in Nursing, Physical Therapy, and Veterinary Medicine; a coordinated degree

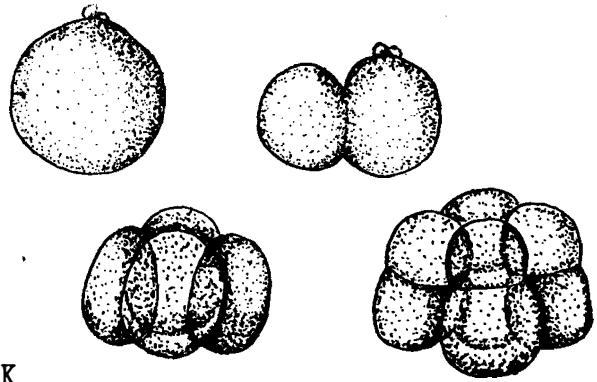
program in Forestry and Environmental Management; and an interdisciplinary program in Environmental Studies. The Department also provides service courses for other departments of the College and offers courses taken by non-majors as part of their liberal arts education.

Biology majors are required to take botany, vertebrate zoology, invertebrate zoology, microbiology, ecology, and seminar; an equal number of elective credits in advanced biology courses; and other supporting courses in various departments. Additional courses are required of majors such as those interested in certification for teaching biology.

Biology has approximately 350 student registrations in courses for majors and an additional 360 student registrations in non-major courses per quarter. Examples of approximate number of majors (seniors, juniors, sophomores) include biology 140, pre-medical 80, pre-veterinary 20, physical therapy 45, medical technology 20. Most of these are double majors, a few are triple majors. During 1983-84, 65 graduating seniors had chosen biology as their major or one of their majors.

The 125th anniversary of Augustana College will be celebrated during 1985.

We are pleased to invite AMCBT to our campus during this special year. Facilities have been reserved for AMCBT for September 27 and 28, 1985.



BOTANY LABS THAT WORK

By

Bill Andresen, William Rainey Harper College, Palatine, IL

To make easy clones, use violets, tobacco "628", or head lettuce. Peel off the outer leaves, get some sterile tissue, and grow under proper light conditions.

A simple method which can be used to demonstrate ecological and respiration-photosynthesis relationships is to use jars with caps. Vary the plant and animal content of each jar, and after a period of time, measure the dissolved oxygen of each jar using the Winkler method.

If you do onion root tip squashes and have problems getting onion bulbs to grow because of their treatment with growth inhibitors, use onion seeds instead. Place the seeds on damp paper towels, cover with other damp towels, and in four or five days you will have excellent root tips. I have tried this method and it seems to be faster, more reliable, and easier than trying to get bulbs to root. Be sure not to let the paper towels dry up.

Soybeans are a good species to use for the effects of varying auxin concentrations on root initiation.

To get good budding yeast cultures, use Saubouraud agar. Or, add some orange juice to aqueous yeast cultures.

For a simple demonstration of growth showing lag, log, and stationary growth phases, use an aqueous yeast culture. Growth is determined by spectrophotometry. This demonstration takes two or three days and is done using student help to get readings throughout the day.

To demonstrate the localized photosynthesis which occurs in corn leaves, compare corn to Coleus. Boil leaves of each in ETOH, stain with iodine, and examine under the microscope for starch granules.

Tired of the bubble-counting method of photosynthesis determination using waterweed? To get a better chance of success, start setting up the experiment in the usual way. Then, place the upper cut stem of each plant into a 1ml pipette which is about half filled with water. Each pipette has a rubber tube attached to the top, tapered end, and each rubber tube is pinched by a simple clamp. Place the plant into a test tube with the rubber tube projecting upward. Move the clamp of each rubber tube up or down until the water/air junction is pushed to one of the printed lines of the pipette. When all the plants

are properly set up, start timing. This method is reported to work about half the time.

For a good method to measure transpiration, cut the roots off a suitable plant. Working underwater, insert the plant into a snug-fitting rubber tube. The other end of the rubber tube goes to one end of a "T" fitting. A second end of the "T" fitting is attached via a rubber tube to a 1ml pipette. The third end of the "T" fitting is attached via a rubber tube to the bottom of a water-filled titration pipette. The control of the titration pipette is set to "off". Remove the entire unit from the water, clamp together and adjust to the proper height. As water is transpired, the 1ml pipette will empty of water, and the printed markings make it easy to measure the amount of water transpired. When the 1ml pipette is nearly empty of water, use the water from the titration pipette to run the water back out to "0".

To fit a root-intact plant into the hole of the cork used for the water container of a transpiration experiment, don't try to jam the roots through the hole. Instead, cut the cork in half longitudinally, then slip over the plant at the junction of the root and stem. Glue the cut halves together. With a little modification this can be used for the transpiration set-up described above.

Your own local, hand-gathered seeds can be used for botany labs. Honey locust and redbud seeds were suggested. Some seeds will have to be sacrificed.

REPORT ON FOCUS ON TEACHER TRAINING; AN OPEN DISCUSSION

AMCBT Meeting 9/28/84

by

Jerry Foote - University of Wisconsin-Eau Claire

Ten people attended this meeting and each chipped in ideas to provide a truly Open Discussion.

Several thoughts were presented regarding things which should be accomplished in training future Biology Teachers.

Not training Biology teachers, but training Science teachers, was a central thought. Some colleges meet this need by requiring future Biology teachers to complete Chemistry courses through Organic, a year of Physics, and Math through Calculus.

In Wisconsin, there is a state requirement that future Science teachers must have a major in the area of science which they will teach. To teach in a minor area, the candidate must also have a major in some other area of science! Science includes: Biology, Chemistry, Earth & Space Science, and Physics. This doesn't completely insure that all future Biology teachers will indeed be well grounded in all of the sciences, but it does mean that Wisconsin will no longer have Physical Education majors or Social Studies majors with only a minor in Biology, teaching Biology!

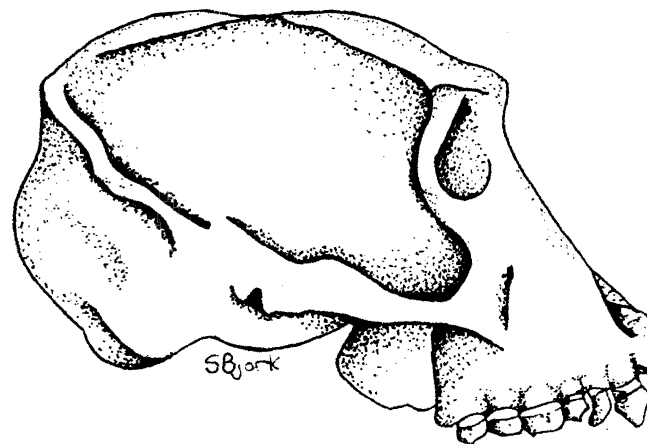
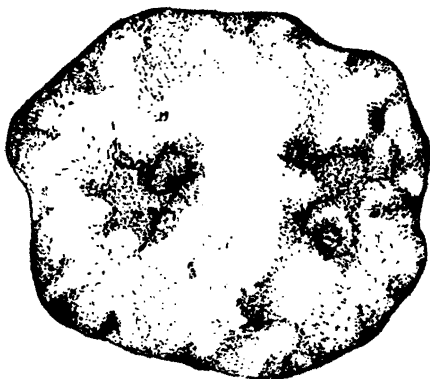
At the high school level, should Biology classes be taught? The above discussion led to the thought that maybe

some sort of Integrated Science Courses should be taught instead of the separate Biology, Chemistry, and Physics series. I don't know of any schools that have gone this far, but there are some that have an Integrated Science Type program which includes the Junior High Science courses and Biology!! Students then continue with Chemistry and Physics if they so desire! There are, then, a few schools beginning to form Integrated Science programs, but I don't know of any Colleges or Universities that are training teachers for this type of Science teaching.

Investigatory or Inquiry experiences were thought to be important and indeed imperative in High School Science courses. What experiences do Colleges and Universities provide for models of this type of education? It was agreed that most Biology courses at the college level are not really inquiry oriented and that this type of experience in a Teaching Methods course would be too limited to provide an adequate model for future teaching. Teachers generally teach as they were taught or as they learned, yet we are asking future science teachers to use a method with which they have either not had previous experience or at best have had very limited experience. Under these conditions, can we really expect High School Science teachers to use inquiry or investigative methods with their students?

This is the point at which we, as science teachers, can play a pivotal role in the training of our future science teachers. We must initiate inquiry types of experiences in our College and University Science courses so that our future teachers can gain experience and confidence with this teaching method. Only with this past experience and confidence will high school teachers really feel comfortable in using these techniques with their students. It was felt that this new type of teaching model is really necessary if our present methods of recitation and memorization are to be modified in any way. With the explosion of knowledge that is upon us, it is incumbent upon future teachers to help their students gain new knowledge through experiences other than memorization of facts. Facts will come and go faster than future students can possibly memorize and keep up with them!

It is up to us, in our College and University courses to lead the way! What can ~~you~~ do to introduce more investigative experiences into your courses?



DIFFUSION DEMONSTRATION
AN INQUIRY ORIENTED PROCESS

By
Jerry Foote - University of Wisconsin-Eau Claire

Probably all Biology and Chemistry instructors at both the high school and college level, discuss the concept of diffusion. Many undoubtedly have students do experiments and others do various demonstrations to help students visualize this process. The usual demonstrations involve opening some aromatic substance in a room and having students note the time that each smells the substance. The students closer to the source, smell it first and those increasingly more distant, smell it later and later.

Experiments, many times include putting a bit of potassium permanganate in test tubes of water and putting ammonia and hydrochloric acid in opposite ends of a piece of glass tubing. These experiments do away with the problem of mass movements and convection currents that plague one doing the aromatic substance in the air demonstration. In addition, the glass tube with ammonia and hydrochloric acid provide the opportunity to explore the rates of diffusion in relation to the molecular weights of the substances involved. The problem with these experiments is that they are not easily seen by large groups, thus they are good as experiments but do not make good demonstrations.

Thanks to the ideas of a former student teacher, I now begin discussion of diffusion with an inquiry oriented demonstration of that process.

It is simple to accomplish, takes little in the way of material, is visually attractive (maybe even exciting?), and it works!!

Necessary materials include: eight 1 liter beakers or similar size jars, water, food coloring, ice, a hot plate, a methylene blue pill (purchased from any Drug Store), and methylene blue powder. With these, one can demonstrate the process of diffusion without the convection currents and the difference in the speed of the process due to changes in temperature, concentration, and surface area.

Fill the beakers or jars with water a day or two before the demonstration so the water can come to room temperature and be completely still when the demonstration is begun. I usually put the beakers out on the lecture table the night before my demonstration but on occasion, I have had to wheel them into the classroom just ten minutes before the demonstration's onset. The site of eight beakers of liquid lined up across the lecture table, one in an ice bath and a second on a hotplate, always stirs interest and questions among my students. They can't wait to see what I am going to do with all this stuff!

A drop or two of the food color in the first beaker followed by 30 seconds to 1 minute of observation starts the class period. The question to the class is obvious: What is happening? Following an explanation and maybe a short discussion by members of the class, we look to beakers 2 and 3.

I ask "If I put one drop in beaker A and 10 drops in beaker B, in which beaker will diffusion proceed most quickly?" When the hypotheses, and sometimes explanations in support of the hypotheses, are on the board, the

experiment is carried out. Again, observations are made and now the conclusion can be drawn.

Time to move on to beakers 4, 5, and 6. #5 is in the ice bath to a depth of about 100 ml. and #6 is on the hot plate turned to a low heat. "If I put one drop of coloring in each beaker, in which will diffusion proceed most quickly?" (or slowly, if you wish to vary the student's thinking just a bit!) More hypothesizing and explanations by the students, then again the experiment is done and conclusions are drawn.

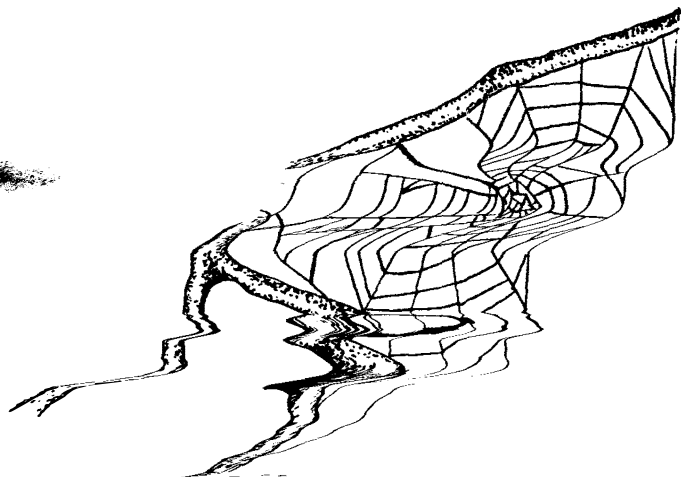
On to the final two beakers. I show the students the tiny methylene blue pill and small weighing paper containing an equal weight of powdered methylene blue. Both beakers of water are still and at room temperature! Once more the students hypothesize and usually give explanations to defend their hypotheses. The pill is always dropped in first and watched for 20 or 30 seconds before the powder is dumped into its beaker. It usually takes another 30 seconds before much is seen since the powder seems to hang on the surface tension of the water. When the powder goes, it really goes, and audible oohs and aahs can be heard from the students.

I don't lecture about diffusion anymore. These demonstrations, to as many as 180 students at a time, do the job. The students explain what is happening using the scientific process of hypothesis, observation of a simple experiment, and the drawing of their own conclusion in each case. The demonstrations are vivid, non-quantitative (thus not scary to non majors), and easy to understand and explain. The relationship between surface area and chemical reactions will not soon be forgotten and indeed, some students wish to experiment further at lab. time to test other hypotheses they have made based on these simple demonstration experiments.

Common sense things which may be overlooked when doing this demonstration include:

1. Be certain that you have a good light colored (white) background for the beakers.
2. Use a solute color which is easily seen against your background.
3. Be careful of your attire for this demonstration. Cryptic and/or protective coloration are not being demonstrated and can easily detract from and confuse the real demonstration.

I would like to demonstrate one more concept, that of pressure. I have not yet figured out how to easily do this, however, I am open to your ideas and suggestions!!



FROM CRAB BULLETIN 34

Peter J. Russell, Biology Department, Reed College

CRAB is the Collegiate Research Association of Biologists. CRAB, if you like, is the Biology equivalent of the CUR organization for chemists, if you are aware of that group. The current steering committee for CRAB consists of myself, Laura Hoopes of Occidental, Bill Steinhart of Bowdoin, and Mary Allen of Wellesley. The goal of CRAB is to develop a national database of biology research being done at Colleges in the form of a published research directory, and to inform interested biologists about research opportunities available to them. For the directory, a form will be sent to College biology departments early in 1985 requesting information about research being done at your institution. This effort will be coordinated by Scott Pyron, the eastern regional representative of Research Corporation. Starting with the January 1985 issue, information about biology research will be included in the well-established CUR Newsletter the publication of the Council for Undergraduate Research. You are strongly advised to subscribe to the CUR Newsletter since it contains a great deal of useful information -- to do so, contact **Dr. Mike Doyle, Chemistry Department, Trinity University, 715 Stadium Drive, San Antonio, TX 78284.** Laura Hoopes will be the Associate Editor for Biology for the Newsletter. If you have information to contribute, please send it to her at the Biology Department, Occidental College, Los Angeles, CA 90041.

NSF, Research in Undergraduate Institutions (RUI) program: The RUI program will definitely be allocated a share of NSF's fiscal 1985 budget. The exact dollar amount awaits the final tabulation of RUI awards in fiscal 1984. The new Director, Erich Bloch, has determined that because the research activities at NSF received an increase of

15.2% from Congress for fiscal 1984 the RUI program will receive that share as its increase over the fiscal 1984 expenditures.

Two important facts derive from the first year of the RUI program: (a) A special program encouraging researchers in undergraduate institutions attracts proposals. Their need for this type of support was demonstrated with over 500 applications to the RUI program. The chances of keeping a program such as this are obviously increased when the number of applications is significant; (b) The insistence by former NSF Director Edward Knapp that research directorates make a special effort to consider RUI proposals and his appointment of staff to press that effort clearly made a great difference. In some cases this resulted in rejections being turned around. For this reason applicants should think long and hard before they withdraw their NSF application, unless support from another source is certain. NSF staff monitoring RUI feel that they have had significant influence in bringing about more open attitudes in certain divisions.

Research Opportunities for Women:

To encourage women scientists to become actively involved in independent research, the NSF has initiated a Research Opportunities for Women (ROW) program. With \$1.5 million for its first year, the ROW program is expected to support about 15 projects. To be eligible, applicants must: 1) have held their Ph.D. degrees for at least three years and have never been principal investigators on Federal agency grants or contracts, or 2) have their doctorates, have had their research careers interrupted for at least two of the past five years and have not been principal investigators on Federal

agency grants or contracts since the interruption.

the door" for grantees, they have stipulated that grantees must meet formally with their program officers at least once during the course of their awards and hence a line item should be included in proposal budgets to cover the cost of a trip to Washington, D.C.

ROW Proposals should be submitted following the general instructions in NSF's Grants for Scientific and Engineering Research (publication NSF 83-57); special supplemental forms (found in the ROW Guidelines Brochure) must accompany all ROW applications.

All ROW proposals must be submitted by January 15, 1985. They may be submitted by "applicants in all categories of employment status . . . through standard institutional channels" and by investigators with no institutional affiliation (who must confirm arrangements for the use of appropriate research facilities if necessary for the success of the project). Proposals will be judged in peer reviews by the appropriate NSF research program officers. Final awards will be recommended by the ROW Program Director. As a result of NSF's intention that these awards should be a "foot in

THE SAINT MARY'S COLLEGE ANNUAL UNDERGRADUATE RESEARCH SYMPOSIUM

Richard Kowles, Saint Mary's College, Winona, Minnesota

been held since that time. Preparations are now progressing to host the twelfth annual symposium during the spring of 1985.

Overall, the symposium has grown in terms of the number of participating colleges and the total number of student presentations. It has, however, not been a steady growth; rather, the numbers have greatly oscillated from year to year. In 1978, only three institutions participated (including Saint Mary's College). In 1982, twelve different colleges generated 34 presentations. Table 1 gives a summary of the existing data regarding participation.

Part of the program at the 1984 AMCBT Annual Meetings held at St. Xavier College in Chicago was devoted to various considerations of the involvement of undergraduate students in research. One aspect of research at any level is finding opportunities for the dissemination of the results. Several such opportunities are available to undergraduates. Tri Beta sponsors an annual meeting at various locations in our midwest area for this purpose, and some states have an Academy of Science that also encourages undergraduate student participation. A group of colleges in the Chicago area hold an annual undergraduate research symposium involving all of the natural sciences. In addition, Saint Mary's College in Winona, MN, sponsors a similar symposium each spring for undergraduate research in the life sciences. Still others may exist of which many of us are not aware.

The Saint Mary's College undergraduate research symposium actually began at the University of Wisconsin at La Crosse in 1974. After the first year, the symposium was willingly turned over to Saint Mary's College where it has

TABLE 1
NUMBER OF PRESENTATIONS
FOR THE YEARS FROM 1977 TO 1984

SYMPOSIUM	YEAR	NUMBER OF PRESENTATIONS	COLLEGES REPRESENTED
11TH	1984	33	10
10TH	1983	21	6
9TH	1982	34	12
8TH	1981	21	8
7TH	1980	23	7
6TH	1979	24	6
5TH	1978	10	3
4TH	1977	17	5
3RD	1976	data not available	
2nd	1975	data not available	
1st	1974	held at U. of Wisconsin-La Crosse	

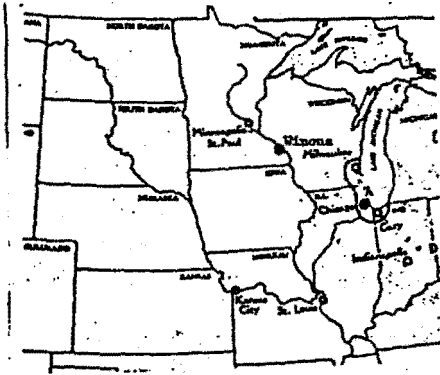


Figure 1. Location of Winona, Minnesota.

Figure 1 shows the central location of Winoná for the three-state area of Minnesota, Wisconsin, and Iowa. With this location in mind, notification and information of the symposium has only included colleges and universities in those three states. Nevertheless, participants from some colleges have to travel a substantial distance, for example the College of St. Scholastica in northeast Minnesota and Southwest State University in extreme western Minnesota. Table 2 lists the colleges and universities that have had students participate in the symposium one or more times thus far. Some persons at colleges not in this three-state region have been added to the mailing list at their request.

TABLE 2
COLLEGES AND UNIVERSITIES
PARTICIPATING ONE OR MORE TIMES

MINNESOTA
 DANIELSON'S COLLEGE
 INVER GROVE HILLS COMMUNITY COLLEGE
 ST. CLOUD STATE UNIVERSITY
 COLLEGE OF ST. CATHERINE
 COLLEGE OF ST. SCHOLASTICA
 MARLINE UNIVERSITY
 COLLEGE OF ST. THOMAS
 UNIVERSITY OF MINNESOTA, ST. PAUL
 UNIVERSITY OF MINNESOTA, MORRIS
 SOUTHWEST STATE UNIVERSITY
 COLLEGE OF ST. BENEDICT
 ST. JOHN'S UNIVERSITY
 BETHEL COLLEGE
 WINONA STATE UNIVERSITY
 COLLEGE OF ST. TERESA

WISCONSIN
 U OF WISC - OSHKOSH
 U OF WISC CENTER - WASH. CO.
 U OF WISC CENTER - MARATHON
 U OF WISC CENTER - WEST BEND
 VITERBO COLLEGE
 UNIV. OF WISC - EAU CLAIRE
 UNIV. OF WISC - LA CROSSE
 UNIV. OF WISC - RIVER FALLS

IOWA
 CENTRAL COLLEGE
 WESTMAR COLLEGE
 ST. AMBROSE COLLEGE

The symposium is conducted in one day (usually on a Friday). No registration fee is charged.

Presentations are 15 to 20 minutes long including a few minutes for questions from the audience. When a large number of students are giving presentations, two separate sections are formed: one for ecological and environmental projects and the other for laboratory-oriented projects (molecular biology/genetics/physiology, etc.). A booklet containing abstracts of each talk is prepared in advance and distributed at the symposium. In recent years, we have had a featured speaker give a full-hour presentation immediately following the lunch period. The University of Minnesota and Rochester Mayo have thus far been excellent resources in this regard.

The symposium has been an ideal situation for Saint Mary's College for reasons other than not having to travel. A research project is mandatory for biology majors, and the symposium affords an excellent way for students to disseminate their information. Saint Mary's students also write a Bachelor degree thesis which is placed in both the department and the campus library; and some of them do get used again. On some occasions, the data have even been published. But for most of these first-time researchers, the symposium will be the best opportunity to inform others of their hard work in the laboratory and the field. In addition, it is great experience for them.

There are, of course, some difficulties. Students are sometimes reluctant to participate because they feel their research project may be inferior . . . most often a fear that is not warranted. Indeed the presentations do range from excellent to almost embarrassing; which is not unlike any other symposium. However, most of these aspiring scientists perform extremely well. Regardless, I have never encountered harsh reactions from the audience, either from students or faculty members. The biggest disappointment has been the occasionally small number of persons attending the presentations, which is

again not unlike many other symposia.

The entire issue of whether research at the undergraduate level is worth the effort has always prompted vigorous debate from proponents and opponents. Most of those persons involved in such programs tend to agree that both advantages and disadvantages exist. At Saint Mary's College, we have periodically weighed the benefits and the accompanying problems. Thus far, the decision has always been that the benefits definitely out-weigh the problems. Most students appreciate the non-classroom activity and the opportunity to be creative. For some, that initial exposure to research can be instrumental in career decisions still to be made. Staff members find that

writing recommendations can be more meaningful and effective as a result of working closely with students in a research project. On the other hand, the additional work load for the staff can be immense...but also enjoyable. At any rate, a mandatory undergraduate research requirement is probably not feasible for every biology program.

If anyone would like to be placed on the mailing list to receive advanced information about the Saint Mary's College Symposium, please notify the Biology Dept., Saint Mary's College, Winona, MN 55987.

TRI-BETA IN THE MIDWEST

By

Ted C. Michaud, Carroll College, Waukesha, Wisconsin

Beta Beta Beta is a society for students, primarily undergraduates in the biological sciences, that was founded in Oklahoma City in 1922. Today there are more than 320 chapters in the United States and Puerto Rico, 63 of which are in the North Central Region. Although AMCBT includes several additional states, the North Central Region of Tri-Beta roughly approximates the scope of AMCBT.

Beta Beta Beta is dedicated to improving the understanding and appreciation of biological science and to the fostering of undergraduate biological research. The national organization publishes a journal, Bios, devoted to undergraduate research papers given at District and National Conventions, to articles of chapter activities, to book reviews of new biological publications and to articles of historical interest to biologists. Beta Beta Beta maintains a National Office at Unadilla, New York, that funds student travel to National Conventions, keeps chapters informed of operating procedures, coordinates the

Bios publication and maintains the national membership records. More than 100,000 persons have been accepted into lifetime membership.

Although some campuses have considered Beta Beta Beta no more than a biological honorary society, it is much more than that. It is true that active members must be majors in the biological sciences who have demonstrated superior academic achievement, however, there is an associate membership category for those whose interest lies in the life sciences in some significant way. Associate members are kept on file at the National Office until they graduate; active members are kept on file on a permanent basis.

The local chapter is the most important component of the national organization. Most chapters sponsor guest lecturers on special topics on a regular basis. Successful chapters support scholarly research, participate in local and national conventions, take field trips and find ways to enjoy themselves in the process.

Professional activity is the real value of membership in Beta Beta Beta and thus the real justification for the continued existence of both the individual chapters and the society as a whole.

Although chapters will vary from campus to campus, certain features are common to all. A chapter of Tri Beta is:

- (1) A group of biology majors and their associates.
- (2) Primarily undergraduates.
- (3) Working toward professional competence in ways that cannot or are not likely to occur in the classroom.

The major objectives of the society are:

- (1) to promote scholarship in the biological sciences.
- (2) to promote the dissemination of biological knowledge.
- (3) to encourage biological research.

The aim is to foster the development of professional biologists.

Tri Beta can serve an important function in yet another way. No matter how "open" an instructor may be, the classroom puts certain restraints on student-teacher relationships. Most instructors try to direct students toward predetermined experiences and understandings. A Tri Beta activity, on the other hand, is a place where the student and the instructor interact as equals; where both learn from each other and more about the other. It is an activity that enhances the educational experience.

Student research is presented at 13 district conventions every year and at the national convention every other year. National registration fees help support these conventions. The national convention was held in Tempe, Arizona

in 1984 and will be held in New Orleans in 1986. The conventions offer undergraduates a chance to report their research, to hear outstanding graduate researchers and to interact with the faculty and students at other chapters. Tri Beta is unique in that the national registration fees help defray the travel costs of its members through grants to chapters that send delegates to the national meeting.

The Frank G. Brooks Award for excellence in undergraduate research is presented at both the district and national conventions. Certificates are awarded to Brooks Award Winners and a plaque is presented to the institution these winners represent. A cash award is made if these papers are accepted and published in Bios. An additional award, the McClung Award is given for the outstanding paper published in Bios each year. The Lloyd E. Bertholf Award is presented to the outstanding chapter nationally each year. Frank Brooks was founder of the society; McClung and Bertholf were early presidents of the society. The Chapter History Award has recently been added for the outstanding display of chapter activities in scrapbook format.

The North Central Region is composed of two districts. The Eastern District has 35 chapters (Illinois 16; Wisconsin 9; Iowa 6; Minnesota 4). The Western District has 28 chapters (South Dakota 2; Iowa 2; Kansas 4; Missouri 14; Nebraska 6). Colleges or universities considering initiating a chapter should contact Mrs. Anne B. Siegel, National Secretary-Treasurer, P.O. Box M, Unadilla, NY 13849. Further assistance may be obtained by contacting Dr. Ted C. Michaud, Eastern District Director and Regional Vice President, Carroll College, Waukesha, Wisconsin 53186 or Dr. James D. Hoerter, Western District Director, Stephens College, Columbia, Missouri 65215.

The National Secretary-Treasurer has available, on request,

information on all aspects of Tri Beta activities, copies of the national constitution, procedural information for local chapter officers, information on Beta Beta Beta lapel pins, keys and sports wear, and national or regional lists of chapters.

My experience has been that Beta Beta Beta can be the "glue" that cements a lasting relationship between Biology Department faculty and students. It gives a potential biologist an early start at the professional activities expected in his field. The society is strong in the midwest and continues to grow.

A NEW YEAR'S PRESENT !

NIH ANNOUNCES NEW PROGRAM TO SUPPORT PRODUCTIVE UNDERGRADUATE INSTITUTIONS: ADVANCE WORD

April 1, 1985, will be the first deadline for the National Institutes of Health's new program, which the Congress recently recommended, to support faculty research at "four year, public and private colleges and universities, which provide undergraduate training for a significant number of our nation's research scientists [but] have not shared adequately in the growth of the NIH extramural [research] program" (House Report 98-911).

In fiscal 1985, NIH expects to spend \$5.0 million to support research by faculty at undergraduate colleges which have

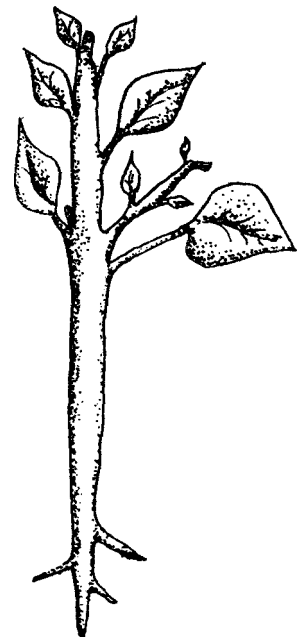
+ received less than \$200,00 in research grants from Public Health Service component agencies, and

+ have graduated since 1977 at least twenty-five students who have gone on to receive doctoral (M.D., D.D.S., D.V.M. and Ph.D.) degrees in a health science field.

Proposals will go through the regular NIH review procedure.

The Alcohol, Drug Abuse and Mental Health Administration (ADAMHA) does not share in this program.

Additional details will be available when guidelines for these new Academic Research Enhancement Awards are published in January 1985. In the meantime, we understand that the one-time grants may be for a maximum \$50,000 over two years for feasibility studies and other small projects that will pave the way for applications for regular, full-scale NIH research grants — "mainstreaming," in other words.



REALISM IN THE UNDERGRADUATE SCIENCE LABORATORY

By

Alfred B. Ordman, Assistant Professor of Biochemistry
Beloit College, Beloit, WI 53511

Introduction: Problems in a liberal arts science laboratory

I have not been teaching so long that I have forgotten the complaints about scientific careers commonly discussed among undergraduates. They say science has too much memorization, not enough excitement, and is not suitable for one who likes to work with people. And in graduate school I was startled to find many students quitting because science was not what they had expected, because research was totally different from the undergraduate labs that they had had. So when I received my appointment at Beloit College in 1977, I decided to try to develop lab courses which provided a more realistic presentation of what research actually involves.

Like most liberal arts college science professors, when I began teaching I was confronted with two major problems: time and money. I had a teaching load of 16 to 20 or more contact hours. And while I was fortunate to have many exciting and expensive instruments, I had only one of each to use with classes of 10 to 30 students. With these two major constraints, I wanted nonetheless to develop the best possible lab program. This presented three challenges: 1) How could I best expose the students to the means by which biochemical knowledge is discovered? 2) How could I expose the students to the equipment I had available? 3) How could I minimize the time required of me to accomplish these goals?

Materials and Methods: A project approach

Unlike most lab courses that use 3 or 4 hour blocks to carry out a simple and straightforward experiment (I wish I could say fool-proof, but nothing is

"undergraduate-proof"), my course would try to integrate several methods into a longer project, so that students could get a feeling for actual research.

I used the following basis for designing my own projects:

- 1) The projects should expose the students to as much of our equipment as possible.
- 2) The projects did not need to have a high probability of success, but should give enough results to demonstrate the principles of the methods used.
- 3) In keeping with 2, the procedures can be difficult or require real art to be successful, and the project descriptions should not be "cook-book", the students should have to decide to ask how to do them properly.
- 4) The projects should each involve a series of experiments, not just one, so the students learn to integrate experiments, schedule their time, and adjust to problems they encounter.
- 5) The projects should relate directly to the material covered in lecture, in order for the students to learn how biochemical information is obtained.

To stress the latter point, in class I begin the course by saying: "If you memorize the text book, you are worth \$39.95. No one will hire you if that's all you're worth. Your value, and what you should learn in this course, is how to ask good questions, and how to design experiments to answer those questions. In your reading, always ask how we know the information presented."

Results: Escape from the cookbook

Let me sketch one such project before describing the overall lab program. A lab called "Purification of Soybean Trypsin Inhibitor (STI) by Affinity Chromatography on Trypsin-Sepharose", was designed to use

dialysis, column chromatography, a fraction collector, cold room, and UV spectrophotometer. It turned out to be convenient, and relatively inexpensive (about \$4 per student for reagents) to synthesize an affinity column and carry out the assays. The basic idea is that STI binds to the enzyme trypsin. The students start with a crude STI preparation and purify it by affinity chromatography. They then assay their preparations to determine their success.

To do this, they must first get the trypsin assay to work, using a synthetic substrate (benzoyl-arginine-p-nitroanilide) which produces a colored product. Once they have gotten that assay to work, they must develop the conditions to assay the inhibitor, mixing a known amount of trypsin with varying amounts of the crude STI. Next they synthesize the affinity column. This involves the use of cyanogen bromide, which is dangerous stuff and must be used under the hood. The students get a real thrill out of the fact that on exposure to air it decomposes to a nerve gas. They then pass their crude STI sample through the trypsin-sepharose column and collect reactions, eluting the STI with high salt and acid concentrations. The fractions are read first at 280nm to determine the protein peaks, and then assayed for inhibition of trypsin activity to determine where the STI elutes. Finally they analyze their data, calculating the fold-purification and yield from the original crude STI to the final fractions. The results provide a large amount of data to be analyzed for the final report. An important question they also answer, when the project does not work, is where the methods failed, and what they would do differently the next time.

Discussion: Let the students do the teaching

Clearly, long term and complex experiments only produce the predicted results about half of the time. Often the amount of trypsin bound is low, so

much of the STI comes off in the first peak. And often getting the trypsin and STI assays to work consistently is difficult. But this too has its dividends. Whenever a student comes to me with problems, I immediately ask the student to show me her notebook, so that I can see what she did. By the middle of the first project, students learn to use their notebooks carefully and thoroughly so they can document exactly what they have done and exactly how they have done it. With a lab that is not cookbook, for which the students design the procedure, close attention to detail becomes compulsory. In spite of the problems and failures they encounter, and because they realize the difficulty and challenge of the projects, the students have a positive, exciting, and educational time, especially toward the end of the term when they compare their successes and failures.

The obvious problems with such projects are three-fold. They could take a lot of the students' time. They could take a lot of my time. And, with a large class, it is impossible for each student to do each project individually. I think the course design has transformed these three pitfalls into advantages.

I have designed the lab portion of the course to require only four projects. By choosing the projects carefully, I expose the students to all of the equipment I want them to use and most of the principles I wish to demonstrate. The four projects include the STI lab, a purification lab involving ultracentrifugation of an enzyme, a characterization lab of the purified material by SDS gel electrophoresis, and a kinetics and protein chemistry lab where they work on an enzyme mechanism. Students do the projects in four groups, which requires them to get along, to communicate effectively, to organize and divide up the work, and to schedule their project work. I believe this gives a better image of the cooperation which now characterizes most big science, and shows that the scientific researcher is not a

solitary individual, but one who works and jokes and gets excited about success and failure with others.

I help the students with their first project. This means that at the beginning of the term I have to be well organized, scheduling conferences with each group to go over procedures, equipment, and location of chemicals. However, they make up all of their own reagents - a skill many undergraduates miss because too often lab TAs make up reagents for an entire class. And after the first project, each group tutors the next group which does their project. That means that the students get to teach the next group the procedures, so they actually are exposed to them twice, and, as we all know, the best way to learn is to teach. Each successive group can improve on the techniques because of the advice of the previous group, so that eventually the experiments do work. In this way, after the first five weeks of the term, I devote little time to teaching the mechanics in the lab. The students work on their own, at their own convenience, and provide their own instruction. My role becomes one of occasionally observing the students and discussing the finer points of technique and theory. It is a pleasure for me.

Conclusions: Try it yourself and reach your own

I have found it possible to do sophisticated and lengthy procedures this way, with a minimum of time, effort and expense. The students' satisfaction, and their success in research positions during the summer and after graduation, have convinced me that my system is ideal for laboratory courses for upperclass students.

Anyone who is interested in the lab procedures that I use in biochemistry and microbiology is welcome to write to me for copies.

Biochemistry:

1. Purification of Soybean Trypsin Inhibitor by Affinity Chromatography (1)
2. Enzyme Purification by Density Gradient Ultracentrifugation
3. Protein Characterization by Sodium Dodecyl Sulfate Gel Electrophoresis (2)
4. Characterization of Horse Liver Alcohol Dehydrogenase by Kinetics and Enzyme Modification (3)

Microbiology:

1. Differentiation of HL-60 cells in Tissue Culture (4)
2. Determination of Growth Parameters of Escherichia coli in Batch and Continuous Fermentation
3. Identification of Unknown Aerobic and Anaerobic Bacteria
4. Construction of a Restriction Map of Lambda Phage DNA by Gel Electrophoresis (5)

The experiments are also available on disk written with Applewriter.

References:

1. FEBS Letters 23:317 (1972).
2. J. R. Pringle and M. Osborn, Methods in Enzymology XXVI, p. 3 (1972).
3. D. E. Koshland, Science 142:1533 (1963)
4. S. J. Collins, F. W. Ruscetti, R. E. Gallagher, and R. C. Gallo, Proc. Natl. Acad. Sci. USA 75:2458 (1978).
5. Cold Springs Harbor Workshop, Manual on RNA Tumor Viruses, July, 1979.

FIRST CALL FOR PRESENTATIONS AT

THE TWENTY-SIXTH ANNUAL MEETING OF THE ASSOCIATION OF MIDWESTERN COLLEGE BIOLOGY TEACHERS

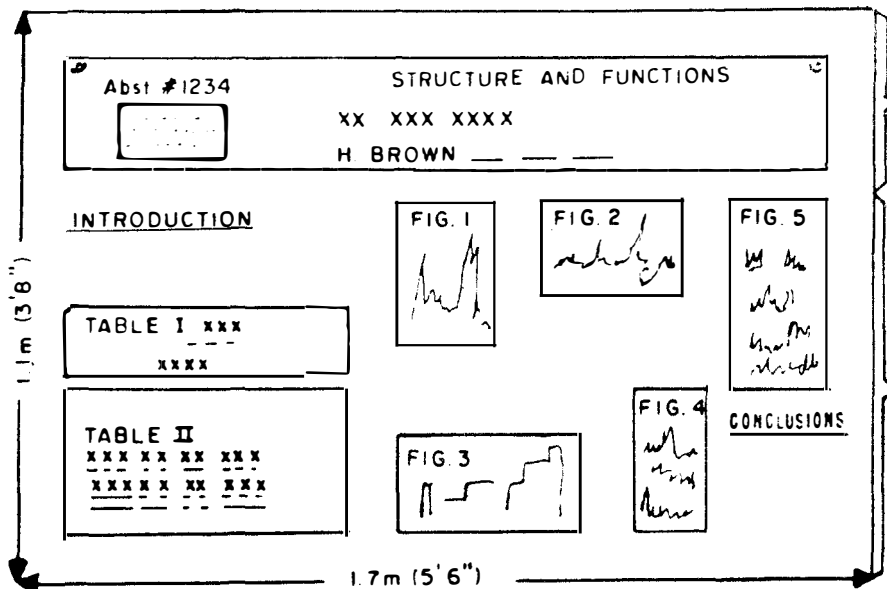
SEPTEMBER 28-29, 1985

AUGUSTANA, COLLEGE, ROCK ISLAND, ILLINOIS

General plans have been completed for our annual fall meeting and it is not too early to begin making plans to contribute. This year in addition the traditional group discussions, exhibits etc. we are planning to have an area devoted to poster presentations. We hope that this will allow some of you the opportunity to share something with the rest of us without the pressures of a group presentation.

Basically what it involves is the organization of pictures, charts, diagrams, written explanations, into a self explanatory layout that could be posted on a bulletin board. Thus allowing anyone to pass by and learn something new. You may wish to present basics for a particular lab you like, or some research that a student may have carried out for you, or your work with a student organization, or a particularly interesting way you present a lecture topic or how to use demonstrations to enhance your teaching etc. The key is to get involved by presenting something in a less formal relaxed setting. Anything related to teaching that is of interest to you would work.

The following illustration should give you an idea of what we have in mind for the board layout.



Provide a label containing the abstract number, title, and name(s) of author(s) to identify your presentation easily.

Post copy of your abstract.

Prepare and bring with you to the meeting all illustrations needed for your presentation—figures, tables, schemes, equations, etc.

Mount your label and illustrations on the fiberboard by means of drawing pins (thumbtacks). Bring your own pins; you will need approximately 50.

Whether you prefer to participate in the traditional way or in this new way please fill out the following Application for a Place on the 1985 AMCBT Program and return it to :

Harold L. Wilkinson, Program Chairman, Dept. of Biology, Millikin University, Decatur, Illinois 62522

APPLICATION

1985 AMCBT Program Participants

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May 15, 1985
August 28, 1985

Name _____ Institution _____

Address _____ Phone _____

Check one: _____ Oral Presentation _____ Poster Session
_____ Other(specify) _____

Title of
Presentation: _____

Abstract: (Please include a two or three line explanation of your
presentation.)

Mail application or suggestions to:

Dr. Harold L. Wilkinson
Dept. of Biology, Millikin University
Decatur, Illinois 62522 Ph. 217-424-6230

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