

Abstracts

For Papers Sessions 1975 NABT Convention

Author: Jane Abbott, Waterville High School, Waterville, Maine
Title: **Environmental monitoring for all students K-12 at different levels of achievement**

This will be a semiworkshop in which K-12 teachers learn some very simple bacteriological techniques, ranging from techniques involving such simple equipment as baby-food jars and tomato soup to the more sophisticated membrane filtration process. Each teacher will be given the script and a study guide so that he can individualize the monitoring techniques demonstrated. Suggested research projects for students that will give them a chance to discover the role of bacteria in the decay process and disease as well as in such industries as beer production will be included.

Author: Isabel S. Abrams, New Trier Adult Education, Winnetka, Ill.
Title: **Science teacher on safari**

Based on participation in the Citco-maide (Citizenry Communication Aide) program, this will be an audiovisual presentation of observations of a seminar in East Africa. The program, co-sponsored by Teachers Rallied for Environmental Education and Friends of Africa in America, provided opportunities for 16 teachers to meet with leaders in Kenya and Tanzania last summer and to learn about ecological problems in these developing countries. Olduvai Gorge, Serengeti Research Institute, and the UN headquarters in Nairobi will be shown, along with slides taken while riding through Amboseli, Tsavo Park, and Ngorongoro Crater.

Author: Dorothy M. Andrews, Bromfield School, Harvard, Mass.
Title: **The Harvard Elm Project**

A narrated slide presentation will

demonstrate how a chance remark by a student resulted in the development of the Harvard Elm Project (H.E.P.), a project deeply involved with values education. The major purpose of H.E.P. was to study the latest scientific methods of combatting Dutch elm disease and to organize a program to educate the townspeople of Harvard so that at the annual town meeting in March 1974 the necessary funds for specialized elm care would be voted, thus preserving the elms for posterity. The impact of this project exceeded all expectations, and it has recently been adopted by the Harvard Women's Clubs as an official bicentennial project. The project serves as an example of how the school and community can work together for the benefit of the environment.

Author: Nancy B. Bell, Dickinson High School, Dickinson, Tex.
Title: **Evolutionary ecology for secondary students**

Real and simulated evolution activities for the outdoors that make evolution more relevant to today's world will be described. Activities using seeds demonstrate selective pressure, interspecific competition, dispersal of individuals, and the effect of seed size versus seed number. Sympatric floral species illustrate isolating mechanisms, pollinator attractants, pollinator preference and its effect upon floral patterns, and hybridization. Mimicry in insects is shown through the use of cracker-and-icing baits that simulate models and mimics for avian consumption. As a concluding exercise, students recall incidences, construction, or perturbances in their areas which may have constituted a selective pressure that affects the evolution or organisms in their own communities. As a result of these activities, students realize that evolution is not static but a perpetual phenomena that occurs in natural and man-made environments.

Author: Stanley D. Boyer, Saint Xavier College, Chicago
Title: **Alternative modes of teaching animal behavior**

This paper will be addressed to the problem of providing suitable as well as feasible learning experiences which can complement lecture and discussion sessions in a course on animal behavior. The rationale and design of laboratory and field trip exercises that have proven successful in a college-level animal behavior course will be discussed. Such exercises are also applicable, with modifications, to high school biology courses. The comparatively small cost of equipment will be of interest to teachers contemplating such activities. The incorporation of actographs and an activity recorder into an extended experimental study of biological rhythms will be discussed, and methods that simultaneously involve all students in a class will be explained. Various ways of utilizing activity record data—ranging from simple to complex—will be given. Observational techniques that utilize the cognitive powers of students will be reviewed.

Author: Robert Clark, Southern Lehigh Senior High School, Center Valley, Pa.
Title: **Serum protein electrophoresis in a second-year biology course.**

The application of electrophoresis techniques to an advanced high school biology class will be discussed. Employing a used electrophoresis separation chamber, power supply, and densitometer, students electrophorese human serum and other mammalian sera and separate these into component proteins. They then quantitate and determine the percentage of each fraction of the total protein present. These data are compared to normal values, and abnormal conditions are studied and compared to controls.

Author: Stanley L. Cummings, Jr., Yosemite National Park, Calif.
Title: **Objectives for outdoor environmental education: a formative evaluation of Yosemite Institute's School Weeks Program**

Yosemite Institute is a nonprofit corporation based in Yosemite National Park. Its main activity is a week-long program during the academic year for 150-200 high school students. Small groups receive instruction in such varied interests as bird habitats, environmental appreciation, and land use management. In an effort to pull together the diverse elements of an offering of this nature, Yosemite Institute has undertaken an evaluation of its program. The evaluation involves three stages: program assessment; decision; and implementation. Program assess-

ment rests on instructor-participant feedback and field observations. At the decision stage a broad-based set of goals and objectives for outdoor/environmental education is defined. Objectives include elements of both content and methodology, making transition to the implementation stage relatively straightforward.

Author: W. W. Darlington, Illinois Wesleyan University, Bloomington
Title: **A crisis in American health care**

Peter J. Levin, discussing the changing picture of medical care at the 1973 NABT convention, suggested that "the prevention and treatment of chronic diseases is not solely the responsibility of the medical profession or any health-care delivery system." This paper will elaborate on that idea. Among supporting factors are potential human life span, areas of the world in which people demonstrate exceptional longevity and health, and current life expectancies of several professional groups compared to U.S. Department of Commerce norms. A widespread functional disorder, the alleviation of which now costs \$225 million annually, provides additional validation.

Cardiovascular diseases are our number one killer. Investigation was begun 35 years ago into the relation of such disorders to physical conditioning. The progress of this research will be reviewed and its implications discussed. Evidence will be presented indicating that both medical and allied health professions are increasingly aware of the relevancy of these studies.

Authors: Claudia B. Douglas and Jane B. Kahle, Purdue University, West Lafayette, Ind.
Title: **Why add frustration? The effects of instructional sequence and cognitive style on biology achievement**

A controlled study was conducted to determine the effect of instructional sequence and cognitive style on achievement of ninth-grade biology students. Students were classified according to learning style and randomly assigned to an inductive or deductive sequence of materials on genetics. A control group received alternative units. All units utilized a self-paced, autotutorial, mastery system. A comprehensive post-test measured achievement. Results imply that ninth-grade students may not be capable of integrating concepts to form hypotheses. Students need to be carefully guided to logical and independent thought by curricular materials designed for individualized learning in a manner complementary to their present thought patterns. This research identifies those materials.

Author: Andrew Dziadyk, E.D. Feehan High School, Saskatoon, Saskatchewan

Title: **Photomicrography in the high school**

This will be a presentation of a program that has resulted in a good level of proficiency in photomicrography for small groups of students and the utilization of their skills for the benefit of other life science students. The presentation will be illustrated with a series of 35-mm transparencies showing techniques, samples of results, and ways to use results for other students. A sampling of black-and-white enlargements of photomicrographs will be displayed, and a handout emphasizing how other teachers may utilize this activity will be provided.

Author: William J. Ennis, Groton High School, Groton, Mass.

Title: **Basic human anatomy and physiology: a curriculum alternative (elective) in the biological sciences for the advanced secondary student**

An elective multimedia, activity-centered, semester science course will be described. The approach of the course is both individualized and modular. It was developed from a six-week unit dealing with the major human anatomical and physiological systems that was offered to advanced biology students at Groton High School. The material is covered through the systemic approach, and a module has been constructed for each major body system. Students may proceed at their individual rates through each module, and there are a number of activities in each module from which to choose, including advanced dissections of mammalian organs and organ systems. A number of sample modules will be available, along with a slide and tape presentation of the actual course in operation.

Author: William J. Ennis, Groton High School, Groton, Mass.

Title: **The use of 35-mm slide-tape programs in the reinforcement of difficult biological laboratory techniques at the secondary level**

As a result of efforts during the past two summer workshops in the science department at Groton High School, a number of "homemade" 35-mm slide-cassette tape programs have been developed. The programs cover a wide range of difficult and advanced lab techniques, from Microscope Technique to the proper use of the Gram Stain Technique in Bacterial Staining. Students assisted in taking the color slides and in recording the cassette scripts. The programs have been designed to be

utilized by the teacher as a pre-lab demonstration, for small group instruction and review, or even for individualized reinforcement. The cost of producing these programs is minimal; much less expensive than many of the commercial programs now available.

Author: Carl D. Finstad, University of Wisconsin, River Falls

Title: **Measurement of the cognitive development of secondary students in biology**

This study compares pre- and post-test differences, traditionally and graded-response scored. An 85-item test written for the study was administered to general biology students at three secondary schools. The individual test items were classified as to cognitive level and biological content. Conclusions of the study are that (i) significant levels of learning in biology were accomplished by the students; and (ii) student performances measured by graded-response scoring were significantly higher than when traditionally scored.

Author: Donald F. Galen, East High School, Phoenix, Ariz.

Title: **Construction and uses of a large high school greenhouse**

The new 20 x 62-foot greenhouse at Phoenix East High School was developed to allow a class of 32 students to work together. They are learning such horticultural techniques as gardening, greenhouse maintenance, hydroponics, plant breeding, and plant propagation. As a result of the techniques learned, the students should be able to apply their knowledge to many careers, including entomology, floral artistry, landscape architecture, and retail nursery business.

Authors: Donald R. Garren and Dennis A. Gathmann, Lake Land College, Mattoon, Ill.

Title: **The enrichment at AT college biology with minicourses**

Biology instruction at Lake Land College has been enriched by a modified Postlethwait-type of audiotutorial instruction. A comparison between achievement test scores for students in audiotutorial classes and those in conventional lecture-laboratory sections was made during the fall of 1973. This comparison indicated that student achievement as measured by percentage scores on unit tests and a final exam was almost identical for the two types of instruction. However, the audiotutorial students were able to complete additional supplemental minicourses of their choice within the same

time span. Based on the freedom and topic flexibility offered by minicourses, audiotutorial students indicated their preference for this type of individualized instruction over traditional methods. Presently, the minicourse program is being expanded to include variable credit and totally flexible scheduling.

Author: Brother Marius Grone, O.S.F., St. Francis Preparatory School, Fresh Meadows, N.Y.

Title: **Determination of leaf form and phenomenon of heterophyly in *Sium suave***

Sium leaf primordia have genetic competence to develop in expanded or dissected forms. Experiments were conducted to test environmental parameters and plasticity of leaf form determination. Studies employed adult and seedling plants to determine the heterophyly as developmental or environmental. Excising of *Sium* leaf primordia into divisional parts prior to in vitro culture served as a test in determining whether the total primordium is under uniform control or if information directing leaf form resides only in specific portions of the primordium.

Author: Garland E. Johnson, Hoover High School, Fresno, Calif.

Title: **A look at an updated second level biology program for high school students**

Slides, outlines, and discussion will be presented to give teachers an opportunity to become acquainted with the third revision of the BSCS second course program *Biological Science: Interaction of Experiments and Ideas*. This program is designed to deepen students' appreciation for basic biological concepts and methodology by emphasizing the nature of experimentation, stressing problems rather than answers, and providing a framework of basic biological concepts upon which a student can base sound reasoning habits. The second course program will attempt to bring the processes of biological investigation into closer relationship with the major problems of facing society today and in the future. Dealing with the consideration of modern controversy as a mechanism in the growth of science, technology, and society will be explored.

Author: Jane B. Kahle, Purdue University, West Lafayette, Ind.

Title: **Attitude and achievement: a study of attitude changes associated with individualized and group instructional modes**

This controlled study demonstrates the effect of different modes of teach-

ing on the attitudes of students toward learning biology. Two basic teaching methods in an inner city high school were compared: (i) an individualized, self-paced audiotutorial model which utilized a mastery learning strategy based on performance objectives and self-tests; and (ii) a traditional, group-paced lecture-discussion model which utilized norm-referenced and teacher-directed teaching and evaluation strategies. The attitude change of a nonscience class was measured as an external control. The evidence of a positive attitude by students in a particular learning situation should have direct effect on both their motivation and achievement. Therefore, any teaching strategy that causes an increase in positive attitude has important educational implications.

Author: Robert C. Knott, University of California, Berkeley

Title: **OBIS: no school in the environment**

OBIS, an emerging program in its third year, is offering children biological experiences in the man-managed environment. Lay leaders use non-threatening low cost activities to provide opportunities for the nation's youngsters to gather evidence for decision-making. An ecological approach is used in the environments in which biological principles and organisms, including man, operate.

Author: David T. Koenigs, John Burroughs School, St. Louis, Mo.

Title: **The evolution of an in-depth ecological study for first-year high school biology students through the utilization of a wilderness field station**

For a school whose philosophy and goals include the development of an appreciation and understanding of man's relationship to the rest of nature, a field station can prove to be an invaluable asset. The acquisition of suitable land, selection of the most advantageous site, design and construction of living quarters, and satisfying state building and health codes are only a few of the problems to be solved before such a facility can become a reality. This paper will deal with these and other considerations, such as versatility, logistics, equipping and managing a camp of this nature, and the development of a comprehensive study program. Emphasis is placed on the changes and improvements that have been made during the five-year evolution of a successful wilderness experience, involving an in-depth ecological study of a remote freshwater stream and the associated oak-hickory forest surrounding this field station in the Ozarks.

Author: Gerald C. Llewellyn, Virginia Commonwealth University, Richmond.
Title: **A report on curriculum inclusion of the biological action and potential effectiveness of commercial products**

Students in introductory college biology lectures, tenth-grade biology students, and in-service biology teachers have responded positively to the study and explanations of numerous commercial agents. Products that lend well to classroom discussion and student study include those that affect or are used on the human body. Examples include soaps, toothpaste, deodorants, cold remedies, caffeine beverages, reducing aids, and hair treatments. The student usually is asked not to test personally the product but to become familiar with the active ingredients, how the ingredients function, the biology of the effected system, and any comments he may have about the usefulness of the product. This approach may be used in the study of any number of human systems. Students appear to be challenged by the opportunity to investigate the details relating to a product of their own choice, and they often develop mature and professional opinions relating to the proposed effectiveness and claims of manufacturers.

Author: M. N. Mahadeva, University of Wisconsin, Oshkosh

Title: **On the biology of religion and ethics: two aspects of human ethology with implications on the survival of *Homo sapiens***

In this paper, the following will be attempted: (i) to define religion and ethics to show that the two are aspects of human behavior having biological bases; (ii) to examine whether a reductionist approach to ethiology may be unprofitable and irrelevant, since mammalian behavior—particularly human behavior—is so much “learned” rather than inherited in the Mendelian sense; (iii) to point out the compelling need for an empirical scrutiny of religion and ethics in order to develop holistic “bioethical” strategies for the survival of our species and all life on earth; (iv) to review the evolutionary significance of religion and ethics as interpopulational competitive devices among humans; and (v) to emphasize the imperative need for the study and development of altruism and cooperation among all the populations of *Homo sapiens* in order to avert the apocalyptic Armageddon.

Author: M. N. Mahadeva, University of Wisconsin, Oshkosh

Title: **The semantics of “evolution”: the metamorphosis of a concept**

The theory of evolution is accepted by

most intellectuals as the greatest single ordering principle in biology. Many look upon this concept as a special extension of the idea of cosmic evolution. Whether people fully understand the concept and its ramifications or not, the word itself has gained almost universal currency. Despite the present controversy over evolution versus creationism, it is perhaps not so well known that the word *evolution* has had a rather checkered history of its own. Even many biologists do not know that Charles Darwin himself never used that word in his *Origin of Species*. Did he avoid it for a reason? The aim of the paper will be to describe the semantics of the word in an introduction to the study of the problem of conceptualization in biology. Is there a distinctive and specific biological way of thought?

Author: Steven J. Muzos, Austin Community College, Austin, Tex.
Title: **Multicampus, individualized community college biology**

General Biology I and II are self-paced and individualized on three different temporary campuses. Bio I contains 19 units (10 core and 9 optional) and Bio II contains 18 (9 core and 9 optional). Each unit includes behavioral objectives; a list of learning activities such as readings, labs, field trips, films, audiotapes; and self-paced readiness evaluation. Students choose their own activities for each unit. Learning materials include textbooks, audiotapes, videotapes, posters, film, slides, and instructor-prepared units. Students may retest on any materials, and both oral and written testing is utilized. Because each campus offers the same courses, students may move back and forth freely between locations and instructors. Coordination of the three campuses is effected by a program leader and an assistant. Instructors, lab monitors, and lab assistants provide optional lectures, class discussions, and tutorial assistance at each location.

Author: Frances Ness, Lincoln-Sudbury Regional High School, Sudbury, Mass.
Title: **Experiments in blood pressure physiology for high school students**

Four different experiments are performed by groups of three to four students. With simple stethoscopes and sphygmomanometers, systolic and diastolic pressure and heart rate of a subject are monitored simultaneously until a basal state is reached. Each group then measures the effect of one of the following: (i) prolonged quiet standing, (ii) immersion of a hand in ice water for a minute, (iii) recovery from three minutes of strenuous exercise, or (iv) drinking strong coffee. The results of each ex-

periment are graphed on one graph which is easily transferred to an overhead transparency for class discussion. Transparencies are filed for use the next year so students can be shown a wide variety of individual cardiovascular responses to the same stresses. Further discussions of homeostatic blood pressure and heart rate mechanisms can then be introduced.

Author: Anne Marie Norberg and Suzanne Pfeffer, University of California, Berkeley
Title: **Kitchen biochemistry: the use of food to introduce and build upon basic biological concepts.**

Using materials readily available in any supermarket, students can experiment sophisticatedly with acids and bases, plant structure, bacteria and fungi, proteins, carbohydrates, and fats. Starting with the basic concepts of atoms, molecules, and pH, students can explore the reactions and processes that cause cookies, cakes, and bread to rise. In attempting to gain an understanding of food reactions, students from age seven to college level can experiment at different levels. With the aid of a hand lens or a compound or dissecting microscope, the level of discovery goes even further.

Author: Ann Marie Norberg, University of California, Berkeley
Title: **Microbiology and the food we eat: using bacteria, fungi, and yeasts available from the supermarket to explore basic biological topics**

What are bacteria, fungi, and yeasts? What changes do they mediate in foods? A teacher or interested parent working with second graders through college students can use microorganisms to explore biology, chemistry, and nutrition at various levels of sophistication. Beneficial bacteria, fungi, and yeasts—used in preparation of many cultured food products—are readily and inexpensively available from the supermarket; furthermore, the supplies and equipment necessary are standard in most kitchens.

Author: W. Robert Stamper, Cheltenham High School, Wyncote, Pa.
Title: **How to add visuals to recorded materials**

Today, many professional groups are making recorded sessions of conferences and conventions available for classroom use. In addition, teachers may find certain readings worth taping. Whatever the source, recordings hold attention better and have more

meaning when accompanied by a visual presentation. This paper will discuss how teachers can make their own visuals using the 2 x 2 format: selecting pictures, chart construction, photographing from various sources, film alternates, timing, and audiovisual balance. The presentation itself will be taped with visuals to illustrate the various principles and techniques involved.

Author: David R. Stronck, Washington State University, Pullman
Title: **Changing attitudes toward nutrition**

The diet of the average American has been gradually changing and worsening. While overeating is producing problems of heart disease and stroke among millions, the Health and Nutrition Examination Survey, a 1974 HEW report, describes widespread deficiencies in iron, calcium, and vitamins A and C. In general, Americans consume too much refined sugar, phosphorus, and saturated fat. At Washington State University, instruction on nutrition in an introductory biology course has included the use of questionnaires and small group discussions. Responses to these questionnaires demonstrate the existence of many misunderstandings and the need for value clarification techniques in the area of nutrition. With good results, discussion leaders have encouraged the students to recognize their prejudices and to consider other attitudes.

Author: George C. Turner, California State University, Fullerton
Title: **A new model for teacher selection and education in the sciences**

By the end of 1971 the long-standing national teacher shortage appeared to have ended. Generally speaking, teachers were in oversupply. Inner-city schools, however, continued to suffer a serious shortage of qualified teachers, especially in science and mathematics at the junior high school level. At the same time, large scale layoffs of scientists and engineers in aerospace industries were being reported almost daily, to an extent that virtually precluded immediate suitable reemployment for such personnel. These two major problems were seen as particularly critical in the greater Los Angeles area. The Urban Science Intern Teaching Project (USITP) was conceived to help ameliorate both. The major thrust of the project, however, was not merely to find "bodies" to fill this gap in our supply of teachers, nor was it to retrain out-of-work personnel and returning veterans. Rather the project directors viewed these circumstances as providing the need and the manpower by which far more fundamental educational problems could be tackled. This paper will describe the creation of entirely new

processes for teacher selection and teacher education.

Author: Bruce Tulloch, Schalmont Middle School, Schenectady, N.Y.
Title: **Strategic grouping in the life sciences**

Heterogeneous classes of early secondary students show wide variance in abilities, interests, and needs. Thus, teaching modes directed at the total class as an intact group are often inappropriate. To facilitate social learning and match instructional tactics with learner characteristics more precisely, classes were broken up into three categories of students, each category composed of one to three groups of four students. Pupils were assigned to a specific categorical group on the basis of similar aptitude, achievement, and motivation. Each group chose a leader who was responsible for transmitting materials and teacher directives to his fellow group members, monitoring their progress, and returning completed work along with status reports to the instruc-

tor. As a result, increased self-control, more immediate feedback to students, and greater teacher time devoted to slower children has been fostered.

Author: Linda Wilson, Shedd Aquarium, Chicago
Title: **Public aquariums and the schools: a double bond**

Aquatic science is being given increasing attention by schools. However, many schools lack opportunity to visit shore areas, trained staff, equipment needed to maintain large numbers of animals, or time and funding to develop materials. Aquariums are too limited in scope to offer credit and are somewhat isolated from the formal curriculum. Working together, though, schools and aquariums can give students opportunities neither can offer alone. This paper will describe the academic association between Shedd Aquarium and Metro High School, an alternative school which utilizes many community resources. Discussion of

how such a program might be set up will be illustrated by slides and film.

Author: Harold Wiper, Newton High School, Newtonville, Mass.
Title: **A club model—one that goes!**

This paper will describe the development of a very successful biology club that features a great variety of activities. The club is built around interest sections, each chaired by a student who has a strong interest in that particular field. Each section plans and runs its own program of speakers, field trips, and projects, one of which is to be directed toward benefiting the school or the community. Last year the pre-med section sponsored a bloodmobile, and the marine section presented a "Save Our Whale" program. The club meets as a whole twice a year—once for organizational purposes at the beginning of the year and for a social get-together at the year's end. In between these times the section leaders meet to coordinate the various activities.

Breeding *Drosophila* ...

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but not involved. The principles we have discussed are the same. The random number function for this program must produce the numbers from 1 to 19. The unique products are formed in the same way as before. These products are examined, sorted, and counted—if acceptable. You will note that some of the unique products formed have the same physical meaning and can be placed in the same storage bins. You might utilize the notation $A(1)A(2)B(1)B(2)C(1)C(2)$.

In addition to the speed with which the computer can "produce" the *Drosophila*, the experimenter is spared the problems associated with preparing culture media, the accidental killing of samples, or having the little critters regain consciousness and fly off to their own breeding grounds. It took the HP 2114B about 15 minutes to generate 5,000 samples using the dihybrid cross program and printing the results for each 1,000 samples. The laboratory time for raising such a large sample is much longer by comparison.

Hopefully, these simple programs will aid you and your students in obtaining larger statistics for genetics study; and having mastered the mathematics of unique multiplication, you will see that this same procedure can be applied to a variety of genetics problems (see Crowder 1967). Your imagination is the major limiting factor of any computer program.

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NSF Chautauqua-Type Short Courses For Secondary School Teachers

The National Science Foundation, which has provided funds to the American Association for the Advancement of Science for short courses for college teachers since 1971, has funded a pilot project extending the program to secondary school teachers. During the 1975-76 academic year, the following two courses will be offered: Water Pollution; and Workshop on Teaching Observational Astronomy.

Each two-day course will be offered twice—once in the late fall and again in early spring. Funds are provided for four nights' lodging and instructional materials for participants.

For further information and application forms, write to Don I. Phillips, AAAS, 1776 Massachusetts Ave., N.W., Washington, D.C. 20036.