

MIDWEST BIOSCENE



ASSOCIATION OF MIDWESTERN COLLEGE BIOLOGY TEACHERS

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MESSAGE FROM THE EDITOR:

Taxes, wild flowers, snow peas, mushrooms, and the **MIDWEST BIOSCENE** announce the ending of winter and the coming of summer. I remain excited about serving as editor of your paper and as you will soon learn your colleagues have provided some excellent reading. In this issue, Harold Hansen initiates a new column - **SPOTLIGHT: AMCBT BIOLOGY DEPARTMENTS**. He tells us about the Biology Department at St. Olaf. Although our Spring is arriving slowly, soon the "Roaners" will be searching moist woodlands for those delicacies of Spring - the morels. Don Huffman shares with us his knowledge of Midwest Mushrooms - an article worth sharing with friends and colleagues. Two other articles in this issue may be of interest and hopefully will generate more articles. I asked David Krohne and Bob Henry, both from Wabash, to share their experiences with interdisciplinary courses about science. Finally, a student at Wabash, Clyde Dawson, has prepared an animated computer program designed to teach students about meiosis and mitosis. With the publication of these articles, I expect that the readers will become excited and begin to share their ideas about course designs, biology curricula, computer programs, and student research with the members. The last issue for 1983 will be in August. Start now and **PARTICIPATE**.

Before you begin reading, grab you calendar and circle **September 30** and **October 1**. We will have an opportunity to visit the "North Country." Harold Hansen, Emeritus Professor of Biology at St. Olaf's. Now is as good a time as any to express Harold's consternation with me and with the AMCBT; he states: "The Midwest Organization must have some kind of a hang-up about the name ST. OLAF. Last year my letter came addressed to Carleton. This letter had no college written on it at all. The agenda for Beloit (the Steering Committee meeting) said the next meeting would be at 'Northfield College.' When the Vikings take over, I'll have all of your scalps - or whatever! **And please no apostrophe s.**" Before you read any farther, you should complete the form attached at the end of the newsletter and **PARTICIPATE** in the activities of the AMCBT. The theme for this year's meeting will be **Deja Vu (Here We Go Again)**. We need members to participate by presenting a paper, chairing a session and/or serving as a recorder at the annual meeting. Group discussions will focus on four general areas: General Education, Training of Biology Majors, Faculty Concerns and Subject Matter.

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***** POTPOURRI *****

FROM THE DESK OF THE EXECUTIVE SECRETARY

The increasing concern of late in the press and in communities around the country regarding the sorry state of science and mathematics education has reminded me of one of the fundamental reasons I was attracted to **AMCBT** back in 1960. The Association then, and I think still does, endeavored in its meetings and publications to promote the teaching of biology at all levels of the educational ladder its membership occupied. Further it also expressed a very healthy concern for the other areas of science and mathematics as well. This was of course the Sputnik era, and the governmental fervor which led to the funding of NASA had spilled over into NSF with its resultant benefits to both secondary and collegiate teaching. I'm sure many of you remember workshops and institutes of all sorts. From the zenith of this time, however, there has been a steady decline in these sorts of governmentally sponsored efforts to enhance science education. Anyone seeing the recent past and projected NSF budgets knows firsthand the truth of this. **AMCBT** participated in many of these, as well as attempting to provide a base to which teachers, active in their respective areas could turn for assistance. It seems to this observer that the problem today is of a dimension far greater than that which triggered the Sputnik era response. Additionally the deterioration seems to be broader and much deeper than before. In the sixties, science and mathematics were being taught, albeit at unacceptable levels. Today in some areas, there are science gaps in the educational curricula simply because there is no one available to teach. Or if science is being taught it is generally being done by someone without the proper preparation. The principal solutions of the sixties, institutes, workshops and curricular approaches, cannot be utilized to the same extent today as in the past. Certainly those teachers presently working in science would benefit from this sort of approach, any active teacher needs refreshers from time to time. However, the problem is in the main drastically different from before.

It is no secret that teachers in all disciplines, but most especially in science and mathematics, have been leaving the profession at alarming rates. Certainly the projections of lowered future student populations have had some affect in this area, at least to allow down the production of new entry teachers, but the primary reasons seem to be related to the environment in which the teacher must work. Administrations, Boards, parents all have shifted some of their responsibilities onto the shoulders of the classroom teacher without giving them any of the needed authority. Financial pressures certainly exist, but in the teaching profession they always have existed. I think it is reasonable to say that teachers really are not in the business for the money. Some of you may have read the article by President Reagan's son in Newsweek on his reasons for quitting the Ballet---the lack of respect, the long hours and the low salary. Does this sound somewhat familiar to you?

There is some hope, but it doesn't appear to be much at present. The papers and TV are now informing us that NSF and the Office of Education are increasing their budgets in the areas of science and mathematics education. Any increases are of course welcome, but it seems to be a band-aid attempt to staunch a main arterial bleeder. We are in serious trouble from K through 12 with respect to decent science and mathematics education. (We are in almost as bad a shape in other areas as well, which accounts for all the cries you hear from the public for a 'Back to Basics' curriculum.) We don't have the warm bodies to put into these classes. Plans to train surplus arts and humanities teachers to teach science and math are I'm afraid not going to do the trick. With all due respect to our colleagues in other disciplines, they are not scientists or mathematicians, and retraining in these areas won't do them any good, nor will it help education. It's aspirin when we need antibiotics. Somehow we will have to supply teachers to go into education across the board. We can't work on elementary teachers to the exclusion of secondary, or vice versa. Whatever

we do will require a considerable degree of coordination because it is going to require schools to work with one another to a degree I can't recall seeing before. For this reason I think regional groups such as **AMCBT** could play a very important role in this cooperative effort. We already have a built in mechanism of information exchange. We have members in all types of educational settings. Jointly I feel we could develop several means whereby the output of teachers of science and math could be increased.

At this point I think I would like to put the ball in all of your courts. The matter I feel goes to the heart of what **AMCBT** has and should always stand for. It is something I feel could be quite appropriately handled in Bioscene and in our meetings. As Executive Secretary I would be more than willing to coordinate any efforts the membership wanted to get going in this direction. What is needed is your input, your desire, and your good will.

RESPONSE ANYONE?????

My apologies to many of you for including on the dues billing amounts that you had paid late last summer, specifically the amount calculated to switch us over to the calendar year billing. Every time I use our computer to do something I learn more about the basic fact that it is a very stupid machine. One of our work study students did very diligently enter these amounts into your accounts, however the computer was not commanded to Save this data. Since your files can only be updated with this command, said information was never entered. Fortunately the office, like many of you who may be switching to some computer use, still saves paper, and we did have a record of your payments. I am using this very public means to apologize to all of you, especially those who noted such on your returned billings.

BIOLOGY AT ST. OLAF

by

Harold Hansen (Professor Emeritus, St. Olaf)

The Biology Department occupies the 200 level (main campus level) of the St. Olaf Science Center, a building shared with the departments of chemistry, physics, mathematics and nursing. The departments enjoyed a fine working relationship with the local architects (Sovik, Mathre, Sathrum and Quanbeck) in planning the three million dollar building which was completed in 1968. A large foyer with two adjacent auditorium-type classrooms and the science library are shared by these departments. The biology area includes a core of teaching laboratories, all conveniently clustered about a central stock room. The perimeter is occupied by two classrooms, faculty offices and research labs, a student research room, special facilities (optical, controlled environment, darkroom, animal room, greenhouse), the departmental office and a seminar room (with adjacent coffee kitchen!). Although some computer terminals are located on this floor, principal computer facilities are on the 100 level where they are accessible to all students. Special shop facilities (for wood and metal work) are also on that level. The department has additional storage areas on the lowest level, with doors especially convenient for loading field gear.

Student registrations in the department number about 650 per semester from a total college population of about 3000. The number of graduating majors is high (97 in 1982) and includes those who prepare for secondary school teaching or for medical, dental, veterinary or graduate schools. In his or her first two years at St. Olaf, a major-oriented student would typically take a course in Cellular Biology and Genetics, one in Organismal Biology, two semesters of chemistry, two of mathematics, one in physics plus an additional course in biology. This plan enables the student to get a strong foundation in the sciences and thus

to be free to move into more specialized courses in the junior and senior years. The usual distribution (area) requirements of the liberal arts program and electives would complete the student's registration under the 4-1-4 system.

The courses regularly offered by the department include:

21 or 22 Biological Science	62 Field Ecology
24 Anatomy and Physiology	64 Virology
25 Cellular Biology and Genetics	66 Comparative Anatomy
26 Organismal Biology	72 Animal Development
31 Microbiology	76 Cell and Tissue Biology
33 Intermediate Genetics	81 Animal Physiology
45 Field Biology (1/4)	68 Independent Study
51 Plant Physiology	70 or 90 Internship
52 Plant Morphology	98 Independent Research
53 Invertebrate Zoology	91 Selected Topics
61 Ecological Principles	

Biology students may also study and conduct research under three programs sponsored by The American Colleges of the Midwest: The Oak Ridge Science Semester, The Wilderness Field Station, and Tropical Field Research in Costa Rica.

The January Interim provides an opportunity for specialized study which in 1983 included the following courses:

20 Reproductive Physiology	82 Desert Ecology (Arizona)
21 Supermarket Botany	83 Nutrition in the Third World
80 Marine Ecology (Cayman Islands)	84 Current Problems in Evolution
81 Winter Ecology (Itasca Park)	85 Biogeography

Independent Study or Independent Research registration is permitted in either semester or the interim. The distribution (area) requirements of the college include - two courses (with no more than one course in each) in Biology, Chemistry, Mathematics, or Physics. One course must be a laboratory science. Some of the departmental offerings are designed for students seeking to fulfill the requirement, i.e. Biological Science, 21 or 22.

The department publishes a Fall Bulletin, used in conjunction with an all-college series of information sessions for entering students. Students have their own in house newsletter entitled Biofeedback. A Seminar series includes as speakers visiting scientists, some recent graduates, staff members and students.

The college is fortunate in having a woodland area as a part of the campus labeled spring flowers of the deciduous forest may be observed there. A more recent development is a student originated project in prairie restoration, again at the edge of the campus. Both of these projects are supported by a recently organized Natural History Club. The annual Green Thumb Day is a departmental activity providing students an opportunity to re-pot their dormitory plants about 600 plants are also given to students on that day.

Current staff members, their primary teaching responsibilities and current research interests are listed below:

Eugene Bakko	Animal Physiology	Thermoregulation and Water Balance in Small Mammals
Alice Burton	Biological Science	Recombinant DNA
	Intermediate Genetics	Life of A. R. Wallace
	Virology	
	Problems in Evolution	
Kathie Fishbeck	Plant Physiology	Nitrogen Fixation
	Plant Morphology	Mineral Nutrition
	Supermarket Botany	
Ted Johnson	Microbiology	Ground Squirrel Hibernation
	Immunology	Immune Systems of Burn Patients
	Cancer Biology	Cancer Cellulose Production by Bacteria
Henry Kerwott	Anatomy and Physiology	Grouse Mating Behavior
	Animal Behavior	Melanin Physiology
	Comparative Anatomy	
	Desert Ecology	
	Ornithology (1/4)	
Marland Madson	Cellular Bio. B Genetics	Plant-soil Relationships
	Organismic Biology	Course Related Library
	Teaching of Life Sci.	Instruction
Daniel Palm	Cellular Bio. B Genetics	Animated movie, chick development
	Nutrition in 3rd World	
	Cell and Tissue Bio.	Catecholamine metabolism
Linda Scott	Anatomy and Physiology	Health Impacts of Indoor Air Quality
	Reproductive Physiology	Women's Health Issues
Kerry Woods	Ecological Principles	Ecology of Northern Hardwood Forests
	Field Ecology	
	Biogeography	
	Math in Biology	
James Zischke	Invertebrate Biology	Water Pollution Studies in Outdoor Experimental Stream Channels
	Field Ecology	
	Organismic Biology	

Marine Ecology
Organismic Biology

Harold W. Hansen (Professor Emeritus)

EDITOR'S NOTE: Spring in Indiana is marked by students and faculty taking field trips to observe the emerging vegetation. Some, however, are searching for Morchella esculenta and other edible mushrooms. So that those of us who enjoy the delicacy of spring mushrooms sauteed in butter will survive to see another spring, Don Huffman shares with us his knowledge about 'rooms.

EDIBLE AND POISONOUS MUSHROOMS IN THE MIDWEST

by

Don Huffman (Professor of Biology, Central College)

We biologists generally recognize a mushroom when we meet one, but few of us are confident enough to instruct the novice mycophagist (or ourselves) regarding the edibility or toxicity of a particular mushroom. Because we do have at least 2,500 species of mushrooms in the Midwest, and a human population largely of European origin where wild mushrooms were traditionally used in cooking, it might be useful for us to know some of the basics of mushroom eating and some of the attendant problems.

First of all, only about 20% of the mushrooms are poisonous, about 10% are edible, and the remaining 80% are inedible for reasons of texture, taste, odor, size, or esthetic considerations - would you want to eat a stinkhorn?. Of the poisonous mushrooms only about a dozen are deadly, and only a few of these are common in the Midwest. These include the "Destroying Angel," Amanita virosa and its closely related species A. verna, and A. bisporigera; the "Death Cap," Amanita phalloides; and the "False Morel," Gyromitra esculenta, which is problematic in its poisonings. Most of the other poisonous mushrooms produce less drastic effects, and deaths tend to be more common in very young children. We really do not have reliable vital statistics on mushroom poisoning because much of it is unreported in the cases of gastrointestinal upsets, etc.. One study in Colorado over a 4-year period showed about 50 confirmed mushroom poisonings annually, with about six hospitalizations per year. If we had better reporting and recording the Midwest would likely have a poisoning rate comparable to that of the Colorado study.

All of you have heard of some of the "rules of thumb" for determining edibility or toxicity of a given mushroom-silver spoon or coin blackening when placed with poisonous mushrooms; garlic turning dark in the presence of poisonous mushrooms, etc.-unfortunately none of these work. There simply is no generalization or rule-of-thumb method by which poisonous mushrooms may be detected. What is necessary is an accurate identification of a mushroom and learning the mushrooms species by species. This is not terribly difficult, but has been difficult to establish with the public.

Mushroom poisoning is actually rather complex. The toxins are distinguished by chromatographic separation and have been placed in 7 groups. Groups I and II contain cyclopeptides (amanitin) and monomethyl hydrazine (gyromitrin) which respectively, cause cellular destruction: liver and kidney damage and death in 50-90% of the persons who eat them. Groups III and IV contain coprine and muscarine which, respectively, affect the autonomic nervous system with mortality rates of about 6-10%. Groups V and VI contain ibotenic acid-muscimol and psilocybin-psilocin and affect mainly the central nervous system

with a mortality rate of about 1%. Group VII mushrooms contain a number of toxins with a variety of gastrointestinal symptoms including irritation and ulceration. There are no established mortality rates known for this last group.

In addition to the chemical complexity of toxins, individual sensitivity and allergic responses must be considered. Some mushrooms such as Armillariella mellea (The Honey Mushroom), and Agaricus bisporus (the Commercial Mushroom) are safe for most persons to eat, but other persons may have an extremely unfavorable gastrointestinal upset from eating the same mushroom. There are other difficulties as well. Some mushrooms such as Lepista nuda (the Blewit) are poisonous when raw but harmless when cooked; some species such as Gyromitra esculenta (the False Morel) are poisonous until parboiled and then thoroughly cooked; other mushrooms such as Amanita virosa are deadly regardless of method of preparation. The quantity of mushrooms consumed is also a factor. Some mushrooms such as the Early Morel (Verpa bohemica) are poisonous only in large quantities; others such as Psilocybe semilanceolata are hallucinogenic in moderate amounts but poisonous in overdoses. Some geographic strains of mushrooms such as Paxillus involutus are poisonous in some geographical areas but harmless in others - probably due to genetically different strains. And, finally, many mushrooms become poisonous only after they are old, decayed, or hit by frost.

The toxicity of some mushrooms probably accounts for the fact that few people eat any wild mushroom other than the Morel or Sponge Mushroom, Morchella esculenta. Actually that is probably a sound approach until and unless one learns to accurately identify some of the other edibles. Just as there are only a few deadly poisonous mushrooms, so there are relatively few choice mushrooms, and these can be learned with the use of a good mushroom manual, or even better with the assistance of a person knowledgeable about wild mushrooms. There are some guidelines which can help you avoid problems with mushrooms and these represent the collective wisdom of mycologists who have worked extensively in this area.

1. When gathering mushrooms examine each specimen and avoid mixing specimens which look alike but are actually different.
2. Avoid mixing different species in the same collecting basket. We recommend wrapping each collection in wax paper which also keeps the mushrooms fresher as well as avoiding contamination.
3. Be certain of your identification of a mushroom before you eat it or serve it to others. Guessing is dangerous.
4. Take a spore print of any mushroom you plan to eat.
5. Never eat wild mushrooms raw.
6. Eat only fresh or well refrigerated mushrooms. Spoiled mushrooms account for about one-fifth of the mushroom poisonings.
7. Eat only a small amount of any mushroom which you are trying for the first time - reactions differ in different individuals.
8. Avoid consumption of alcohol while eating mushrooms. Several species have toxins which are released with alcohol extraction.
9. Don't force mushrooms on other persons. The fear alone may cause illness.

10. Avoid mushrooms growing in lawns, golf courses, etc., where pesticides may have been used. Many mushrooms concentrate these toxic substances and could poison you.
11. Learn a few species of mushrooms which you can accurately recognize. Then exercise your creativity in cooking these instead of experimenting on new or doubtful species.

Much of what we've said above sounds rather ominous, and it is wise to be cautious in eating of mushrooms. However, there are some excellent edible mushrooms in the Midwest, and with the usual precautions for individual reactions, the following species can be highly recommended for your trial.

1. Agaricus campestris - found in lawns and pastures, mostly in summer and fall following heavy rains.
2. Boletus edulis - found in hardwood forests from mid to late summer.
3. Cantharellus cibarius - hardwood or coniferous forests, from mid-summer to late autumn.
4. Calvatia cyathiformis - in grassy areas or woods, mid-summer through autumn.
5. Calvatia gigantea - in wooded areas in the autumn.
6. Coprinus atramentarius - near rotting wood, but in soil, mid to late summer
7. Coprinus comatus - in lawns or roadsides, spring and fall.
8. Dentinum repandum - in wooded areas, mid-summer through fall.
9. Hericiium coralloides - on dead wood, late summer.
10. Lactarius deliciosus - in coniferous woods, summer and fall.
11. Lepiota procera - in brush, lawns or near leaf piles, late summer and fall.
12. Laetiporus sulphureus - on hardwood stumps or trees, summer and fall.
13. Morchella esculenta - in woods, thickets, or grassy areas in spring.
14. Pleurotus ostreatus - on dead or dying wood, spring and fall.
15. Rozites caperata - in mixed woods or conifers, late summer and fall.

If you don't recognize some of the above edibles, you might want to try looking for

them in the following books:

Groves, J. Walton. 1962. Edible and Poisonous Mushrooms of Canada. Ottawa: Canada Dept. of Agriculture

Miller, Orson K., Jr. 1979. Mushrooms of North America. Third revised softback edition. Dutton: New York.

Smith, Alexander H. 1963. The Mushroom Hunter's Field Guide, revised and enlarged. Univ. of Mich. Press: Ann Arbor.

With one of the above, a nice spring or late summer day, and a handy wooded area early you can join the growing number of persons who hunt for mushrooms as a source of interesting culinary diversion. In the meantime, you may learn some biology and have some fun.

EDITOR'S NOTE: Norman Jensen, Past President of the **AMCBT**, shares with us his thoughts about the **AMCBT**. Thank you Norman for sharing your thoughts with the membership and for serving as President of the organization.

THE PAST, THE PRESENT AND THE FUTURE

by

Norman Jensen, Past-President **AMCBT**

Having had some time to reflect on the meetings at Central College in October, I feel that they went well. I know of no major problems that arose. Janice Kemp did a superb job with local arrangements and added a touch of "class" by planning our banquet at the Straw-Town Inn. Neil Baird, in the meantime, had arranged a fine program after going through some uncertainties in the late summer. Attendance at the meeting was up slightly from the previous year in spite of the great uncertainty in faculty travel funds. I know of several people who were attending the meetings after an absence of several years and liked what they saw and heard.

It is interesting to see how the use of computers is having a major impact on biology and the way it is being taught in the classrooms and laboratories. At Central College, one of the principle addresses, a couple of the main sessions and some of the concurrent sessions dealt with the use of computers in biology. It's an interesting phenomenon and for many of us it means some retraining is necessary in order to deal with the students who are entering colleges with the desire and expectation of using computers in their education.

"What is **AMCBT**?" is a question often asked by people who are considering it as a professional organization.

AMCBT is a unique organization in that it is regional in its geography. Because most national meetings are held at more "exotic" locations and travel and lodging costs become almost prohibitively expensive, **AMCBT** offers to the biologists of the midwest the opportunity to attend an annual meeting close by. These annual meetings are diversified and provide something for everyone. Drs. Don Scoby, Jim Holler, and Harold Hansen are putting together the program for the 1983 meeting at St. Olaf College and their enthusiasm about the meeting should make it a "must" on your calendars.

I'd like to take this opportunity to thank Dr. Nancy Walker of Rockhurst College for the years of frustration and hard work that she put in while serving as Editor of the Midwest Bioscene. Because of her responsibilities at Rockhurst, she submitted her

resignation prior to the meetings at Central College.

Along this same line of thought, I would like to thank Dr. Bill Doemel of Wabash College who has agreed to edit the Midwest Bioscene. It is an important part of AMCBT and I hope that all members and anyone who would like to contribute articles or papers will provide Bill with the material that he needs to publish a desirable paper.

(EDITOR'S NOTE: At Wabash College, every Freshman is required to take a **Freshman Tutorial** in the fall or spring semester. These tutorials are designed to insure the first year student's participation in small group discussions that will challenge him intellectually and suggest the kind and quality of experience characteristic of the liberal arts. Instructors select topics of critical importance to them and ones they judge to be pertinent to student concerns. The student need not have had previous experience in the particular field in order to participate -- and his participation is important. Limited to fourteen members, each tutorial encourages students to practice both written and oral self-expression, in some cases using media such as videotape, photography and music. Reading and writing assignments will, of course, vary with individual topics and instructors, but the goals of every tutorial remain the same: to read texts with sensitivity, to think with clarity, and to express one's thoughts with conviction and persuasion -- all in terms of each tutorial's particular subject. Below are descriptions of two of these tutorials that were offered by scientists.

A COURSE IN SCIENTIFIC CREATIONISM AND EVOLUTION

by

David Krohne (Assistant Professor, Biology, Wabash College)

This spring I offered a seminar on Scientific Creationism and Evolution as part of Wabash College's freshman tutorial program. Freshman tutorials are designed to provide freshman with an experience more like that found in upper level courses. Rather than an introductory lecture course, the tutorial focuses on small group discussion and writing.

Obviously, the subject of creationism and evolution is far too large to be covered in a single course. One could concentrate on a host of topics including philosophy of science, legal questions, historical aspects of the debate, public policy, scientific questions, etc. I chose to consider the scientific basis of creationism in comparison with evolution. In doing this, we concentrated on two main texts: Darwinism Defended by Michael Ruse and Scientific Creationism by Henry Morris. Most of the students had not had more than high school biology. The class consisted of both ardent creationists and evolutionists.

Early on in the course we attempted to identify, through reading and discussion, the major features of the scientific method and a set of criteria with which we could identify "good" science. We then focused on the theory of evolution, using Ruse as a text, and considered the evidential basis for it. With this background in basic evolution, we proceeded to a consideration of Morris' objections to evolutionary theory and his argument that creationism can have a sound scientific basis. One of our primary goals was to learn to distinguish between a good and poor scientific argument.

I believe that the exercise was a success in that all students came away with a better understanding of the theory of evolution, regardless of their position in the debate. Second, many are better able to identify a weak argument. Those with strong fundamental religious or evolutionary bias did not change their views but still came away with an

ability to discuss the problem intelligently.

Nevertheless, my feeling at this point is that I would not do this particular exercise again. The reason is that the book Scientific Creationism is so poorly written and argued that it does not deserve serious consideration in a college course. Let me be clear about what I am not saying. I do not mean to say that scientific creationism cannot be legitimate intellectual exercise- it perhaps can. I am not saying that evolution and religion must oppose each other- perhaps they may be reconciled. I am not saying that religion must be scientific to be valid. I am simply saying that Morris' book, as the best exposition of the scientific creationist view, is so grossly incorrect, unfair and in some cases downright dishonest that it does not deserve dignification with serious academic discussion.

SCIENCE AND PSEUDOSCIENCE

by

Robert Henry (Chairperson, Physics Department, Wabash College)

In this freshman tutorial the students studied the criteria by which scientists determine which phenomena and theories should be classed as science and which as pseudoscience. They discussed and wrote papers about the application of these criteria to such phenomena as dowsing (water-witching), biorhythms, astrology, extra-sensory perception, acupuncture, and the use of animals in predicting earthquakes. The class also looked at historical examples of the rejection of genuine break-throughs, such as continental drift.

The texts used were The Psychology of the Psychic by Marks and Kammann and Theory of Science by Gale.

The objectives of the course were to sharpen up the students' critical faculties with respect to pseudoscience and to provide some interesting topics for their papers. Both objectives seem to have been achieved.

Much help in structuring the course was provided by Dr. Donald E. Simanek, Professor of Physics at Lock Haven College (PA), who has taught courses on pseudoscience for several years.

VIDEOTAPES FOR COMPARATIVE VERTEBRATE ANATOMY: HEART ANND ARTERIES OF THE DOGFISH SHARK

by

Frances A. Rogers (Associate Professor of Biology, Drake University)

The viedotapes dealing with the circulatory system of the dogfish shark have been developed for use in Comparative Vertebrate Anatomy classes at Drake University. The original impetus for producing these tapes was the desirability of presenting visual instruction involving the use of small specimens to an entire laboratory section at one time. Satellite benefits of equal importance were the opportunity to present theoretical considerations in conjunction with laboratory dissections and to provide valuable "hands on" experience to students who participated in the production of he tapes.

The first videotape which was produced was "Circulation Through the Heart and Gills of the Dogfish Shark." Similarities between the heart of the adult shark and embryos of all vertebrate groups were stressed. Certain structures of the gills, such as cross trunks and

components of collecting loops were particularly well demonstrated. Sequence of blood flow through these structures was emphasized. Important terminology was clarified and reinforced by the use of diagrams and accompanying narrative.

The second videotape was "Aortic Arches and Systemic Arteries of the Dogfish Shark." The six arches of the hypothetical ancestral vertebrate were described in relation to their modifications as seen in laboratory dissections of the shark. The basic vertebrate pattern of dorsal and ventral aortae and major branches of the descending aorta was described. Emphasis was placed upon the primitive circulatory system of the shark which reflects embryonic patterns common to all vertebrates.

The videotapes proved to have several major advantages over conventional methods of laboratory instruction. Time was used efficiently for both the instructor and the students in as much as repetition of demonstrations was not needed. Colors and shapes were presented (by the tapes) as they would later appear in the laboratory exercise. Evolutionary concepts and vocabulary became more meaningful when presented in conjunction with the examination of an actual specimen. Increased comprehension of information was demonstrated by improved performance in dissections and quizzes as compared to previous classes. The videotapes were enthusiastically received by the students. Future plans include additional tapes on shark anatomy, a comparative study of vertebrate brains, and programs designed to facilitate accurate dissections of the cat.

MITOSIS AND MEIOSIS FOR THE APPLE II+ COMPUTER

By

Clyde L. Dawson (Senior Biology Major, Wabash College)

This genetics program was developed for use in an introductory biology laboratory at Wabash College to teach the processes of mitosis and meiosis. The program is designed to be run on an **Apple** micro-computer as a graphic learning tool to depict accurately, yet simplistically the processes of mitosis and meiosis. It was designed for use in the laboratory but, it would obviously work in a classroom setting as well.

The program is self loading, when the terminal is turned on, if the diskette is in the primary drive then the program will load and the menu will be displayed. The menu has two options either to run the mitosis program or the meiosis program and then the next option is to choose whether the program is to be run with or without text. To make the program easy to use there are numerous stops, when running in text mode to allow the student the ability to read all of the information.

This program should run on any **Apple** which has 32K of memory or more but the program was developed in three parts: the main menu, mitosis, and meiosis to simplify adapting the program to most any Apple micro-computer. The menu program is the essential element in the set, for it controls the running and loading of the two other programs and the binary shape table. If you are planning to type in the program from the listing then rather than saving the menu copy the disk should be initialized with the menu program in memory. The menu also loads the shape address. The only changes which would need to be made to adapt this to any **Apple** micro-computer should be able to be made in the menu program, which is very short and easy to follow. Lines 43 and 44 using poke commands set the starting address for the shape table and line 40 loads the address in that position.

The program offered for purchase on the diskette has no internal copy protection so that the purchaser may make backup copies, but it is designed to disable the reset key on

Apple II microcomputers and the DOS commands have been changed so that students cannot tamper with the diskette with out having another diskette from which the DOS system may be loaded. Copying directions are given in the literature accompanying the purchased diskette.

The diskette based program can be obtained for \$10.00 plus \$3.50 for packaging, postage and insurance; from:

Clyde Dawson
R# 3, Box# 355
Muncie, IN 47933.

Part I - The Menu Program:

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10 REM CELL DIVISION MENU BY CLYDE L DAWSON II.
11 REM PROGRAMS FOR GENERAL BIOLOGY
12 REM CREATED 11-FEB-83
13 REM
15 REM COPYRIGHT (C) 1983, BY CLYDE L DAWSON. ALL RIGHTS RESERVED.
16 REM REPRODUCTION BY ANY MEANS FOR SALE OR DISTRIBUTION IS
17 REM STRICTLY FORBIDDEN WITHOUT PRIOR CONSENT OF THE AUTHOR. (C)
18 REM DOS (R) COMMANDS HAVE BEEN CHANGED TO COPY THIS DISKETTE FOLLOW
19 REM DIRECTIONS IN DOCUMENTATION.
30 HOME
40 PRINT CHR$(4);"BLOAD BIOSHAPES, A$6080"
43 POKE 232,128 REM SHAPE TABLE ADDRESS
44 POKE 233,96 REM SHAPE TABLE ADDRESS BIT TWO
45 POKE 231,2
46 POKE 230,32
50 HOME
51 PRINT "GENETICS MENU": PRINT
52 PRINT " THE FOLLOWING OPTIONS ARE AVAILABLE"
53 PRINT
54 PRINT "1). GRAPHIC MITOSIS"
55 PRINT "2). GRAPHIC MEIOSIS"
57 PRINT :D$ = CHR$(4): REM ^D
58 PRINT "OPTION?";: GET A$: PRINT A$
60 IF A$ = "1" THEN PRINT D$;"RUN MITOSIS"
61 IF A$ = "2" THEN PRINT D$;"RUN MEIOSIS"
63 PRINT "<^G>ERROR": HTAB (1): VTAB (8): GOTO 58 REM <^G> IS A CONTROL G
65 END

```

Part 2: Mitosis

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10 REM MITOSIS -- PROGRAM FOR BIOLOGY INSTRUCTION.
15 REM COPYRIGHT (C) 1983, BY CLYDE L DAWSON. ALL RIGHTS RESERVED.
16 REM REPRODUCTION BY ANY MEANS FOR SALE OR DISTRIBUTION IS
17 REM STRICTLY FORBIDDEN WITHOUT PRIOR CONSENT OF THE AUTHOR. (C)
18 REM DOS (R) COMMANDS HAVE BEEN CHANGED TO COPY THIS DISKETTE FOLLOW
19 REM DIRECTIONS IN DOCUMENTATION.
110 REM
1000 TEXT : HOME
1020 PRINT "THIS SUB-ROUTINE IS DESIGNED TO"
1040 PRINT "ILLUSTRATE HOW CELL'S REPLICATE"
1060 PRINT "THEIR CHROMOSOMES AND PASS COPIES"
1080 PRINT "ON TO THEIR DAUGHTER CELLS"
1090 PRINT
1092 PRINT "TO DISPLAY TEXT TYPE 1";: GET T$: PRINT T$

```

```

1300 VTAB (10)
1320 INVERSE
1340 PRINT "PRESS ANY KEY TO CONTINUE";
1360 NORMAL
1380 GET A$
1390 X=100: Y=100
1400 HGR : ROT= 1: COLOR= 3
1410 SCALE= 4: DRAW 1 AT X,Y - 40: SCALE= 1: DRAW 1 AT X,Y - 10
1420 HOME : VTAB (21):
1422 IF T$="1" THEN PRINT "THIS IS THE CELL AND THE NUCLEUS IS IN"
1424 IF T$="1" THEN PRINT "THE CENTER.  PRESS ANY KEY": GET A$: PRINT A$
1430 C$ = "PRESS ANY KEY TO CONTINUE"
1440 HOME : VTAB (21): INVERSE : PRINT "EARLY PROPHASE": NORMAL
1442 IF T$="1" THEN PRINT "THE NUCLEAR MEMBRANE WILL DISOLVE NEXT."
1444 IF T$="1" THEN PRINT C$: GET A$: PRINT A$
1460 XDRAW 1 AT X,Y - 10
1500 SCALE= 2: DRAW 2 AT 10,10: DRAW 2 AT 14,10: HOME : VTAB (21)
1510 IF T$="1" THEN PRINT "IN THE UPPER LEFT IS A CHROMSOME."
1512 IF T$="1" THEN PRINT C$;: GET A$
1520 HCOLOR= 0: DRAW 2 AT 10,10: DRAW 2 AT 14,10: HCOLOR= 3:
1522 DRAW 2 AT X - 20,Y - 20: DRAW 2 AT X - 24,Y - 20
1530 DRAW 4 AT X - 34,Y: DRAW 4 AT X + 26,Y
1540 HOME : VTAB (21)
1542 IF T$="1" THEN PRINT "THE CHROMOSOME IS NOW IN THE CYTOPLASM"
1544 IF T$="1" THEN PRINT "THE SECOND CHROMOSOME IS IN THE LEFT "
1546 IF T$="1" THEN PRINT "CORNER OF THE SCREEN.  PRESS ANY KEY "
1550 DRAW 3 AT 10,10: DRAW 3 AT 14,10: VTAB (24)
1552 IF T$="1" THEN GET A$
1560 HOME : VTAB (21): INVERSE : PRINT "PROPHASE";: NORMAL
1562 IF T$="1" THEN PRINT " THE SECOND CHROMOSOME"
1564 IF T$="1" THEN PRINT "IS INSIDE THE CELL."
1566 HCOLOR= 0: DRAW 3 AT 10,10: DRAW 3 AT 14,10: HCOLOR= 3
1568 DRAW 3 AT X + 22,Y + 10: DRAW 3 AT X + 18,Y + 10: VTAB (22)
1570 IF T$="1" THEN VTAB (23): PRINT "MIGRATION BEGINS WHEN A KEY IS PRESSED";
1572 IF T$="1" THEN GET A$
1580 DRAW 2 AT X - 28,Y - 20: DRAW 3 AT X + 26,Y + 10
1590 FOR I = 0 TO 5
1600 DRAW 2 AT X - 20 + 4 * I,Y - 20: DRAW 3 AT X + 18 - 4 * I,Y + 10
1610 HCOLOR= 0
1620 DRAW 2 AT X - 28 + 4 * I,Y - 20: DRAW 3 AT X + 26 - 4 * I,Y + 10: HCOLOR=3
1700 NEXT I
2000 HGR
2020 SCALE= 4
2030 ROT= 1
2040 COLOR= 3
2100 DRAW 1 AT X,Y - 40
2200 SCALE= 2
2300 DRAW 2 AT X - 4,Y - 20
2310 DRAW 2 AT X,Y - 20
2340 DRAW 3 AT X - 2,Y + 10
2350 DRAW 3 AT X - 6,Y + 10
2400 DRAW 4 AT X - 34,Y
2450 DRAW 4 AT X + 26,Y: HOME
2460 VTAB (21): INVERSE : PRINT "EARLY METAPHASE": NORMAL

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2462 IF T$="1" THEN PRINT "THE CHROMOSOMES ARE LINED UP ALONG THE"
2464 IF T$="1" THEN PRINT "CELL PLATE.  "
2470 IF T$="1" THEN PRINT C$;: GET A$: PRINT A$: HOME
2500 VTAB (21): INVERSE : PRINT "LATE METAPHASE": NORMAL
2510 IF T$="1" THEN PRINT "THE SPINDLE FIBERS ARE FORMING NOW."
2600 FOR I = 1 TO 30
2610 HPLOT X - 34 + I,Y
2620 HPLOT X - 34 + I,Y + (.5 * I)
2630 HPLOT X - 34 + I,Y - (.5 * I)
2640 HPLOT X + 26 - I,Y
2650 HPLOT X + 26 - I,Y + (.5 * I)
2660 HPLOT X + 26 - I,Y - (.5 * I)
2670 NEXT I
2700 IF T$="1" THEN INVERSE : PRINT C$;: NORMAL : GET A$: PRINT A$
2710 HOME : VTAB (21): INVERSE : PRINT "ANAPHASE": NORMAL
2720 IF T$="1" THEN PRINT "THE CHROMOSOME PAIRS WILL PULL APART  "
2722 IF T$="1" THEN PRINT "LEAVING IDENTICAL CELLS"
2790 HTAB (1)
3000 FOR I = 1 TO 30
3010 HPLOT X - 4 - I,Y - 15 + (.5 * I): HPLOT X - 4 - I,Y - 15 + (.5 * I)
3020 IF (((I / 2) - INT (I / 2)) = 0) THEN HCOLOR= 0
3022 DRAW 2 AT X - 2 - I,Y - 20: DRAW 2 AT X - 4 + I,Y - 20
3024 DRAW 3 AT X - 4 - I,Y + 10: DRAW 3 AT X - 8 + I,Y + 10
3030 IF (((I / 2) - INT (I / 2)) = 0) THEN HCOLOR= 3:
3032 DRAW 2 AT X - 4 - I,Y - 20: DRAW 2 AT X - 2 + I,Y - 20
3034 DRAW 3 AT X - 6 - I,Y + 10: DRAW 3 AT X - 4 + I,Y + 10
3040 HCOLOR= 0
3060 HPLOT X - 1 - I,Y: HPLOT X - 2 + I,Y
3080 HPLOT X - 4 + I,(Y - 15) + (.5 * I): HPLOT X - 4 + I,(Y + 15) - (.5 * I)
3100 HPLOT X - 4 - I,Y - 15 + (.5 * I): HPLOT X - 4 - I,Y + 15 - (.5 * I)
3110 NEXT I
3120 IF T$="1" THEN PRINT C$;: GET A$: PRINT A$
3130 HOME : VTAB (21): INVERSE : PRINT "TELOPHASE": NORMAL
3132 IF T$="1" THEN PRINT "THE CELL WALL WILL FORM LEADING TO CY-"
3134 IF T$="1" THEN PRINT "TOKINESIS. ";: PRINT C$;: GET A$: PRINT A$
3140 HCOLOR= 3
3150 FOR I = 1 TO 42
3160 HPLOT X,Y - 40 + I: HPLOT X,Y + 44 - I
3170 NEXT I
3180 HOME : VTAB (21): INVERSE : PRINT "CYTOKINESIS";: NORMAL
3182 IF T$="1" THEN PRINT " IS TAKING PLACE AND NOW"
3184 PRINT " THERE ARE TWO IDENTICAL DIPLOID CELLS": PRINT C$;: GET A$
3190 IF T$="1" THEN PRINT "IN THE MIDDLE OF THE CELL, AND THE TWO "
3200 IF T$="1" THEN PRINT "NEW CELLS PULL APART.          "
3300 HGR
3310 SCALE= 2
3330 DRAW 1 AT X - 20,Y - 20: DRAW 1 AT X + 20,Y - 20
3340 SCALE= 1: DRAW 2 AT X - 20,Y - 10: DRAW 2 AT X + 20,Y - 10
3350 DRAW 3 AT X - 20,Y + 5: DRAW 3 AT X + 20,Y + 5
3550 HOME : VTAB (21): INVERSE : PRINT C$: NORMAL : GET A$: PRINT A$
4970 TEXT : HOME
4980 HCOLOR= 3
6000 PRINT CHR$(4);"RUN MENUE"
9990 END

```

Part 3: Meiosis

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100 REM MEIOSIS -- WRITEN BY CLYDE L DAWSON II -- 6-APRIL-1983
200 REM THIS PROGRAM IS COPYWRITTED (C).
300 REM ALL RIGHTS RESERVED. REPRODUCTION BY ANY MEANS IS
400 REM STRICTLY FORBIDDEN. (C) 1983.
500 X = 120:Y = 90
700 HOME
710 PRINT "THIS SUB-ROUTINE IS DESIGNED TO SHOW"
712 PRINT "MEIOTIC DIVISION OF A CELL."
712 PRINT: PRINT "TO DISPLAY TEXT TYPE 1";: GET T$: PRINT T$
720 C$ = "PRESS ANY KEY TO CONTINUE"
730 PRINT : PRINT C$;: GET A$
1000 HGR : ROT= 0: COLOR= 3
1010 SCALE= 6: DRAW 1 AT X,Y - 60: SCALE= 3: DRAW 1 AT X,Y - 30:
1020 HOME : VTAB (21): INVERSE : PRINT "INTERPHASE": NORMAL
1022 IF T$="1" THEN PRINT "DNA IS DUPLICATED DURING THIS PHASE TO"
1024 IF T$="1" THEN PRINT "PREPARE FOR DIVISION.": PRINT C$;: GET A$
1030 SCALE= 2: DRAW 2 AT X - 30,Y - 45: DRAW 2 AT X - 34,Y - 45
1032 DRAW 3 AT X + 20,Y + 35: DRAW 3 AT X + 16,Y + 35
1100 HCOLOR= 3: SCALE= 3: DRAW 1 AT X,Y - 30: HCOLOR= 1: DRAW 1 AT X,Y - 30
1102 HCOLOR= 0: DRAW 1 AT X,Y - 30
1130 HOME : VTAB (21): INVERSE : PRINT "EARLY PROPHASE I": NORMAL
1140 IF T$="1" THEN PRINT "THE CHROMOSOMES WILL FORM A TETRAD"
1142 IF T$="1" THEN PRINT C$;: GET A$
1190 SCALE= 2
1200 FOR I = 0 TO 17
1210 HCOLOR= 0: DRAW 2 AT X - 30,Y + 2 * I - 45:
1212 DRAW 2 AT X - 34,Y + 2 * I - 45: DRAW 3 AT X + 20,Y - 2 * I + 35
1214 DRAW 3 AT X + 16,Y - 2 * I + 35
1220 HCOLOR= 3: DRAW 2 AT X - 30,Y + 2 * I - 43
1222 DRAW 2 AT X - 34,Y + 2 * I - 43: DRAW 3 AT X + 20,Y - 2 * I + 33
1224 DRAW 3 AT X + 16,Y - 2 * I + 33
1250 NEXT I
1270 HCOLOR= 0: DRAW 2 AT X - 30,Y - 09: DRAW 2 AT X - 34,Y - 09
1272 DRAW 3 AT X + 16,Y - 1: DRAW 3 AT X + 20,Y - 1: ROT= 16: HCOLOR= 3
1280 DRAW 2 AT X - 30,Y - 4: DRAW 2 AT X - 30,Y - 8: DRAW 3 AT X + 16,Y + 0
1282 DRAW 3 AT X + 16,Y + 4
1300 FOR I = 0 TO 10 STEP 2
1310 HCOLOR= 3: DRAW 2 AT X + 2 * I - 30,Y - 4: DRAW 2 AT X + 2 * I - 30,Y - 8
1312 DRAW 3 AT X - 2 * I + 16,Y + 4: DRAW 3 AT X - 2 * I + 16,Y
1330 IF I = 10 THEN GOTO 1350
1340 HCOLOR= 0: DRAW 2 AT X + 2 * I - 30,Y - 4: DRAW 2 AT X + 2 * I - 30,Y - 8
1342 DRAW 3 AT X - 2 * I + 16,Y + 4: DRAW 3 AT X - 2 * I + 16,Y
1350 NEXT I: HCOLOR= 3
1400 SCALE= 3: ROT= 4: DRAW 4 AT X - 6,Y - 30: DRAW 4 AT X - 6,Y + 30
1402 SCALE= 2: ROT= 0
1410 HOME : VTAB (21): INVERSE : PRINT "LATE PROPHASE I": NORMAL
1420 IF T$="1" THEN PRINT "THE TETRAD HAS FORMED AND CROSSING"
1422 IF T$="1" THEN PRINT "OVER CAN OCCUR": PRINT C$;: GET A$
1500 P = X - 4: FOR I = 0 TO 28 STEP 4
1520 HPLOT P + .4 * I,Y - 30 + I: HPLOT P - .4 * I,Y - 30 + I:
1522 HPLOT P,Y - 30 + I: HPLOT P + .4 * I,Y + 30 - I:
1524 HPLOT P - .4 * I,Y + 30 - I: HPLOT P,Y + 30 - I

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1550 NEXT I
1560 HOME : VTAB (21): INVERSE : PRINT "METAPHASE I": NORMAL
1570 IF T$="1" THEN PRINT "THE TETRAD ALIGNES ON THE METAPHASE"
1572 IF T$="1" THEN PRINT "PLATE. ";C$;: GET A$
1600 FOR I = 28 TO 0 STEP - 4
1610 ROT= 16: HCOLOR= 0: DRAW 2 AT X - 10,Y - 4: DRAW 2 AT X - 10,Y - 8
1612 DRAW 3 AT X - 4,Y + 4: DRAW 3 AT X - 4,Y
1620 HPLOT P + .4 * I,Y - 30 + I: HPLOT P - .4 * I,Y - 30 + I
1622 HPLOT P,Y - 30 + I: HPLOT P + .4 * I,Y + 30 - I
1624 HPLOT P - .4 * I,Y + 30 - I: HPLOT P,Y + 30 - I
1630 DRAW 2 AT X - 12 - .4 * I,Y - 29 + I: DRAW 3 AT X - 1 + .4 * I,Y + 19 - I
1640 HCOLOR= 3: DRAW 2 AT X - 08 - .4 * I,Y - 37 + (I - 4)
1642 DRAW 3 AT X - 5 + .4 * I,Y + 27 - (I - 4)
1650 IF I = 24 THEN HOME : VTAB (21): INVERSE : PRINT "ANAPHASE I ";
1652 IF I = 24 THEN FLASH : PRINT "REDUCTION DIVISION ": NORMAL
1654 IF I = 24 AND T$="1" THEN PRINT "HOMOLOGUES SEPARATE TO OPPOSITE POLES."
1656 IF T$="1" THEN PRINT C$;: GET A$
1660 NEXT I
2000 ROT= 0: HGR
2100 SCALE= 6: DRAW 1 AT X,Y - 60
2110 SCALE= 1: DRAW 1 AT X,Y - 43: DRAW 1 AT X,Y + 33
2120 ROT= 16
2130 DRAW 2 AT X,Y - 33: DRAW 2 AT X,Y - 37: DRAW 3 AT X,Y + 42
2132 DRAW 3 AT X,Y + 38
2140 HCOLOR= 0: ROT= 16: DRAW 2 AT X,Y - 33: DRAW 2 AT X,Y - 37
2142 DRAW 3 AT X,Y + 42: DRAW 3 AT X,Y + 38: ROT= 0
2150 HOME : VTAB (21): INVERSE : PRINT "TELOPHASE I";: FLASH
2152 PRINT " CYTOKINESIS ": NORMAL
2160 IF T$="1" THEN PRINT "NUCLEAR MEMBRANE REFORMS AND"
2162 IF T$="1" THEN PRINT "CHROMOSOMES DISAGGREATE": PRINT C$;: GET A$
2290 ROT= 16
2310 HCOLOR= 3: FOR I = 1 TO 64: HPLOT X - 66 + I,Y: HPLOT X + 62 - I,Y
2312 NEXT I
2400 HGR : HCOLOR= 3: ROT= 0
2410 SCALE= 1: DRAW 1 AT X,Y - 43: DRAW 1 AT X,Y + 23: ROT= 16
2420 DRAW 2 AT X,Y - 33: DRAW 2 AT X,Y - 37: DRAW 3 AT X,Y + 32
2422 DRAW 3 AT X,Y + 28
2430 ROT= 0: SCALE= 3: DRAW 1 AT X,Y - 63: DRAW 1 AT X,Y + 4
2490 A = X + 20:B = X - 20:
2500 HOME : VTAB (21): INVERSE : PRINT "PROPHASE II": NORMAL
2510 IF T$="1" THEN PRINT "CHROMOSOMES REFORM; NUCLEAR MEMBRANE"
2512 IF T$="1" THEN PRINT "DISINTEGRATES. ";C$;: GET A$
2600 HCOLOR= 0
2610 SCALE= 1: DRAW 1 AT X,Y - 43: DRAW 1 AT X,Y + 23: ROT= 16
2620 HCOLOR= 0: ROT= 16: DRAW 2 AT X,Y - 33: DRAW 2 AT X,Y - 37
2622 DRAW 3 AT X,Y + 32: DRAW 3 AT X,Y + 28: ROT= 0
2630 HCOLOR= 3: DRAW 2 AT X - 2,Y - 35: DRAW 2 AT X + 2,Y - 35
2632 DRAW 3 AT X - 3,Y + 28: DRAW 3 AT X + 2,Y + 28
2700 DRAW 4 AT X - 20,Y - 33: DRAW 4 AT X + 20,Y - 33: DRAW 4 AT X - 20,Y + 32
2702 DRAW 4 AT X + 20,Y + 32
2710 HOME : VTAB (21): INVERSE : PRINT "METAPHASE II": NORMAL
2720 IF T$="1" THEN PRINT "CHROMOSOMES MOVE TO METAPHASE PLATE"
2722 IF T$="1" THEN PRINT "AND SPINDLE FIBERS FORM.": PRINT C$;: GET A$
2800 FOR I = 0 TO 16: HPLOT X - 20 + I,Y - 33: HPLOT X + 20 - I,Y - 33

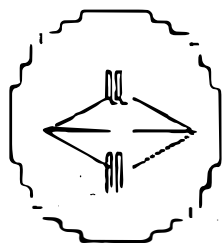
```

```
2802 H PLOT X + 20 - I, Y + 32: H PLOT X - 20 + I, Y + 32
2810 NEXT I
2820 HOME : VTAB (21): INVERSE : PRINT "ANAPHASE II";: FLASH
2822 PRINT " EQUATIONAL DIVISION ": NORMAL
2830 IF T$="1" THEN PRINT "CENTROMERE DIVIDES;CHROMATIDS MOVE"
2832 IF T$="1" THEN PRINT "TO OPPOSITE POLES.": PRINT C$;: GET A$
2900 FOR I = 16 TO 0 STEP - 1
2910 HCOLOR= 0
2920 H PLOT X - 20 + I, Y - 33: H PLOT X + 20 - I, Y - 33: H PLOT X + 20 - I, Y + 32
2922 H PLOT X - 20 + I, Y + 32
2930 DRAW 2 AT X - 18 + I, Y - 35: DRAW 3 AT X - 19 + I, Y + 28
2932 DRAW 2 AT X + 18 - I, Y - 35: DRAW 3 AT X + 18 - I, Y + 28
2940 HCOLOR= 3
2950 DRAW 2 AT X - 19 + I, Y - 35: DRAW 2 AT X + 19 - I, Y - 35
2952 DRAW 3 AT X - 20 + I, Y + 28: DRAW 3 AT X + 19 - I, Y + 28
2990 NEXT I
3000 HOME : VTAB (21): INVERSE : PRINT "TELOPHASE II";: FLASH
3002 PRINT " CYTOKINESIS ": NORMAL
3010 IF T$="1" THEN PRINT "NUCLEAR MEMBRANE FORMS AND"
3012 IF T$="1" THEN PRINT "CHROMOSOMES DISAGGREGATE. FOUR HAPLOID"
3014 IF T$="1" THEN PRINT "CELLS. ";C$;: GET A$
3100 FOR I = 0 TO 32
3110 H PLOT X, Y + I - 63: H PLOT X, Y - I + 65: H PLOT X, Y + I + 5:
3112 H PLOT X, Y - I - 4
3130 NEXT I
3150 HOME : VTAB (21): PRINT C$;: GET A$
3200 HGR
3210 SCALE= 2: DRAW 1 AT X + 20, Y - 40: DRAW 1 AT X - 20, Y - 40
3212 DRAW 1 AT X + 20, Y: DRAW 1 AT X - 20, Y
3220 SCALE= 1: DRAW 1 AT X + 20, Y - 30: DRAW 1 AT X - 20, Y - 30
3222 DRAW 1 AT X + 20, Y + 10: DRAW 1 AT X - 20, Y + 10
6000 HOME : VTAB (21): PRINT C$;: GET A$: PRINT A$: TEXT
9990 PRINT CHR$(4);"RUN MENU"
9999 END
```

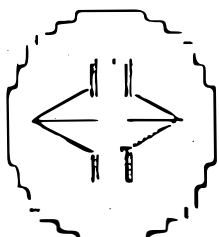
Part 4: Shape Table

6080	-	04	00	0c	00	38	00	42	00
6088	-	4B	00	00	00	2D	35	2D	2E
6090	-	15	15	2E	36	35	36	36	36
6098	-	37	3E	F6	1E	37	3F	3E	3F
60A0	-	3F	3F	3C	27	3F	38	20	27
60A8	-	3C	24	24	24	2C	24	25	0C
60B0	-	0C	25	2D	2C	2D	05	00	36
60B8	-	36	36	36	25	24	24	24	36
60C0	-	00	35	35	36	36	2E	24	24
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60D0	-	00	2E	05	00	00	FF	FF	FF

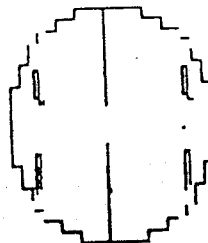
MITOSIS



Late Metaphase

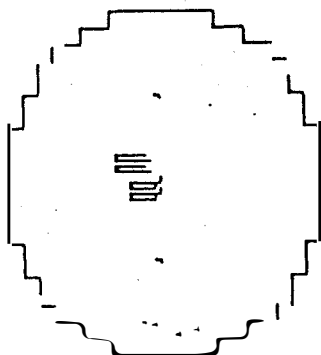


Early Anaphase

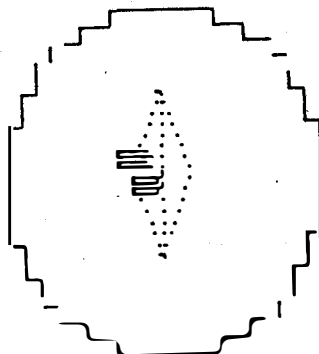


Telophase

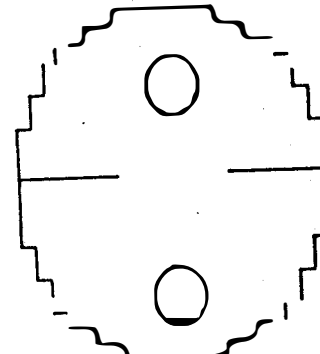
MEIOSIS



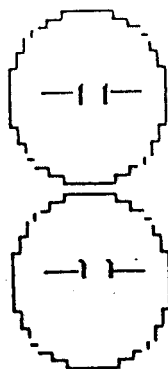
Metaphase I



Anaphase I



Telophase I



Anaphase II



Telophase II

COMMUNICATIONS FROM MEMBERS:

Robert Muckel, Associate Professor of Biology (Doane College, Crete, Nebraska 68333) writes: I am interested in collecting and sharing information from smaller undergraduate institutions on biology curricula. It seems to me that a good way to do this would be by conducting a survey through BIOSCENE and/or through discussions at the annual meeting. If you are interested in such a survey, write to Bob. Perhaps, your comments can frame an interesting discussion at the annual meeting.

POSITIONS AVAILABLE:

Education: Rockhurst College, the Jesuit College in Kansas City, seeks an Assistant Professor in education for August 1983 with Ph.D. or Ed.D. and background in math/science education and teacher education. Teaching experience in elementary or secondary schools required. Candidate should be committed to working in a teacher education program with general education/multi-cultural emphasis. Responsibilities include undergraduate teaching, supervision of student teachers and college service as appropriate. Closing date for application is April 20, 1983. Send curriculum vitae to: Susan Adler, Education Department, Rockhurst College, 5225 Troost Avenue, Kansas City, MO 64110. Rockhurst is an affirmative action, equal opportunity employer.

MEETINGS CALENDAR:**APRIL '83**

21-26 April. Biosynthesis of the Photosynthetic Apparatus: Molecular Biology, Development, and Regulation (1983 UCLA Symposium on Molecular and Cellular Biology). Keystone, Colo. UCLA Symposia, Molecular Biology Institute, University of California, Los Angeles, CA 90024.

MAY '83

1-4 May. ASM Conference on Gene Manipulations in the Exploitation and Study of Fungi. South Bend, Ind. Mildred Schwartznau, ASM, 1913 I St., NW, Washington, DC 20006.

1983 Summer Meetings, Cold Spring Harbor Laboratory. Cold Spring Harbor, N.Y. Gladys Kist, P.O. Box 100, Cold Spring Harbor laboratory, Cold Spring Harbor, NY 11724.

4-8 May. C. elegans.

11-15 May. Microbial Development.

18-22 May. RNA Processing.

25-29 May. RNA-TV.

1-8 June. Symposium on Molecular Neurobiology.

16-21 August. Yeast.

23-28 August. Phage and Bacterial Regulatory Mechanisms.

31 August-4 September. Modern Approaches to Vaccines.

6-11 September. The Transformed Cell.

24-26 May. International Conference on Ecology and Environmental Quality (2nd). Jerusalem, Israel. Hillel I. Shuval, The Hebrew University-Hadassah Medical School, Environmental Health laboratory, P.O. Box 1172, Jerusalem, Israel.

JUNE '83

7-11 June. Wind River Conference on Genetic Exchange (27th). Estes Park, Colo. Donald A. Morrison, Dept. of Biological Sciences, University of Illinois, box 4348, Chicago, IL 60680.

JULY '83

10-14 July. 1983 Meeting of the Society for Virology. East Lansing, Mich. David H.L. Bishop, Dept. of Microbiology, LSCR, 520 11th St. South, University of Alabama, Birmingham, AL 35294.

25-29 July. Gordon Research Conference on Microbial Degradation. Wolfebow, H.H. Greg Zeikus, Dept. of Bacteriology, University of Wisconsin, Madison, WI 53706.

AUGUST '83

7-12 August. Microbial Ecology Symposium (3rd International). East Lansing, Mich. The Kellogg Center for Continuing Education, Michigan State University, East Lansing, MI 48824-1022.

SEPTEMBER, 1983

30 September, 1 October. **AMCBT** Annual Meeting. St. Olaf. Northfield, Minn.

RESOLUTIONS:

AMCBT resolves that in the light of the recognized crises in science education, the **AMCBT** membership requests the reinstatement of the education programs of the National Science Foundation. Programs of particular concern are: Undergraduate Research Participation, Chataqua, C.A.U.S.E., Continuing Education for College Faculty, and Equipment Grants. (The above resolution was passed at the 1982 Annual Meeting of the **AMCBT** and was sent to the following groups or individuals: Editor, American Biology Teacher; Senate Appropriations Committee, Washington; Editor, BioScience; House Appropriations Committee, Washington; Editor, National Association of Biology Teachers.

The **AMCBT** thanks the following individuals for their help in making the 1982 Annual Meeting a success: Professor Larry Mills, Nancy Doemel, Neil Baird (Program Chairperson), Anita Salem, Dr. E.J. Brandt (Monsanto Chemical), Teresa Herren (Park Ranger, U.S. Corps of Engineers), Don Hoffman, Janice Kemp (Local Arrangements Chairperson), Dr. Theodore Crovello (University of Notre Dame), Emmalou Heusinkveld, President Kenneth Weller (Central College), Provost Harold Kolenbrander (Central College), Brenda Delotz, Jim Stroh and other students of the Central College Biology Department.

Now is also a time to urge your colleagues to join the **AMCBT**. We owe a special **THANK YOU** to John Carlock and the Central Office for the brochure which boldly presents the organization to prospective members. If you are planning to attend a local, state or national meeting, write Ed Kos and obtain some brochures to distribute at the meeting.

FUTURE ARTICLES:

The next issue of the **BIOSCENE** will feature the beginning of a series of articles from the Shedd Aquarium, Chicago, Ill.

REMEMBER TO COMPLETE THE ATTACHED FORM AND RETURN IT TO JIM HOLLER NOW!

Association of Midwestern College Biology Teachers
Program Presentation Information

Dear Participant:

The following information will enable us to serve you better at this year's annual meeting. Please supply the necessary information to the program chairman whose address is:

Dr. Jim Holler, Department of Biology, University of Wisconsin-Platteville, Platteville, WI 53818

Application for a Place on 1983 AMCBT Program

Check One: Oral Presentation Poster Session Other

Title of Presentation: _____

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

Name _____ Institution _____

Address _____ Phone _____

Room Requirements

Arm Chairs _____
Lab Tables _____
Chalkboard _____
Podium _____
Darkened _____
Electricity _____
Water _____
Gas _____

Other Requirements

Audio Visual Requirements

2x2 Slide Carousel _____
Movie Projector _____
16mm sound _____
8mm _____
Film Loop _____
8mm _____
Super 8 _____
Kodak _____
Overhead _____
Opaque _____
3¼ x 4¼ slide _____
Recorder _____
Cassette _____
Reel to Reel _____
TV Playback Deck & _____
Monitor _____
Specify type _____
Other _____

