SPECTRUM

THE JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION

"THE CHALLENGES OF CHANGE"

ISTA
CONVENTION
1992
PHEASANT
RUN

SPRING 1993

ILLINOIS SCIENCE TEACHERS ASSOCIATION

SPECTRUM

JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION
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ISTA NEWS

PRESIDENT'S LETTER

Dear ISTA Colleague,

I hope you are having a good new year and that your teaching has been rewarding for you and your students. Let me share a few important developments in our organization with you. In the last *SPECTRUM* I reported that ISTA had received a Science Literacy Grant to continue our work in the area of performance assessment. After much negotiation with representatives of the State Board of Education, President-Elect David Winnett has produced a plan that will greatly enhance the spread of performance assessment in science classrooms throughout the state. David will be meeting with other leaders in this field who have been working to produce science performance assessment instruments at various sites throughout Illinois. They will produce a cohesive set of staff development materials. We will then conduct two trainers' seminars, one in the northern part of the state and one in the southern part. Our goal is to develop a corps of experts who can conduct performance assessment seminars for local schools and school districts. Much of this effort will be tied to the Educational Service Centers. In short, ISTA, with cooperation from the ESCs, is taking the leadership role in making science performance assessment a reality in Illinois.

Recently, the Executive Board of ISTA held its winter meeting at the Collinsville Holiday Inn and Convention Center, the site of the 1993 ISTA Convention. This convention, chaired by Rion Turley and Virginia Bryant, will be held October 1 and 2. The facilities look first rate and there are plenty of hotels, inns and restaurants in the immediate vicinity offering a variety of accommodations to fit the needs of our diverse membership. While workshops, keynote speakers, commercial exhibits and collegial interaction form the backbone of our conventions, each site offers features which take advantage of the uniqueness of the geographic area. At the 1993 convention we will have such features as an evening of dining and dancing on the riverboat "Belle of St. Louis," as well as numerous field trips to science centers, zoos and museums. Another interesting attraction is the Cahokia Mounds, remains from one of the most prominent Native American civilizations in North American. Be sure to mark you calendars now for what promises to be a fantastic convention.

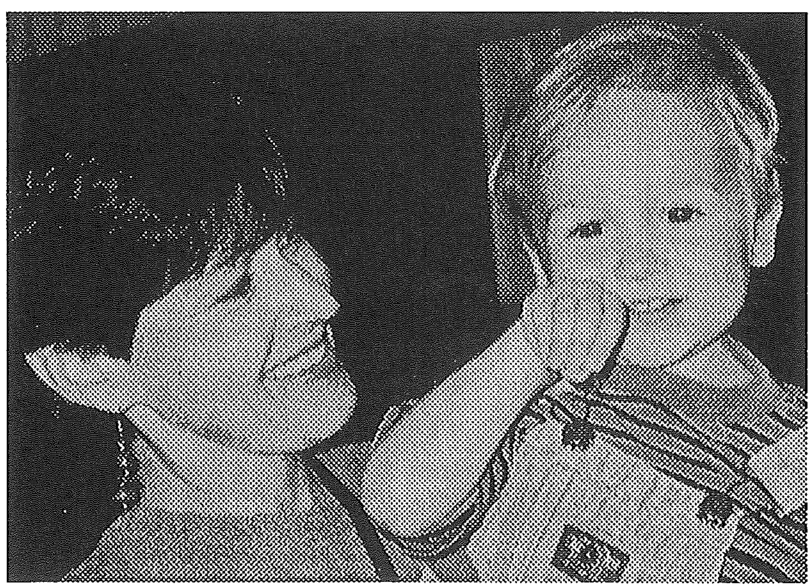
I would like to conclude my report of ISTA business by expressing immense gratitude to Shelly Peretz who has decided not to continue as Convention Registration Chair. Shelly started her chairmanship at the 1986 convention held at the Museum of Science and Industry and has held the position until now. Shelly, a strong advocate of computerization, created a database of convention registries and presenters that makes registration at our conventions easier and more efficient. In addition, she has used her desktop publishing expertise to produce advance programs for our conventions. Shelly's service to ISTA has been a major contributing factor to the success of our conventions and her decision to step down at this time reminds me of how easy it is to take the good work of our volunteers for granted. Thanks, Shelly.

By the time the next issue of *SPECTRUM* is published David Winnett will have started his two-year stint as president of ISTA and I will be assuming the post of past president. I would like to take this opportunity to thank the members of ISTA for the confidence and support they have shown me over the last two years. In addition, I would like to express my appreciation for my wife Eileen's help and for the inspiration and insights that my son Max has provided. Max was born shortly before my two year presidency began and we have enjoyed sharing our feelings about science education in Illinois with you.

Respectfully,

Mark Wagner

Mark Wagner
President, ISTA



Max Wagner (waving good-bye)

1993 Annual Meeting
Illinois Science Teachers Association
October 1 - 2, 1993
Collinsville, IL

Call for Papers

PLEASE COMPLETE A FORM FOR EACH PARTICIPANT (You may duplicate this form).

I wish to be a: ❑ presenter ❑ presider
I can be available for: ❑ Friday's program ❑ Saturday's program ❑ either day

Please print or type:

Name ____________________ Day phone ____________________

Affiliation (School or Organization) ____________________ Home phone ____________________

Address of above organization ____________________ Home address ____________________

City, State, Zip Code ____________________ City, State, Zip Code ____________________

Title of presentation (10 word maximum)____________________

Program description as you wish to appear in the program book (25 word maximum)____________________

Due to limited space, presentations must be limited to 50 minutes.

I. Type of Session
- ❑ hands-on workshop
- ❑ demonstration
- ❑ contributed paper
- ❑ panel
- ❑ other____________________.

II. Intended Audience
- ❑ preschool
- ❑ elementary
- ❑ middle/jr. high
- ❑ high school
- ❑ college
- ❑ supervision
- ❑ general
- ❑ teacher preparation
- ❑ other____________________.

III. Subject Area
- ❑ astronomy
- ❑ biology
- ❑ chemistry
- ❑ earth science
- ❑ physics
- ❑ ecology/environment
- ❑ science/tech/society
- ❑ other____________________.

IV. Equipment Required
- ❑ overhead projector
- ❑ slide projector
- ❑ other____________________

Note: Convention will furnish only overhead, screen, VCR/monitor, and 35mm slide projector. All other equipment, including computers, will be furnished by presenters.

V. How many participants can you accommodate at your session? _____30-50 _____51-80

- Please attach a less than one page abstract of your proposed presentation.
- As a professional, nonprofit organization, the Association is unable to reimburse participants for travel or other conference expenses.
- ALL PARTICIPANTS, INCLUDING PRESENTERS, ARE REQUIRED TO REGISTER FOR THE CONFERENCE.
- This form is not for commercial or non-commercial exhibits. It is only for educators!

Signature ____________________ Date ____________________

Deadline for submitting papers: April 1, 1993

Send to: **Michael Schneider, ESC #16, 500 Wilshire Drive, Belleville, IL 62223**

ISTA 1993 CONVENTION

Collinsville Convention Center and Holiday Inn, IL
October 1-2, 1993

Make plans now to attend the 1993 convention and enjoy an exciting array of convention events, presentations, and the attractions of the greater St. Louis area.

Cahokia Mounds Historic Site & Museum
Gateway Arch
Missouri Botanical Garden
St. Louis Zoo
St. Louis Science Center
The Magic House Children's Museum
National Shrine of Our Lady of the Snows
Anheuser-Busch Brewery
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Monsanto Life Sciences Facility
Cave tours

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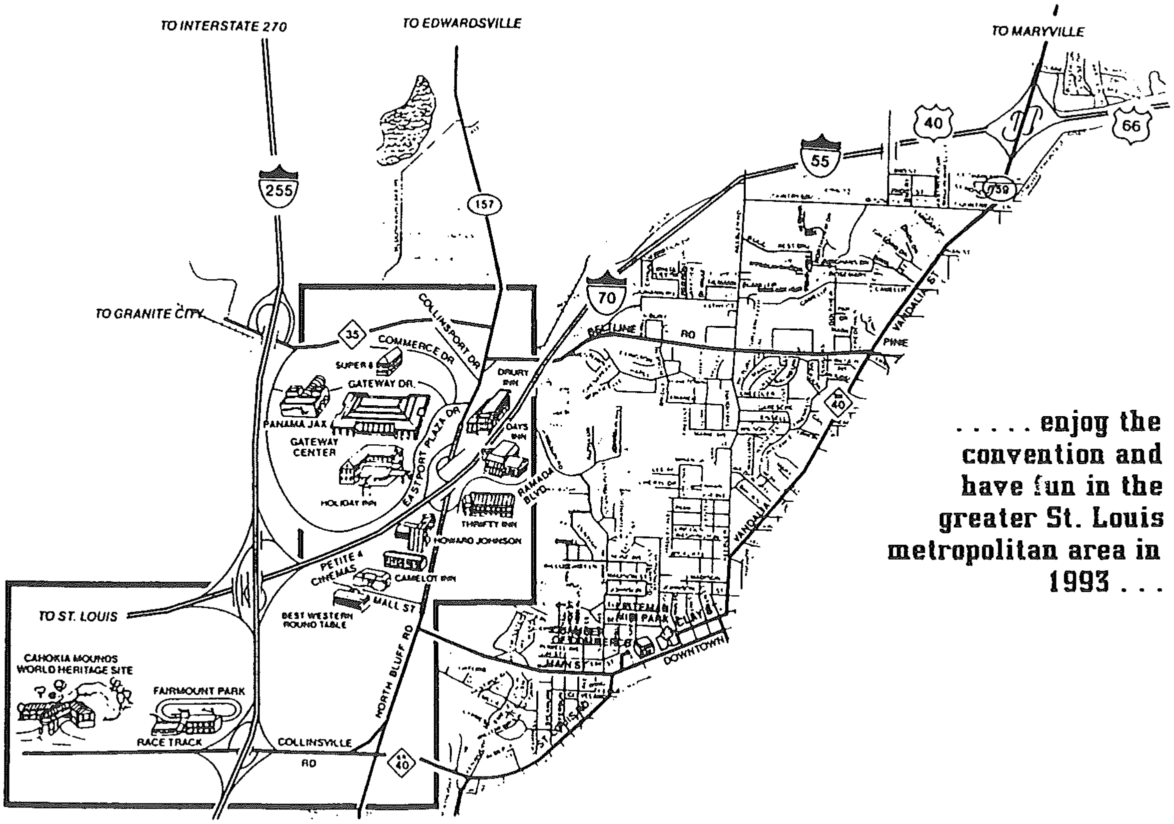
special sessions, workshops, demonstrations and more. . . . .



. . . . . enjoy the convention and have fun in the greater St. Louis metropolitan area in 1993 . . .

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ILLINOIS SCIENCE TEACHERS ASSOCIATION

January 14, 1993

Dear Fellow Science Educators:

On behalf of the Illinois Science Teachers Association, we are pleased to inform you that the FY93 Scientific Literacy Performance Skill Assessment Project has been funded by the Illinois State Board of Education. ISTA will continue development of additional exemplary models of performance and performance based assessment measures.

This year's project will begin the work on grades 7 to 12 instruments to assess Illinois State Goals for Science III and IV. In addition, the project will provide protocols for group assessment and the use of portfolios as a management mechanism in student performance assessment. The dissemination of the assessment products produced by ISTA will be announced by Educational Service Centers at a later date.

On behalf of everyone involved in this project, we look forward to sharing with you an array of outstanding local assessment tools. If you have any questions or comments, contact the project's secretary, Laura Hartwig, Southern Illinois University at Edwardsville, Box 2222, Edwardsville, Illinois 62026, (618) 692-2446.

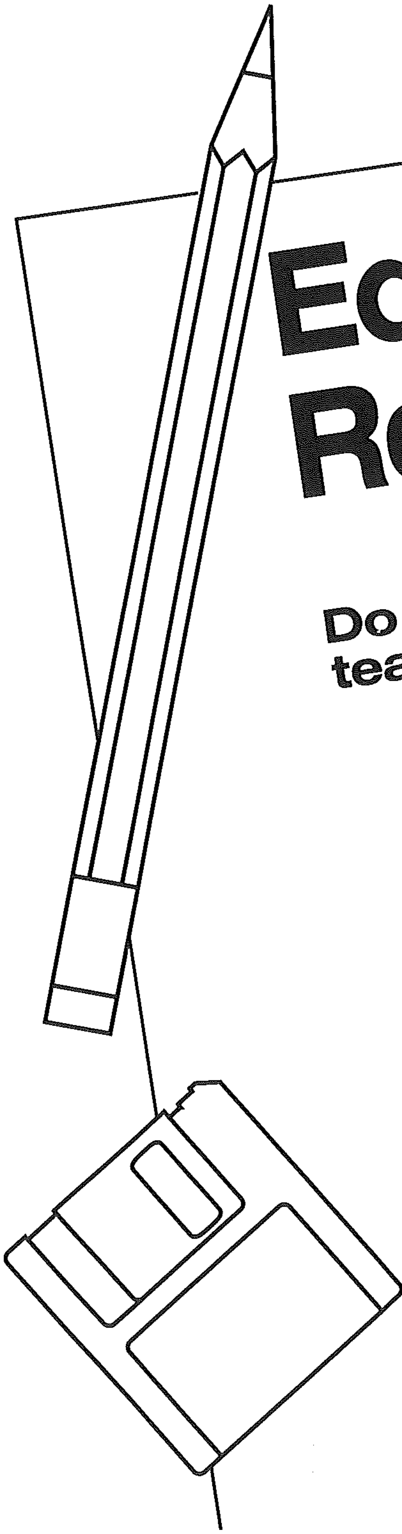
Sincerely,

Mark Wagner

Mark Wagner
President ISTA

David Winnett

David Winnett
President Elect ISTA



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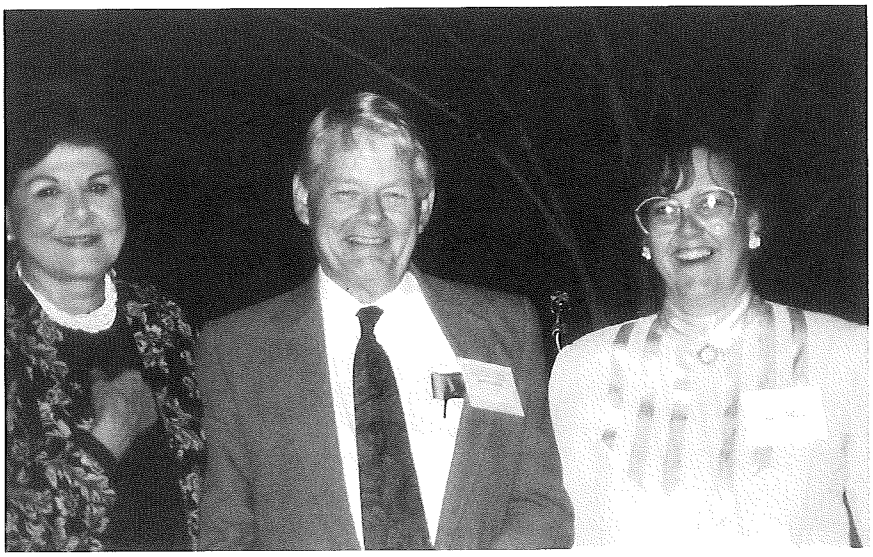
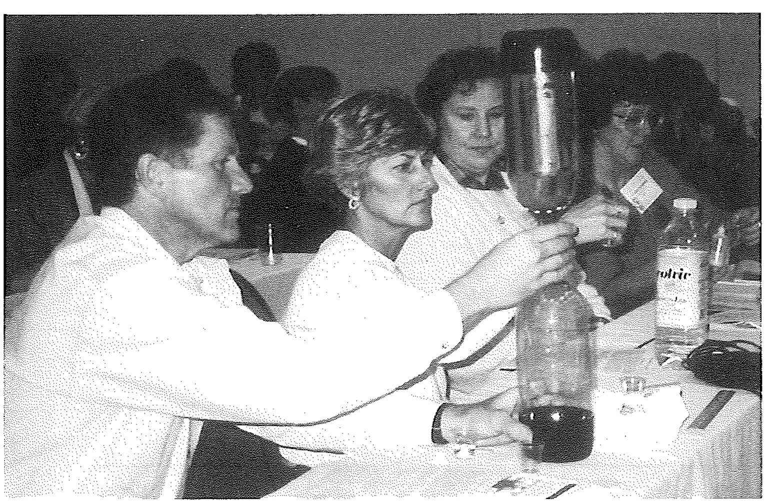
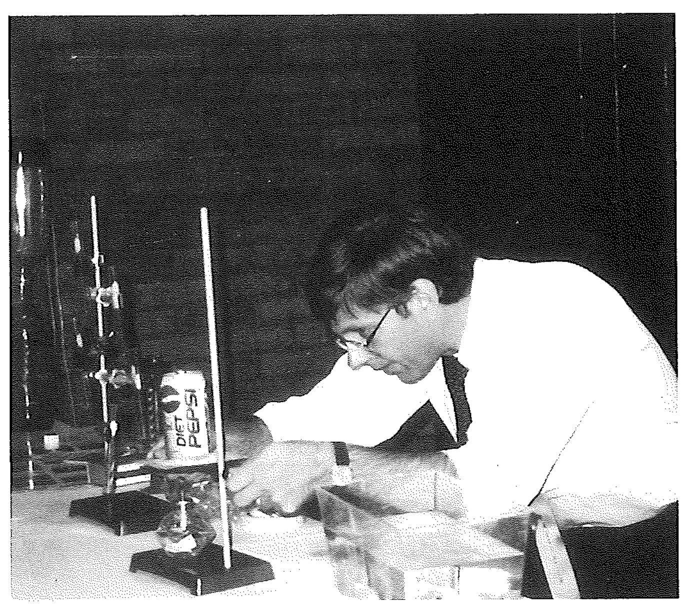
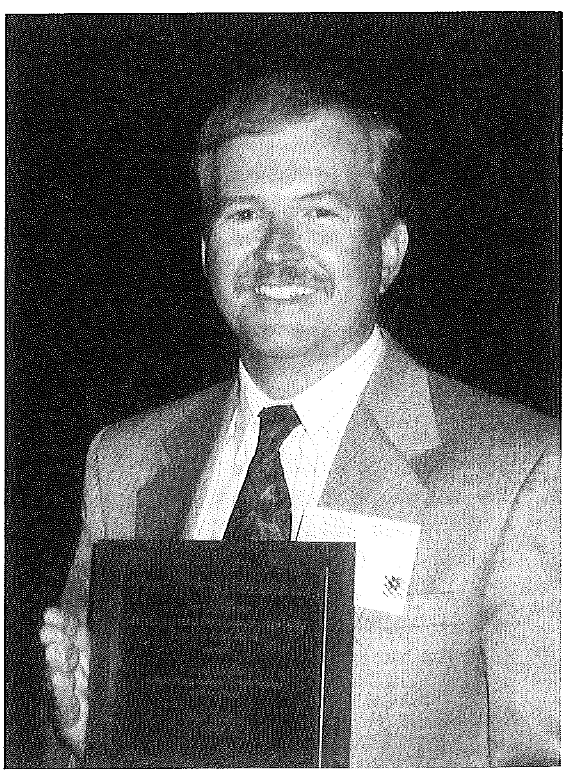


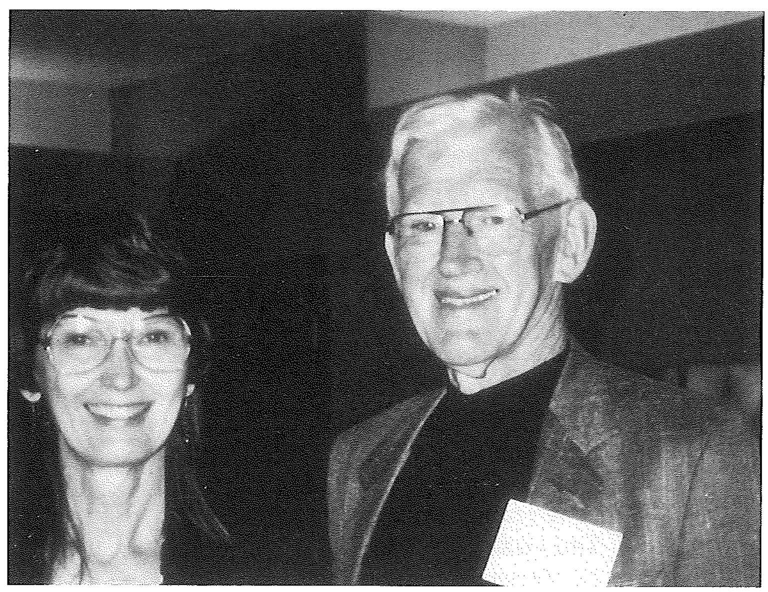
ISTA Convention '92





Photos courtesy of Rosamond Hilton





From *ISTA Convention 1992*

CONGRATULATIONS **to the winners of our Raffle Drawing during the General Session III !**

Jessie B. Rucker, Curie HS
Winner of Weekend Package for Two

Karen E. Abrams, Lemont
Carol M. Altorfer, Peoria
Andrew Apicella, Port Byron
Stephen R. Bonomo
Like Bonomo, Princeville
Tim Brinker, Glen Ellyn
Virginia R. Bryan, Edwardsville
John C. Carleton, Rockton
Kenneth Carlson, Joliet
Lois H. Case, Naperville
Nanette Cassettari, Norridge
Lawrence Cwik, Naperville
Dorothy Dirks, Glendale Heights
Judith Ditkowsky, Chicago
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Illinois Earth Science Teachers Association
Illinois Medical Technology Association
National Association of Biology Teachers

ARTICLES

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LABORATORY SAFETY: A CASE STUDY IN REFLECTIVE THINKING

Turning on the power for any electrical device exposes science teachers and their students to the danger of electrical shock. A myth perpetuated in the world of fantasy (cartoons, movies, and TV) depicts electrically zapped villains being disposed of immediately and neatly. In the real world, electrocution is seldom instantaneous and it is never neat. The average time to die from accidental electrocution is approximately two hours; the brain usually dies last! For example, reflect on an accident scenario in which arcing to a worker's abdomen occurred as he reached over an 8000-volt, 300-watt microwave generator power supply.

Electrical Shock Scenario: The Facts

The path of electricity was along the victim's kidneys and liver out through his feet to earth ground. The victim was knocked down, but thinking himself uninjured he tried to get back to his feet. He did not know he was dying. Witnesses reported that he was coherent and wanted to return to his job. He was even annoyed with fellow workers because they had called the paramedics and had tried to restrain him. Five minutes later he became dizzy and nauseated. Inside of another thirty seconds he was convulsing and vomiting uncontrollably. Then he passed out. After a couple of minutes he regained consciousness, complained that he was having difficulty breathing, then passed out again. At this point the paramedics arrived. Their response time had been less than ten minutes.

Administering CPR the paramedics revived the victim, but after a few seconds he again lost consciousness. Then his heart went into ventricular fibrillation. The paramedics were able to successfully defibrillate, but they were not able to revive him. The victim was taken to the hospital and died two hours later. The duration of electrical shock was less than one second; yet the current through the victim's vital organs was sufficient to do irreversible damage.

According to the coroner's autopsy report, the affected organs were literally cooked by a combination of Watt's Law Heating and the radiation emitted from the unshielded 300-watt microwave power supply. The power supply was unshielded because the victim removed the shielding cage to make it easier to get closer to his work.

Accident Analysis Parameters

During an accident investigation three conditions for corrective action are considered: the equipment, the environment, and the work procedures.

(1) For this accident it was determined that the nature of the equipment had not constituted a hazard until the victim removed the shielding. However, as official corrective action the power supply housing was modified by the company (not the manufacturer) so that tests could be made without removing the shielding cage. Also, an electrical hazard label was affixed to the shielding cage.

(2) The environment was determined to have been safe until the victim (described in the accident report as rather obese) did not give himself room to work. Corrective action included rearranging the floor plan so that workers could walk around behind the equipment to make measurements.

(3) The victim had been on the job for only nine months and was still considered a trainee. Possibly, because he was working alone he was not aware of the policies and work procedures for dealing with hazards. Corrective action included a restatement of the formal directive that employees will not work alone. Furthermore, a retraining program was immediately initiated for all employees in the plant (including clerical and secretarial help).

For excellent reasons, the employer immediately disclosed all circumstances of the accident (except those that were considered respectful of the victim's right to privacy). At no time did the employer suggest that the victim was to blame. If the publicity of an accident is covered up or played down, it can happen again. If the accident is blamed on the victim, then the effects are relegated to chance. In other words, the causes would not be predictable, and nothing would be learned from the experience.

Safety-First Rationale

The notion of Safety-First is based on identifying patterns for matching effects with probable causes. If victims are blamed for accidents, there can be no basis for establishing Safety-First as a concept: the logical corrective action would be to replace the victim. Besides being an act of good faith with workers, it is in compliance with federal law to provide a complete report on the nature of accidents in the workplace. In many public schools such compliances are not required.

What caused the accident? Certainly, the victim caused the accident by committing a series of unsafe acts, but were the hazards within his control? By law, even haphazard individuals must be protected from hazards. The only meaningful way to do this is to deal with the equipment, the environment, and the procedures through a process of education that is based on reflective thinking and before-the-fact problem solving. Consider the following reflections on well-known (but seldom understood) safety maxims.

MAXIM #1: Keep Out of the Circuit!

This is the first rule trainees and students learn. In this accident the victim got into the circuit, but in a rather subtle way. He did not touch or grasp any part of the circuit. He entered the circuit by proximity: arcing occurred across a distance of approximately four centimeters.

To reflect on this, one should think of the human body as an electrical device. Because it has many free electrons the body as a whole possesses potential electrical properties such as resistance, capacitance, and inductance. Most of us are not aware of these properties because our skin (as insulation) has relatively few free electrons. Given the circumstances of this accident, arcing was expected over the 8000-volt, 4-cm separation. This is because under normal conditions of temperature and pressure dry air will consistently arc in an electric field intensity (potential gradient) of 500 volts per centimeter. For some reason the victim did not reflect on this bit of empirical knowledge.

A safe laboratory experiment can be designed to verify the electric potential gradient of air by discharging capacitors at various voltages and distances. Maxim #1 is NOT simple. Because the body has capacitive properties, convincing students to stay out of the circuit involves much more than just telling them to hold one hand behind their backs while making measurements!

MAXIM #2: It's the Current that Kills You!

Another maxim to which students seldom relate: It's the current, not the voltage, that kills you! Certainly our victim committed an unsafe act when he failed to predict worst-case consequences by doing a simple Ohm's Law calculation to determine how much current he was capable of drawing from the power supply. Assume he had an external resistance of approximately one million ohms. (Females have a somewhat lower resistance of three-fourths that of males.) Based on the following calculation the victim would have provided a short-circuit to ground of only eight milliamps of current:

I = V/R = (8000)/(1M) = 8 mA.

The hearts of most human beings will stop if a current of 500 milliamps exists for just a few seconds. Hearts will fibrillate at 200 milliamps, and some individuals with sensitive nervous systems will freeze on a circuit at 100 milliamps. (Nervous system cells are in the fractional-ohm range: such cells have excellent electrical conductivity.)

The victim might have known these statistics, and he might have performed an Ohm's Law calculation. To be reflective thinkers and good problem solvers, students need to consider worst-case as well as best-case consequences. The above calculation was for best case.

Consider and reflect, however, that on the night of the accident it was hot and the victim was wet and salty from perspiration. Under these circumstances the body resistance could drop into the 10K range. Now the calculation becomes

I = V/R = (8000)/(10K) = 800 mA.

This exceeds the lethal range for most people. However, continuing in the problem-solving mode, this could NOT have happened because the power supply was limited to delivering a maximum of 300 watts.

In order for the victim to have drawn 800 milliamps, the power delivered would have been

P = (I*I)*R = (0.8)(0.8)(10K) = 6400 watts
(Impossible!)

Obviously, this was the incorrect calculation for worst case. So, what was the worst-case scenario? Since the power supply was limited to delivering a maximum of 300 watts the correct calculation should have been to use Watt's Law—not Ohm's Law. Use the same formula as above except solve for the unknown current, I.

I = square root of (300)/(10K) = 173 mA.

Had the path to ground been through the victim's heart (which it was not), ventricular fibrillation—not heart stoppage—would have been the worst case. The victim did suffer ventricular fibrillation but it was not a direct consequence of the electrical shock. Though not lethal in itself, the shock led inescapably to death by heart failure brought on by kidney and liver failure.

Student Exercise #1

In a certain home the family keeps a 1500-Watt electric heater in their bathroom. The two-pronged heater cord is not earth grounded. How much ground-fault current might be drawn by a wet female human being standing with both feet on a wet insulating rug as she turns on the heater? Again, use the Watt's Law formula: Current equals the square root of Voltage divided by Resistance. Power equals 1500 watts. Resistance equals 7.5K because wet female resistance is three-fourths that of wet males.

I = square root of (1500)/(7.5K) = 447 mA.

Consider this result in the range of 500 mA. Assuming the potential victim does not use her toes to turn on the heater, the heart path is unavoidable. An electrical shock of just a few milliseconds duration would be lethal.

Insidious Conditions

Returning to the case of the real-world victim, recall that he was working in a radiation environment. Did he not know that radiation intensity falls off under an inverse-square relation? The presence of strong electromagnetic radiation complicates predictions for hazardous environments because the electric potential gradient of air is no longer 500 volts per centimeter. Radiation in air can cause the air to ionize, thereby reducing the potential gradient to as low as 25 volts per centimeter.

MAXIM #3: Keep Your Distance!

Under normal conditions in dry air, a safe distance from a concentration of electric charge is a generous one centimeter for every 500 volts of potential. This is because the dielectric strength (sometimes called the insulation breakdown) of air is about 500 volts for a one-centimeter thickness of air. In the vicinity of 5000 volts, at least 10 centimeters of air will usually insulate a person from electric shock. Other substances (e.g., rubber) with greater dielectric strengths enable people to get closer to high voltages because the distance is compressed.

For example, a substance with a dielectric strength of 50K volts per centimeter might enable a worker to get safely 100 times closer to a test point than in air. On the other hand, if the dielectric strength of the air is degraded for some reason to 50 volts per centimeter, then a safe distance is at least 10 times farther than normal.

Student Exercise #2

At what distance should one expect dry, nonionized air to arc given a charge separation of 10K volts?

Potential Gradient = (Voltage/Distance),

Potential Gradient = (500V)/(1cm) = (10KV)/(Xcm),

or

Distance X = (10KV)*(1cm)/(500V) = 20 cm.

Wearing a metal belt buckle did not help the victim's situation. The Corona Effect explains how charges converge at points of greatest curvature, and one metal belt buckle has many more free electrons than a large group of human beings. According to the coroner, the burns on the victim's abdomen were beneath his belt buckle.

The point of these arguments is that there is much more to electrical safety than just reciting maxims. It is important to try to make the laboratory environment predictable, but at no time is an environment totally predictable. Therefore, the best precaution is to avoid committing unsafe acts. Obviously, the next maxim is NOT a precaution.

MAXIM #4: Get the Power Off!

Get the power off the victim or get the victim off the power! Most safe environments have a GFCI (ground fault circuit interrupter) configured to override all main power supplies. This is seldom the case for school laboratories. Teachers need to know if such safety devices are installed.

A ground fault is a path to earth ground that is not part of the intended circuit, for example, a human being. The GFCI is the best safety device we have. It is highly sensitive and reactive to minute fluctuations in current. The GFCI functions almost instantaneously to turn off the main power at the source.

Implications

Fortunately for students, teachers do lab experiments first to check equipment reliability. In other words, teachers are the buffer between hazards and students; consequently, students very seldom cause accidents. This is not at all true for teachers and instructors. Many teachers (including the author of this article) have been locked on electrical circuits, and for some reason nearly all of them have escaped unscathed. At least, that is what they report. Probably, this is because unlucky victims seldom have horror stories to relate.

Teachers learn about equipment by studying documentation and by experimenting with the unknown. By the time students get to the equipment the teachers, through after-the-fact reflective thinking, have pretty well determined what the hazards might be. Students are thereby forewarned to do reflective thinking before-the-fact. The last maxim is frequently ignored.

MAXIM #5: Don't Tempt Fate!

Sometimes, students or teachers engage in horse-play. For example, students enjoy the bell-ringer experience where they form a chain (circuit) using a hand-cranked induction coil to generate a significant current. If the motive force is intense enough, some students will freeze on the circuit.

As a dare, students enjoy charging up capacitors for others to discharge by touching the capacitor leads to their tongues. The experience is difficult to describe because the effect is different for different people. Often the capacitors are mislabelled.

Old-timers like to show off their knowledge of electricity by standing on a chair and placing a finger in an open lightbulb socket. The assumption is they are not a path to earth ground: The point of this demonstration is totally missed if the chair is made of metal. It is never safe to demonstrate that a complete circuit or path to ground is necessary to be electrocuted.

Teachers sometimes demonstrate the electrical conductivity of various solutions as electrolytes (e.g., distilled and salty water) by inserting a lightbulb connected across electrodes into respective beakers. Occasionally, the teacher ends the demonstration by placing the plugged-in open-circuit device on a usually wet laboratory table. The experiment is just as effective (though not as spectacular) using a 6-volt source instead of the 120-volt main line.

Of course, not all electrical shock victims die. Many are merely maimed, crippled, or in some way partially incapacitated for life.

Thomas O. Jewett
Southern Illinois University at Edwardsville
School of Education
Dept. of Curriculum and Instruction
Building II
Edwardsville, Illinois 62026-1122

"SCIENCE KNOWLEDGE AND ATTITUDES OF PRESERVICE ELEMENTARY TEACHERS"

World's population explodes!
Massive starvation in the third world!
Fuel reserves depleted!
Global warming predicted!
Decertification increases!
20% of all plants and animals face extinction!

These are not titles from grade "B" movie thrillers or the prognostications of the prophets of doom and gloom, but the findings of the government's *The Global 2000 Report to the President: Entering the 21st Century.* Since its publication in 1980, many of these predictions have come to fruition.

Most of these problems, caused by technology and humanity's abuse of that technology, will also need to be solved by science and technology combined with a changing attitude about science and its uses.

Since young children formulate their attitudes at an early age, elementary science education is crucial in developing positive feelings toward science. "The teacher plays the central role in communicating the essence of science to children." (Estes, 1990). Teachers who do not like science, will likely have students who do not like science (Shrigley, 1974).

Therefore, the lack of time spent on science in elementary schools is a major concern. Manning et al. (1981) reported in his survey that 25% of teachers polled spent no time at all teaching science, and the remaining 75% spent less than two hours a week on science.

Rationales given by practitioners are many and varied but seem to fall into four main categories:

1. Lack of teacher content knowledge.
2. Lack of equipment and materials.
3. Lack of instructional time.
4. Teacher attitude toward science.

These four reasons are interrelated but seem to hinge on content knowledge which aids in shaping teacher attitude. (Pedersen, McCurdy, 1992). Poor attitudes toward science stonewall efforts by teachers to overcome material and time constraints.

In view of their preparation, the lack of teacher confidence in instructing science is not surprising. In a 1992 survey I conducted of preservice teachers in their senior year, 119 reported having an average of 2.34 science courses in high school and 2.94 science courses in college. This coursework consisted of 58% life sciences, 21% earth sciences, 13% physical science, and 8% general science.

"Most people teaching elementary school today didn't study physical science in college at all, and they last dealt with basic chemistry and physics when in high school, possibly as long as 30 years ago. In fact, many people who ultimately major in elementary education did not study physical science even in high school, and they are nervous about the subject." (Estes, 1990).

55% of those surveyed felt they did not possess sufficient science content background to teach their future students.

This perception if supported by the fact that when given the sample test of Illinois Goal Assessment Program in science at the 8th grade level, the average score for the survey group was 77%. The scores ranged from a high of 55 correct answers to a low of 31 correct answers, with a medium of 13 incorrect answers on the 60 question exam.

Surprisingly, attitude toward the subject of science was very positive. Nearly 2/3 of the students really liked science and found it interesting. In light of this attitude, it was unexpected that these same students reported not liking their science coursework in high school or college, ranking science classes among the lowest in terms of enjoyment in comparison to their other subjects.

Perhaps this ambivalence can be explained by the fact that 75% of the students had been instructed solely by the lecture/book method. The other 25% received instruction through a combination of techniques including hands-on. Considering that most teachers teach the way they were taught, a rather frightening circle of instruction seems to be self-perpetuating.

How do we break this cycle and alter teacher attitudes toward the instruction of science? Since content knowledge brings about confidence and helps shape attitude, the most apparent solution seems to be for colleges and universities to require more science coursework at the undergraduate level, ensuring this coursework be evenly distributed among the sciences.

Yet, Shrigley (1974) suggests that there is more to developing teachers' attitudes toward instructing science than simply providing them with more science courses. The method in which teachers are instructed seems to be a crucial factor also. Remember that preservice teachers reported a high interest in science but rated their science coursework, (lecture/book instruction) as low and unenjoyable.

Pederson and McCurdy (1992), in a study with preservice teachers, found that attitude was positively affected when a combination of science content instruction and modelled process approach, hands-on pedagogy were utilized in the students' science education methods class. Students developed a science knowledge base while being provided with methodologies other than the standard lecture model. These students were then able to utilize their new found content and teaching techniques in a practicum experience.

It seems that an integration of science coursework with educational methods coursework is a successful way to attack the problem of knowledge base, confidence, and attitude toward teaching science in the elementary classroom. Specially designed science content classes for elementary teaching majors breaks the traditional mold of teacher preparation, and could lead to "turf wars" between departments of science and education.

Perhaps a cooperative, team-taught effort between the two departments is the optimum solution. This collaborative effort should allow students to interact with their environment by actively involving the student in hypothesizing, experimenting, collecting, and analyzing data in life, physical and earth sciences. In view of the frightening realities of the predictions contained in the *President's 2000 Report*, a solution to elementary teacher knowledge base and attitude toward science instruction must be found.

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AN ECOLOGICAL APPROACH TO LANDSCAPING WITH NATIVE PLANTS

Landscaping is an activity most everyone undertakes at one time or another. It is an attempt to repair and beautify our continually disturbed environment. The human race is the greatest "disturber" of all time. Since the dawn of agriculture and animal domestication, humans have plowed up the prairies and cut down the forests. We've overgrazed the pastures and "goated" off the hills. Mining has stripped large areas of the earth's surface. In a word, we have abused the natural environment in the worst possible ways.

Our attempts to repair abused land with plants are often ill-fated. Too often we select plant materials which promote our mental acceptance of this modified environment. Little consideration is given to restoring the site with the native species which once grew there. What we frequently end up with is a very unnatural, stereotyped landscape dominated by one or more species which may not be native to the area or suitable to the growing site. This monocultural, non-native, off-site approach often leads to problems.

For example, consider the frequent use of pin oak, white birch, and silver maple in home landscapes. Pin oak is a rapid-growing bottomland species which prefers moist, acidic soils. Its shallow root system makes transplanting easy. However, iron deficiency can occur when pin oak is planted in soils containing limestone or other alkaline materials (pH > 6.7). Without treatment, this results in yellowing of the foliage, stunted growth and eventually death of the tree.

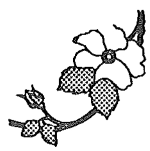
Paper (white) birch is an attractive tree from the northern forest, and is not well adapted to lawn situations. Planting it in grass puts it under stress and increases the likelihood of major insect problems like the bronze birch borer.

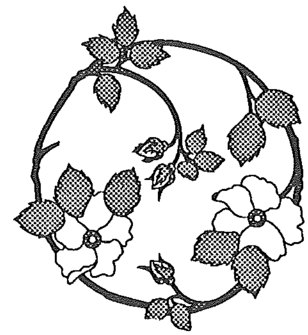
Silver maple is a fast-growing bottomland species whose brittle, soft wood is prone to heavy damage during wind and ice storms.

Let's examine some alternatives for these selections that may have merit for both the environment and ourselves.

Ecological Principles Applied to Landscaping

We can avoid potential problems and achieve more interesting surroundings by applying some simple ecological principles to landscaping. The old adage, *"It's hard to improve on Mother Nature"*, is very applicable to sensible landscaping. What is Mother Nature trying to tell us? We can look to natural plant communities as a guide and discern some basic truths that may be applicable.





Use of Native Plants - The first principle to emphasize is the use of native plants in our surroundings. There is abundant evidence for the problems created by importing non-native plants. When exotic species are introduced, the natural checks and balances are absent, and the alien plants often quickly dominate the native species. European white popular, tree-of-heaven, multiflora rose, crown vetch, various honeysuckles, and the latest scourge, autumn olive are prime examples. Touted as single-plant solutions for erosion control and/or food and cover for wildlife, these overly-aggressive exotics spread out of control at the expense of many native species. If some well-chosen native hardwoods, shrubs, and prairie grasses had been used, the same purposes could have been served without the problems now facing many land-owners' neighbors.

Diversity versus Monoculture - A second important ecological principle to apply in landscaping is the use of a variety of plant species. In nature, species diversity influences succession and the stability of the biotic community. Left to heal on its own, a disturbed site will undergo a slow, deliberate change in plant species. This natural healing process, called *ecological succession*, moves from an unstable plant community with low diversity to a stable climax community with a higher degree of diversity. For example, a bare field, if left alone, will be colonized by a few annual weeds. These will be replaced by perennial weeds followed by a variety of woody shrubs. Shade-intolerant pioneer trees will be next to invade the site eventually shading out many of the shrubs. In time, these colonizers will give way to long-lived, shade-tolerant trees and understory shrubs. These veterans will form the foundation of a stable, species-rich environment.

By choosing a variety of selected native species, we can speed up the succession process and achieve a more stable, diverse, and interesting environment. This requires a good understanding of individual species, their characteristics, and growth requirements.

Site Suitability - Many species will grow in a wide range of site conditions, and most yards offer acceptable planting sites. If the yard has low areas where water stands for some time or dry areas where nothing seems to grow, these spots should be evaluated carefully prior to planting. Yard areas back-filled with clay subsoil are not desirable planting sites.

A Natural Landscape Example

Let's go through the process of landscaping a yard using the above principles to see what choices can be made.

Dominants - Start with the largest plants. At maturity, they will dominate the landscape and influence the rest of your plant choices.

Most yards with adequate space could support at least one white oak and one sugar maple. A burr oak would be another good choice. These three trees are climax species in the natural forest community. They are long lived, durable species, and are not prone to storm damage if they remain healthy and free of decay. Their large size at maturity emphasizes the need for unobstructed growing space and proper placement to nearby buildings. Often wrongly dubbed as slow-growers, I have seen these trees gain size quickly and give a yard special character while they are still young. The white oak is a special, aesthetic favorite of mine. As a young tree it quickly develops a wonderful, full aspect, suggesting early, the magnificent form of the mature tree.

These three tree species can add interesting colors and textures to the landscape. White oaks possess a reddish-bronze fall color and light grey bark. Younger white oaks frequently retain their leaves throughout the winter which adds visual impact to the yard during the dormant season. The brilliant orange, autumnal leaf color and darker bark of sugar maple complements the white oak. The burr oak's thick, corky bark and massive form adds an elegant contrast.

If your yard is large and spacious, diversity can be enhanced by planting additional tree species. Possible choices might include: hackberry; white and blue ash; red, post, chestnut, shingle and swamp white oak; river birch; red maple; and sweetgum.

Small flowering trees - Several small trees can be used to strengthen the structural diversity of the yard's plantings. These include redbud, flowering dogwood, and alternate-leaf dogwood (known as pagoda dogwood in the nursery trade). These small trees should be positioned to receive full sunlight. Wonderful spring blooms will appear on redbud and flowering dogwood just before they leaf out. The creamy-white flowers of alternate-leaf dogwood appear after the leaves emerge. A mixture of these species will enhance the yard's color well into the season.

Other small trees, such as ironwood, can form an understory when planted near the large, dominant trees. This adds a habitat component that is especially attractive to songbirds.

Evergreens - With evergreens, you can bend the "go with the natives" principle just a bit. There are several pine species which, if not overdone, can enhance a large yard. Eastern white pine is, by far, the most versatile choice.

Eastern redcedar is another choice. It is very hardy and adds a dark green touch to the yard during winter. Redcedar, junipers, and pines need full sunlight. They must not be crowded by large trees or shaded by buildings.

If heavy shade exists, hemlock would be a good choice. It is moderately slow growing at first, but develops rapidly after the root system becomes established.

Shrubs, Wildflowers and Prairie Plants - Part of the yard should be developed into habitats other than trees. A sunlit opening can be developed into a low maintenance, native prairie planting. A circular plot of tall prairie grasses and a mix of perennial prairie wildflowers can be surrounded by mowed lawn to make spring burning an easy matter. Prairie gardens must be burned annually (in March) if they are to develop quickly and thrive. Prior to burning, I recommend you check with your fire department on local burning ordinances and the need for a burning permit.

In another part of the yard, a collection of native shrubs could be planted. Leatherwood, sumac, hazelnut, wildplum, blackberry, wild raspberry, and grey dogwood are good choices. Root starts of these shrubs can be dug, with permission, from overgrown areas on nearby farms. Their fall colors are spectacular, and most provide nourishing wildlife food.

Woodland wildflowers, such as spring beauty, bloodroot, trilliums, dutchman's breeches and bluebells, can be planted under the trees. They will bloom and do most of their growing before the leaves fully develop on the trees.

Don't overlook the need for water. A small pond can be constructed near the edge of one of these habitats using cement or heavy rolled plastic film and stone. Both water and plant diversity attract songbirds.

Availability of Native Plants - Some of the tree species listed in the Table are available from commercial or state nurseries, while others may have to be dug locally with permission from private property. Species with a deep taproot, such as hickory or oak, are more difficult to transplant. But here's one method I find guarantees almost 100 percent success. Dig a 4 to 6 foot tall sapling and move it to its permanent planting site in March. Don't worry about getting all the taproot or moving much soil, but make sure to keep the roots moist. After transplanting, cut the young tree off at ground line. Several vigorous sprouts will emerge from the base. In July, cut off all but the tallest, most vigorous sprout, and continue to water as needed. Within a year's time you will have a young, vigorous tree.

Prairie plants and wildflowers should not be dug. Our few remaining prairie and woodland remnants are too precious to disturb. Wildflowers and prairie plants should be grown from seed. Seed is available from commercial dealers (*contact the magazine's editor for a printed list of dealers*).

To the watchful eye of your neighbors, a natural landscape yard may look out of place and unkempt. But with a little education about what you are trying to accomplish, the final result can be a marvelous collection of microhabitats that delight the senses and enrich our daily lives.

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To the watchful eye of your neighbors, a natural landscape yard may look out of place and unkempt. But with a little education about what you are trying to accomplish, the final result can be a marvelous collection of microhabitats that delight the senses and enrich our daily lives.

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Species Characteristics and Desirability

	Growth Rate[1]	Light Requirements[2]	Fall Color[3]	Desirability[4]
Primary Tree Species				
White Oak (*Quercus alba*	S	F	G	10
Sugar Maple (*Acer saccharum*)	S	S	S	10
Burr Oak (*Quercus macrocarpa*	S	F	A	10
Secondary Tree Species				
Hackberry (*Celtis occidentalis*)	M	F	A	9
Red Oak (*Quercus rubra*)	M	F	G	9
Shingle Oak (*Quercus imbricaria*)	M	F	A	9
Sweet Gum (*Liquidambar styraciflua*)	F	F	S	9
Chestnut Oak (*Quercus prinus*)	S	F	A	9
Blackjack Oak (*Quercus marilandica*	S	F	S	9
Swamp White Oak (*Quercus bicolor*	M	F	G	7
Blue Ash (*Fraxinus quadrangulata*)	F	F	A	7
River Birch (*Betula nigra*)	F	F	A	7
Shagbark Hickory (*Carya ovata*)	S	F	G	7
Pin Oak (*Quercus palustris*)	M	F	G	6
Black Oak (*Quercus veluline*)	M	F	A	6
Mockernut Hickory (*Carya tomentosa*)	S	F	G	6
White Ash (*Fraxinus americana*)	F	F	G	6
Tulip Tree (*Liriodendron tulipifera*)	F	F	A	6
Ohio Buckeye (*Aesculus glabra*)	M	F	A	6
Red Maple (*Acer rubrum*)	F	F	S	5
Basswood (*Tilia americana*)	F	F	A	4
Small Trees and Shrubs				
Redbud (*Cercis canadensis*)	F	F	A	10
Flowering Dogwood (*Cornus florida*)	F	F	S	10
Alt.-leaf Dogwood (*Cornus alternifolia*)	F	F	A	10
Ironwood (*Ostrya virginiana*)	S	S	A	10
Leatherwood (*Dirca palustris*)	M	F-P-S	G	10
Witchhazel (*Hamamelis virginiana*)	F	P	A	8
Sumac (*Rhus* species)	F	F	S	8
Wild Plum (*Prunus americana*)	F	F	G	7
Hazelnut (*Corylus americana*)	F	F	G	6
Blackberry (*Rubus allegheniensis*)	F	F	A	6
Wild Black Raspberry (*Rubus occidentalis*)	F	F	A	5
Grey Dogwood (*Cornus racemosa*)	F	F	A	5
Evergreens				
Eastern Redcedar (*Juniperus virginiana*)	S	F	A	8
White Pine (*Pinus strobus*)	F	F	A	8
Eastern Hemlock (*Tsuga canadensis*)	S	S	A	8
Prairie Plants				
Big Bluestem (*Andropogon gerardi*)	S	F	S	10
Indian Grass (*Sorghastrum nutans*)	S	F	S	10
Little Bluestem (*Andropogon sooparius*)	S	F	S	10

Prairie Wildflowers: over 30 species available such as: Pale Purple Cone Flower, Yellow Cone Flower, Rattlesnake Master, Compass Plant, Prairie Dock, Rosenweed, Purple Prairie Clover and others

1 Growth Rate: S = slow; M = medium; F = fast; **2** Light Needs: F = full sunlight; P = partial sunlight; S = shade tolerant; **3** Fall Color: S = striking color; G = good color; A = average color; **4** Desirability: 10 = highest; **4** = lowest; ranking reflects the author's personal judgements and preferences regarding these species

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ATTITUDE AND ACHIEVEMENT

The most important outcome for science education is what students derive from these experiences. Students should go away from their courses feeling good about the time spent in them and desiring to take more science. They should believe that the subject matter is relevant to their lives and that it will be useful in the future, whether they go into science or into other careers. Unfortunately, most students do not take any more science beyond high school biology and they have developed less than a positive attitude about science. I do not wish to dwell on the state of affairs in science education because there are hundreds of reports and papers on the topic (National Research Council, 1990) that present this state of affairs, all of which are negative. So let me share with you an approach that I have been using with science teachers to help them become more sensitive to their students' attitudes and achievements.

Feedback is a powerful tool, if used properly. We often get so involved in our teaching that we forget to determine what students think about our courses. We just never bother to ask the obvious. My colleagues and I have constructed a form (page 21) in order to gather data that might help science teachers to become more aware of what is taking place in their learning environments. The instrument is called: "Questionnaire for the Assessment of a Science Course." Note the second entry from the top requests the grade from the last grading period, which provides some data on achievement. Achievement data is valuable, but we tend to overdo the paper and pencil testing that assesses information. We believe the six-week grade is one valid indicator of achievement, because in addition to test scores it often includes laboratory work, homework, and assignments that reflect student effort.

The 23 items listed on the questionnaire address what the students perceive from their science class. Students' responses on self-report instruments have been found to be a reliable and valid measure of the classroom learning environment (Chavez, 1985; Fraser, 1985; Waxman, 1984). Students' perceptions have also been useful in helping educators understand classroom processes (Gage, 1972; Walberg, 1976). In addition, student perception data have been found to be effective in feedback to classroom teachers (Talmage & Eash, 1979; Gage, 1972; McDonald, 1979) and for improving classroom environments (Fraser & O'Brien, 1985).

The first 14 items on the questionnaire are taken from the National Assessment in Science (Hueftle, Rakow, & Welch, 1983). Items 1-4 ask: How much do you enjoy this science course? These statements address the attitude concepts of enjoyment, which relate to boring and fun. Items 5-8 ask: How useful is the information taught in this course? These statements ask students to assess the worth of the subject matter for its utility in their lives - present and future. Items 9-14 ask: How did you feel in science class during this course? These items assess many feelings such as comfort, curiosity, stupidity, success, and happiness. According to

Ed. note: Excerpted from "Turning Students onto Science Through a Balanced Curriculum Diet," *The Texas Science Teacher* (May 1992).

Hueftle, Rakow, & Welch, (1983), this set of affective ideas relates to what students believe about their science class rather than their science teacher. Furthermore these researchers report that these items correlate with science achievement.

Items 15-21 ask: What took place in the classroom during this course? You will note that the questions relate to how students are made to think. Questioning and wait time are assessed through students' perceptions of what goes on in their classrooms. This type of assessment can indicate to a teacher whether he or she is encouraging students to think and explain ideas, which is a good indication of the quality of instruction. The work of Tobin (1987) suggests that extended wait time (3-5 seconds) may be best for higher level learning.

Items 22 and 23 ask two of the most important questions: Did you enjoy this course and did you learn a lot? We want students to go away from science courses with a positive attitude toward science and with the belief that they learned a great deal of useful information and acquired valuable skills.These outcomes relate to goals that are essential to effective science programs. In addition to the 23 items, which require responses on a Likert scale, there is space for students to list what they like or dislike about their science course.

This questionnaire and others like it should be used by biology teachers to gather data regarding students' feelings and perceptions of their courses. Students are very candid and offer valid insights into what takes place during their courses. This type of assessment, which is related to the affective domain, can be used as an indirect method to evaluate whether teaching science as a way of thinking is occurring. The teachers who have used this feedback form have welcomed the information and seem to use it in reflecting upon their teaching. This type of assessment and feedback activity probably has much more value if it is initiated by science teachers, than if it is required by administrators and school districts.

Recommendations

Turning the majority of students on to science is the challenge of the 1990s. High school biology teachers are faced with one of the biggest responsibilities toward the accomplishment of this goal. Most of our youth take high school biology, but many of these students take little or no science thereafter. How can these educators make science interesting and relevant to high school students without trivializing the study of biology? This is not a simple matter or the problem would have been solved long ago. Fortunately, part of the problem has been identified — high school biology contains too much content. How do we help biology teachers to recognize and correct the problem?

A partial solution to the problem is for expert biology teachers, like yourselves, to assist inexperienced teachers in their planning and teaching. A strategy that you might adopt is to include a scheme and story line that focuses on the nature of science and scientific literacy. The scheme that I am recommending conceptualizes the improvement of scientific literacy with four themes: (1) science as a way of thinking, (2) science as a way of investigating, (3) science as a body of knowledge, and (4) science and its interaction with technology and society. The experts among you might devise subtle ways to point out the problem of too much content. This will not be easy because new teachers have a mind set that is hard to change. They believe, as I once did, that their job is to teach students a great deal of biology so they will know the subject well, especially if the students go on to college and take more biology. Some believe this is faulty reasoning because students forget most of this content. The expert biology teachers do not cover a great deal of subject matter, they address fewer topics, and teach for depth and understanding. Their students do not seem to be disadvantaged when they go on to college and enroll in advanced biology courses.

Help inexperienced teachers to analyze their instruction and discover for themselves that they are teaching and testing for too many facts and terms. Help them to realize that teaching a great deal of content displaces opportunities for students to think and to find out for themselves. There is a disease that is endemic in biology education — namely teaching too much content. We must wipe it out, just as modern medicine has wiped out many diseases. This will not be easy.

Let's help inexperienced science teachers view their task as one of teaching science as a way of thinking. Help them to examine their goals and objectives to determine if students will engage in inductive and deductive thinking in the formation of concepts and principles. Examine their instructional activities to determine if they have the potential to cause students to wonder why and reason about biological phenomena. Will the learning experiences that they are planning to use leave young people with a belief in the value of the science and in their ability to participate in the scientific enterprise if they choose to do so?

Encourage new biology teachers to incorporate many investigations in their courses of study. Laboratory exercises, science projects, simulations, and field experiences do take more time than reception learning through the lecture format, but they are worthwhile. Ensure that these learning experiences go beyond hands-on exercises, make them minds-on exercises that promote higher level thinking. Build these activities around the major conceptual schemes that form a relevant biology course.

In closing, I wish to remind you that you are the master chefs and only you can offer outstanding biology courses to high school students. You know the recipes and how to prepare the right combination of activities that turn students on to biology. Continue to do this, but also help new and inexperienced teachers, even administrators, to understand the type of science courses that are necessary to make the reformation, which is taking place in science education, a success.

Note. For a copy of the manual to analyze the content of science textbooks, using the four themes of scientific literacy, send a $3 check, made out to the University of Houston to cover the cost of duplication, mailing, and handling to:

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QUESTIONNAIRE FOR ASSESSMENT OF A SCIENCE COURSE (QASC)

Name of Science Course

The number grade You Received in This Course for the Last Grading Period

School

Your Grade Level Date

INSTRUCTIONS: Please indicate how you feel about this science course. Read each statement carefully. Circle the letter that best indicates your feeling about each statement. Below are the responses you can make:

Key: N = never, S = sometimes, O = often, A = always

The following is a sample item, please study it.
The information in this science unit is useful to my life..... N..S..O...A
Since S was circled, it means the information is believed to be useful to the person's life—sometimes.

A.	HOW MUCH DO YOU ENJOY THIS SCIENCE COURSE?				
1.	Science class is often boring	N	S	O	A
2.	Science class is usually fun	N	S	O	A
3.	I enjoyed going to science class	N	S	O	A
4.	I am afraid to ask questions	N	S	O	A
B.	HOW USEFUL IS THE INFORMATION TAUGHT IN THIS COURSE?				
5.	The information is useful to me	N	S	O	A
6.	The information is meaningful to my life	N	S	O	A
7.	This information should be required in science classes	N	S	O	A
8.	I will be able to use the information in the future	N	S	O	A
C.	HOW DID YOU FEEL IN SCIENCE CLASS DURING THIS COURSE?				
9.	I felt uncomfortable during this course	N	S	O	A
10.	I was curious	N	S	O	A
11.	The classes made me feel stupid	N	S	O	A
12.	I felt confident	N	S	O	A
13.	The class made me feel successful	N	S	O	A
14.	I was unhappy in class because of this course	N	S	O	A
D.	WHAT TOOK PLACE IN THE CLASSROOM DURING THIS COURSE?				
15.	Our teacher asked many questions	N	S	O	A
16.	We are expected to explain events or ideas	N	S	O	A
17.	We were given plenty of time to think about answers to our teacher's questions	N	S	O	A
18.	Our teacher's questions really made us think	N	S	O	A
19.	We were given enough time to answer questions	N	S	O	A
20.	The questions really made us learn about the demonstrations and laboratory work	N	S	O	A
21.	We were given many paper and pencil exercises to help us learn this unit	N	S	O	A
E.	OVERALL RESPONSE TO THIS COURSE?				
22.	I enjoyed this course	N	S	O	A
23.	I learned a lot during this course	N	S	O	A

F. Please write several comments about your impression of this science course—what you liked or disliked about it.

1.
2.
3.

REVIEWS

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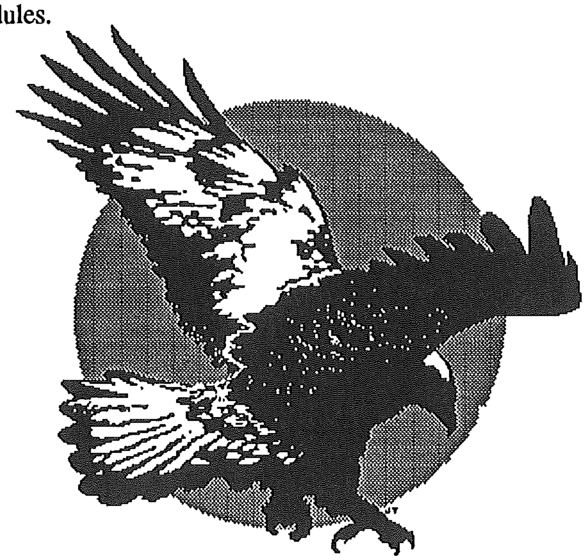
NEW HYPERCARD STACKS FOR BIOLOGY/LIFE SCIENCE CLASSROOMS

One of the most difficult problems in incorporation of software into biology/life science classrooms is finding potential sources of appropriate software. Many junior high school, high school and college teachers produce their own classroom computer materials but do not publish or distribute it in any fashion. In response to this potential market, Intellimation, a software publisher in Santa Barbara, California, has begun commercial distribution of a large number of these instructor-produced packages. Intellimation's biology/life science products range from anatomy, physiology, genetics and neurobiology, to evolution, ecology, and organismal biology . The first seven Hypercard packages evaluated below vary in price from $35 to $59 and all include user and/or instructor manuals. Catalogues can be obtained by writing to Intellimation, Dept. TLBH, PO Box 1922, Santa Barbara, CA 93116 or by contacting their Educational Media Representative, Bob Hayes, at 1-800-325-7550. All materials ordered may be returned within 30 days for full credit or refund, less shipping and handling charges, if they do not meet materials do not meet your classroom or personal needs. For each package below the recommended grade levels are given in parentheses after the title. Please keep in mind the fact that these reviews are done with the assumption that the stacks will be used to supplement class material and allow for further exploration, rather than as stand alone educational modules.



The Human Body: Structure and Function ($39, grades 6-12)

This package, produced by a former college biology instructor and current medical student, allows students to explore various parts of the human body and learn about functions and cooperative interactions. The material provided is for the most part very good, though at times there are leaps in the sophistication of the stack subject material with no middle level background supplementation. Graphics are very good, animations are mediocre. The most valuable parts are the information cards and diagrams. Hypercard stack organization is awkward, navigation is somewhat illogical and difficult. To get full value from this stack you will need to use the accompanying manual as you first investigate the program. The utility of this program is based directly on the instructor's willingness to invest time in learning the program *and* subsequent effort in integrating it into their curriculum.

MacFrog (Color Version) ($55, grades 10-12)

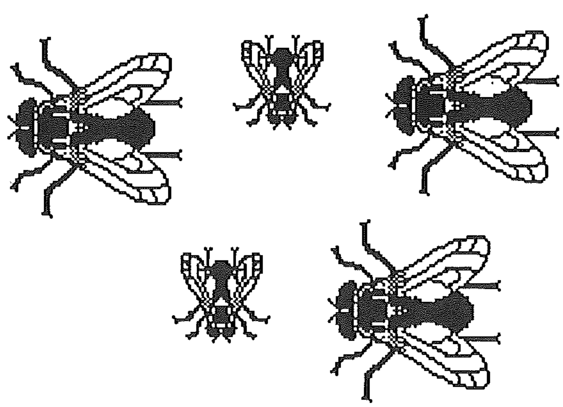
MacFrog (Color Version) is an extraordinary anatomy package. I recommend this package as an excellent prelab activity prior to frog dissection and believe that it performs quite admirably as an alternative activity for those students electing not to take part in dissection activities. Excellent use of color pictures of actual organs. Students remove each organ with a pair of cursor forceps, resulting in a dialogue box which briefly explains the function of each structure removed. The frog dissection is divided into five components, each including a review quiz, and there is a final frog anatomy test. Student progress toward completion of the program and quiz/test performance are recorded and made available only to the teacher. Student observation during the actual dissection is greatly facilitated by prelab exposure to this package, as is understanding of the anatomical differences between humans and frogs. Though I would like to see more detail in the dialogue box explanations, the quality of the graphics and heavy emphasis on student manipulation of anatomic structures outweigh this shortcoming. Highly recommended.

Mitosis and Meiosis ($35, grades 10-12)

Animated drawings of animal cells allow students to directly control rate of the processes of meiosis and mitosis. Very straight forward and easy to use, the animation clearly reinforces the dynamic nature of these processes. Well done, though there is nothing terribly flashy, nor any more than the title implies. Diagrams or animations contrasting meiosis and mitosis would be appropriate in future versions of this package. "Mitosis and Meiosis" will be a valuable asset in those classrooms with access to an LCD display panel.

HyperLink: Genetic Linkage and Mapping ($39, grades 10-12)

A beautifully presented package which clearly explains genetic linkage, mapping and clearly illustrates how scientists determine whether linkage occurs in specific situations. The user selects one of ten species and then selects two species-specific traits. Offspring of strains with the selected traits are testcrossed and analyzed phenotypically to determine if the genes controlling expression of the two traits are linked. Reasonably well written tutorial. Students (or teachers) willing to put in the time required may go beyond the determination of linkage to actually determine map distances and construct a genetic map for their selected combination of traits. Users become familiar with the use of chi-square tests through their analysis of data, though a built-in chi-square calculator allows the user to work with the data without having to do actual number crunching. Frustratingly, the relationships between physical traits in each of these species are artificial, since the linkage relationships for most traits in complex organisms are unknown. This is a good package for individual teacher professional development and for those students who are particularly strong academically, patient and interested in pursuing this area of genetics on their own. Suitable for some Advanced Biology or AP students.



HyperFly ($35, grades 10-12)

This laboratory software package allows the user to cross 45 different strains of mutant fruitflies and examine the offspring to determine whether each trait is an autosomal dominant, autosomal recessive, X-linked dominant or X-linked recessive trait based on the phenotypic ratio of the offspring. Offspring are displayed individually unless the user selects the collective display setting, which allows the user to specify the number of offspring produced (20, 60, 100 or 200) and to see their phenotypes collectively rather than individually. Fairly straightforward, though the software does not tell the user whether their final assumption of inheritance pattern is actually correct or incorrect. I think this type of feedback is essential to the learning process... There is an answer key in the Instructor's Manual, however. For those wishing more challenging crosses there is now HyperFly Advanced ($39), a package which demonstrates 16 patterns of inheritance.

Plant Stacks ($49, grades 9-12)

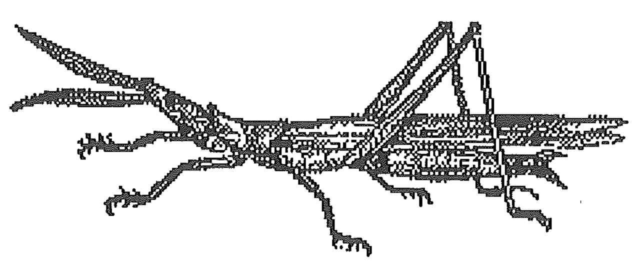
This well-organized, well-written tutorial allows teachers and students to interactively view a large number of different aspects of plant biology. Though designed for college level Introductory Biology or Botany courses, high school instructors and motivated high school student can profit greatly from this stack. The package consists of 16 clearly delineated modules, allowing for easy navigation. Outstanding use of graphics, animations and even some incorporation of electron micrographs!!! Well written, straight forward accompanying manual. A number of the modules such as those dealing with chemistry, cellular energy, protein synthesis, respiration, the cell cycle and mitosis are appropriate for incorporation into a number of biological topic areas broader than botany. This four disk, 2.5 megabyte package is highly recommended and is an excellent addition to any biology teacher's (or biologist's) software library!!!

Bloom or Doom ($39, grades 10-12)

This computer simulation game aims to teach students about photosynthesis, transpiration and data analysis. Though all of these aspects are incorporated into the simulation, its slowness, lack of quality graphics, simplistic modeling and limited opportunity for student input contribute to an entirely unsatisfying, minimally informative learning experience. Its lack of any capability to graph collected data only adds to its inadequacy as scientific simulation software. The game component is equally unsatisfying.

HyperBug 2.1 ($20, grades 6-adult)

HyperBug 2.1 is a package which provides the user with much of the fundamental background of entomology. It includes illustrated sections regarding insect orders, development, morphology, collection methodology, a detailed list of entomological resources and a significant amount of insect clip art. The developer, Mark O' Brien, has set up the stack such that it allows easy access to all of the included graphics for incorporation into newsletters, handouts and lab manuals. In fact, use of any of the illustrations for classroom or personal noncommercial use is encouraged. A very thorough, well designed informative stack. Very highly recommended, another excellent addition to any teacher's software library. For further information contact Entomation, 2742 Beacon Hill, Ann Arbor, MI 48104-6502 or (313) 971-6033. Entomation also produces a number of high quality entomological and botanical clip art disks ranging from $10 to $18.



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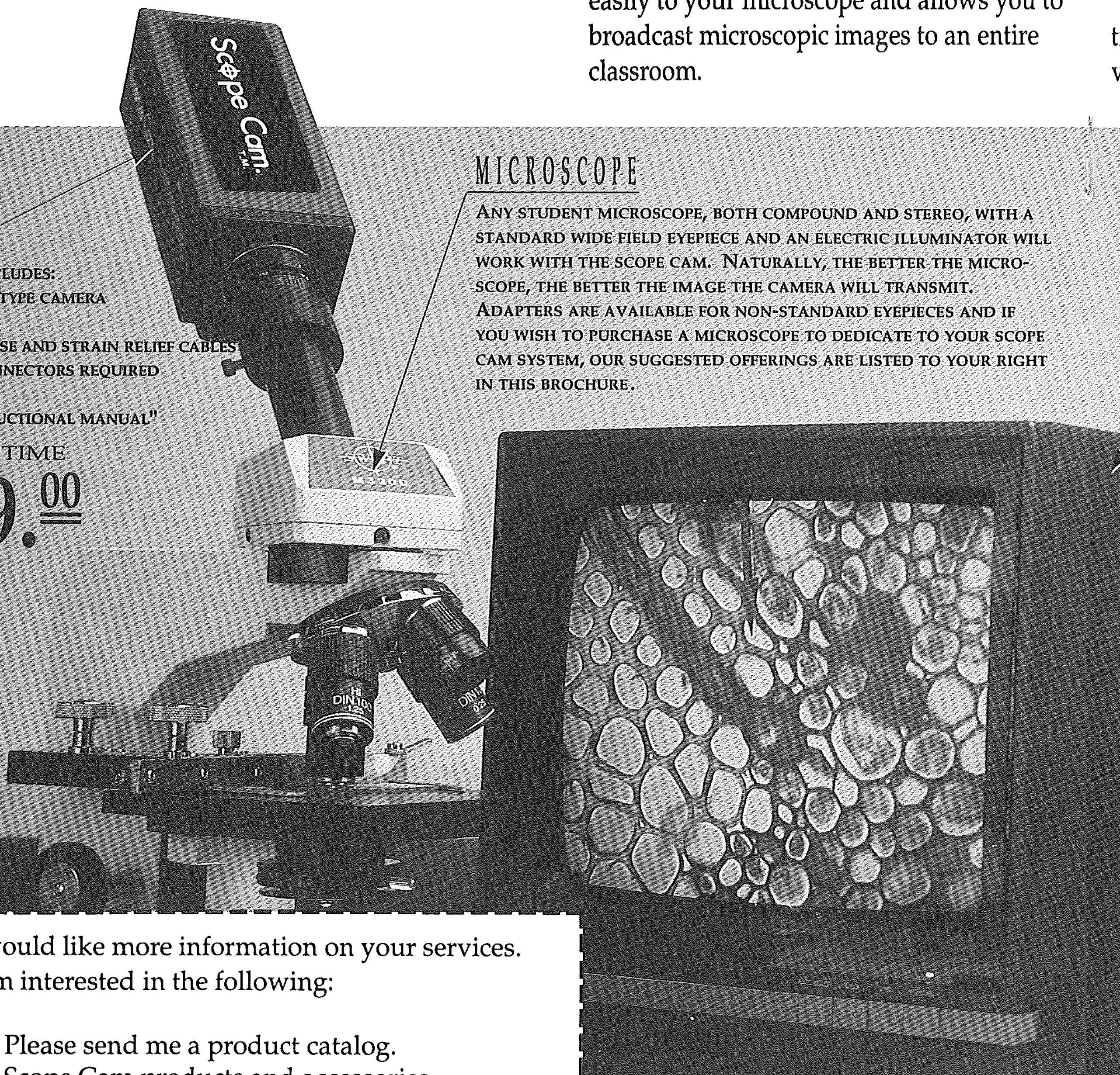

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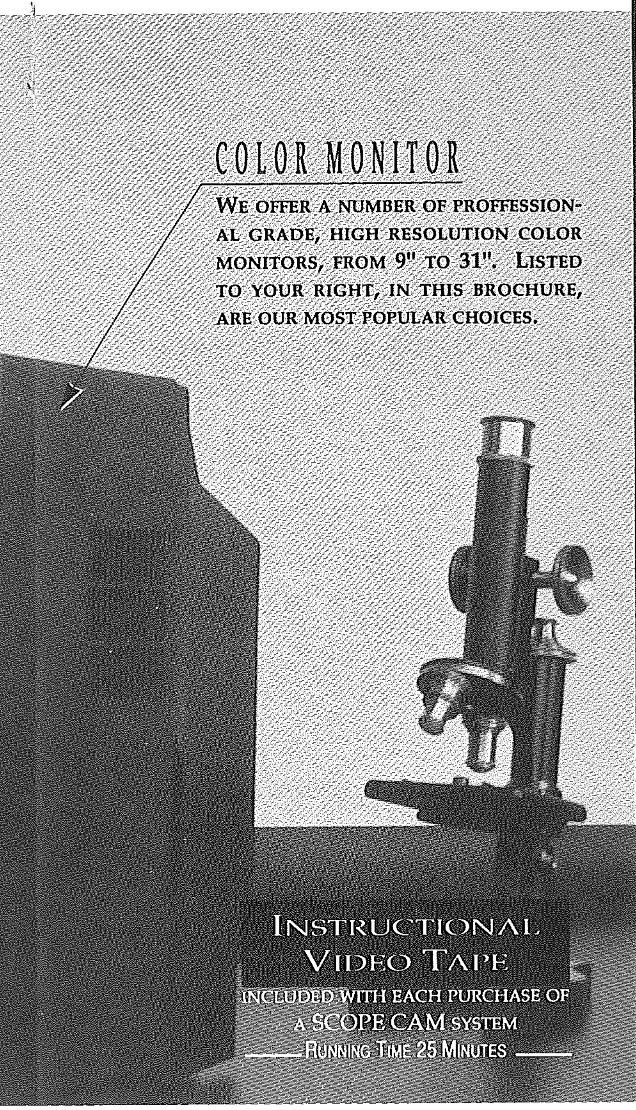

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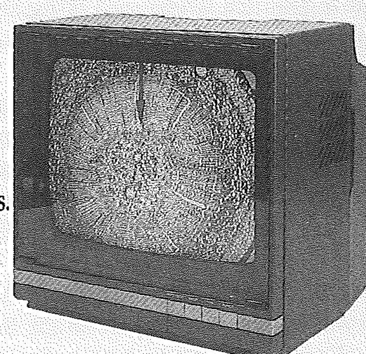

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SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

MINI IDEAS

Margaret A. Bankhead
Robert A. Black Magnet School
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Chicago, IL 60617

INVERTEBRATES ON PARADE

It was mid-March and I was searching for an exciting culminating activity to bring closure to our study of invertebrates and to chase away the winter doldrums. After much deliberation I decided a parade patterned after the Tournament of Roses Parade would fit the bill perfectly and also actively involve the students.

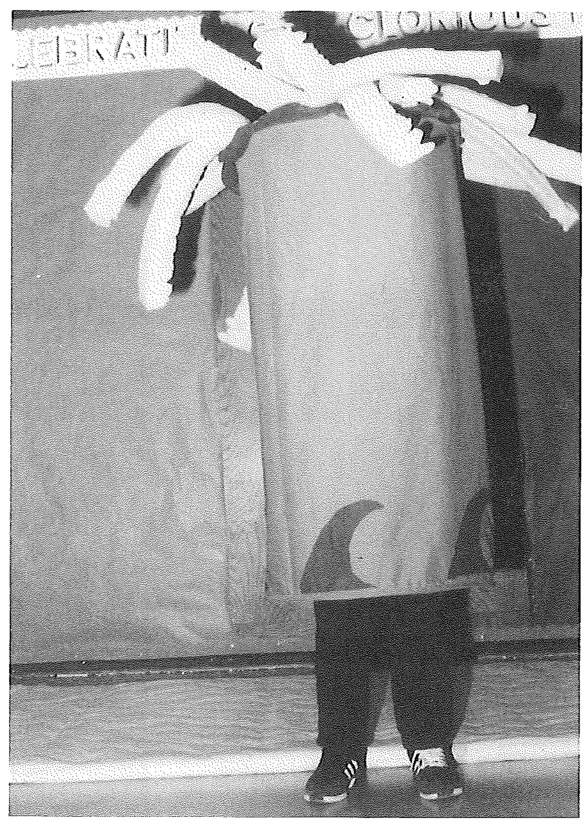
The following guidelines and activities were established in joint collaboration with the students: Participating students would select their favorite invertebrate to portray. To encourage a wide selection of different invertebrate animals, only one student was allowed to portray an animal. In cases where an animal was selected by more than one student, the first student to turn in an entry form was allowed that choice.

A theme, The World of Invertebrates was decided on. Maps of the parade route through the school corridors were drawn up and with the principal's permission invitations to view the parade and to attend post-parade activities in the school's auditorium were issued to all classes and sent home to parents.

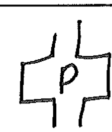
The principal was chosen as Grand Marshal. On the day of the parade she was pulled along the route in a beautifully decorated wagon. Some participants rode tricycles. Most walked interspersed between the participating students dressed in the costumes they had designed and made to depict the invertebrate animals they were portraying. Other participants in the parade included a trio of musicians, a group of cheerleaders as well as flag and banner carriers. The parade ended in the auditorium where each of the students made a dramatic presentation about the invertebrate animal they were portraying.

Three prizes were awarded based on the popular vote of the students and staff. The Principal's Trophy was awarded for the most realistic portrayal of an invertebrate animal. The Science Teacher's Trophy was awarded for the most creative presentation and interpretation of theme and the Students' Trophy to the Crowd's favorite.

Based on the reaction and comments of the participating students, as well as those viewing the parade, this activity was enjoyed by all and sent us scurrying into Spring in very high spirits. We plan to stage an even bigger parade this year with some additions.



Kim Pittman
Springman Junior High
Glenview, Illinois 60025



DNA MODELS

Objective:

To understand that DNA is made up of units that attach to each other in a certain way. Each unit has a phosphate, a sugar, and a connecting molecule. The connecting molecules are chemicals called bases. There are four different types of bases. The sequence of these bases in DNA molecules tells what types of protein will be made inside a cell.

Background:

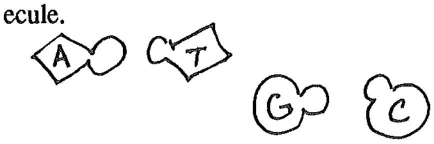
This is an exciting activity in which the students construct a three dimensional model out of spice drops, felt squares, or colored construction paper. They then suspend them in a shoe box so that they can be twisted in a double helix.

Materials:

1 bag of spice drops
1 bag of marshmallows (white or colored)
wire (any size)
shoe box

Procedure:

1. Discuss the structure of DNA.
2. Have the students wire the bases, phosphates and sugars together, suspend in a shoe box.
3. If using construction paper: Cut out templates and xerox the form on the construction paper. They can then glue together at the tabs, twist and hang in the shoe box. Cover the shoe box with construction paper before hanging the molecule.



Kim Pittman
Springman Junior High
Glenview, Illinois 60025

MAKING PROTEINS

Objective:
To understand the relationship between amino acids and protein synthesis.

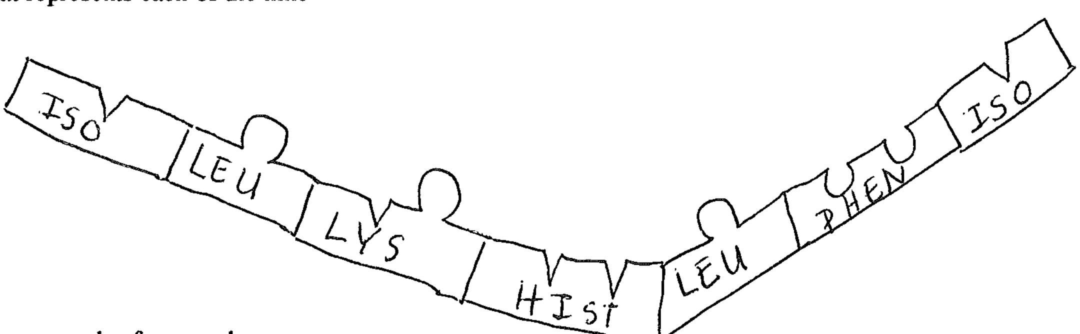
Background:

In addition to meeting the above objective, this activity shows the interdisciplinary nature of science and art. This is a cooperative learning class exercise that allows the students to physically synthesize proteins. The students enjoy "playing" the protein synthesis activity. The finished products are strands of multicolored proteins that can be suspended from the ceiling.

Materials:
Colored construction paper (9 different colors) 2" x 4"
Scissors
Stapler
Markers

Procedure:
1. Discuss the importance of the nine essential amino acids:
Isoleucine - regulates blood sugar
Leucine - Source of fuel during exercise
Lysine - production of antibodies, hormones and enzymes for repair
Methionine - aids in maintenance and health of liver and digestive tract
Phenylalanine - natural appetite suppressant
Threonine - makes collagen, elastin and enamel. Promotes good liver function
Tryptophan - promotes restful sleep, aids in mood stabilization
Valine-storage of energy
Histidine - allergic reactions and production of red blood cells
2. Place a key on the board that represents each of the nine essential amino acids:

iso - yellow
leu - green
lys - red
meth - orange
phen - white
threo - purple
tryp - blue
val - brown
hist - black



In addition, have them cut out a notch of some shape to represent a difference in molecular structure. For example:

iso , leu , lys .

3. Place them in four groups and give them a copy of their protein sequence. Explain that they are to read the sequence (mRNA), and the person that goes to get the colored squares is the (tRNA), the staples represent the chemical bonds that hold the amino acids together.

4. Allow them to assemble according to the key and the sequence. With their markers they should write the abbreviation on the paper to facilitate learning the amino acids

Protein A (i.e., muscle strength/movement-myosin)
iso-leu-leu-leu-iso-leu-lys-leu-leu-lys-meth-les-iso-thr-thr-iso-meth-try-val-val-val-iso-leu-hist-leu-lys-phen-thre-iso-thr-val-iso-leu-lys-lys-phen-thr-iso-val-meth-meth-iso-hist-iso-leu-leu-phen-val-thre-meth-val-try-phen-val-leu-val-thr-meth-val-leu-iso-val-val-his-iso-iso-leu-lys-meth-meth-try-val-val-leu-phen-phen-leu-ios-thre-

Protein B
leu-try-try-leu-lys-lys-hist-meth-ther-val-try-lys-
hist-leu-iso-iso-ther-meth-val-hist-try-hist-lys-
meth-ther-iso-iso-iso-iso-try-try-try-try-try-try-
try-try-meth-iso-try-iso-try-try-ther-ther-leu-try-
iso-try-try-hist-try-try-try-meth-lys-try-thr-thr-
met-phen-met-try-try-leu-iso

Protein C
meth-meth-meth-hist-meth-hist-meth-hist-meth-meth-hist-
meth-hist-meth-hist-meth-hist-try-val-try-hist-
phen-try-val-meth-meth-thr-thr-thr-thr-thr-thr-
val-meth-meth-hist-meth-hist-meth-hist-thr-thr-
meth-hist-thr-hist-meth-hist-thr-hist-thr-lys-lys-
lys-leu-leu-lys-hist-leu-phen-hist-thr-meth-lys-
lys-lys-lys-leu-iso-iso-leu-meth-hist-lys-leu-hist

Protein D
iso-leu-lys-thr-meth-leu-hist-thr-val-iso-phen-leu-thr-leu-thr-val-iso-leu-lys-try-try-try-try-try-phen-phen-leu-try-leu-try-try-iso-phen-lys-leu-lys-leu-phen-leu-phen-leu-phen-leu-phen-leu-phen-leu-phen-lys-phen-iso-hist-hist-try-thr-try-thr-leu-iso-phen-lys-leu-thr-try-hist-hist-leu-hist-leu-hist-iso-try-hist-try-iso-hist-iso-phen-lys-try-try-phen-lys

5. Discuss what proteins are used for and how they are the building blocks of life. Hang the proteins in a twisted fashion (as they appear in nature) from the ceiling.

Janet Franklin and Nancy J. Mitchell
Excerpted from "Adapting Scientific Experiments from Business and Industry to the Classroom"
Macomb District #185
Western Illinois University
Macomb, IL

IDENTIFICATION OF MICROORGANISMS IN INDUSTRIAL WASTEWATER ACTIVATED SLUDGE

Appropriate Grade Level

Junior High Life Science (7-9)

Experimental Setting

National Starch and Chemical Corporation in Meredosia, Illinois is the company's largest resin and adhesive production facility. Well water used in their production process is treated at their waste-water treatment plant and returned to the Illinois River. An activated sludge process is part of thewastewater treatment process. Activated sludge is "activated" due to the addition of protists added by plant personnel. The activated sludge is used to speed up the decomposition of organic wastes. After time in an aeration tank, activated sludge is allowed to settle out by sedimentation. Aeration is accomplished by bubbling large quantities of air into a constantly agitated tank. Microscopic examination is done to indicate the condition of the sludge during the treatment process as different concentrations are indicative of sludge quality. The microorganisms considered to be important indicators include: protozoa, nematodes, some blue-green bacteria and rotifers. As bacteria are consumed by these microorganisms, they help produce a clear effluent. The effluent is the clear water which will be returned to the river.

Experimental Objectives

1. to familiarize students with wastewater treatment processes
2. to collect samples of activated sludge from an industrial wastewater treatment plant
3. to use the microscope to observe microorganisms
4. to identify microorganisms in activated sludge
5. to determine percentages of organisms present in samples
6. to organize and record data in the form of charts and graphs
7. to understand terms: activated sludge, effluent, microorganisms, sedimentation, wastewater, decomposition

Equipment and Materials (per student)

1 compound microscope
2 slides
2 coverslips
1 eyedropper
access to the 100 mL Activated Sludge sample
access to charts and/or keys to protists
1 sheet graph paper
colored pencils
1 air pump to aerate class sludge sample
1 meter length of aquarium tubing attached to air pump

Prerequisites

Students will need some knowledge of preparing a wet mount slide. They should have some expertise in the use of the compound microscope. A working knowledge of protist culture techniques is necessary.

Guidelines for Conducting Experiment

Day One

1. It is recommended students tour an INDUSTRIAL wastewater treatment facility. To avoid exposing students to pathogenic bacteria avoid sewage wastewater treatment. Verify with the industry the safety of using their sludge in a classroom setting.
2. On the tour, collect 100 mL sample of activated sludge.
3. Upon return to the classroom, aerate the sludge sample using an aquarium pump and tubing.

Day Two

1. Each student shall prepare a wet mount slide of the activated sludge.
2. Each type of microorganism needs to be identified.
3. Count the numbers of each type of protist and nematodes found in the field of view.
4. Record the data in a chart.

Day Three

1. Determine the total numbers of organisms.
2. Record the total numbers in the data table (chart).
3. Determine the percentages of each organism.
4. Record percentages in the data table (chart).
5. Prepare a histogram (bar graph) to compare population percentages.

Anticipated Outcomes: Students shall:

1. recognize different types of protists
2. become familiar with wastewater treatment facilities
3. realize the value of protists in decomposition of organic waste matter
4. recognize environmental conditions necessary for protist culture
5. prepare data tables (charts) and histograms (bar graphs) as they organize data
6. recognize terminology involved in Microbiology studies

Safety Precautions

Activated sludge samples should be treated with the same precautions one must take when working with any water sample. Students should not eat or drink in the area where they work. They should wash their hands with soap and water after completion of their slide preparation. The instructor should check with the industry providing the activated sludge to make sure it is safe for classroom work.

Related Activities

1. Examine activated sludge samples during different seasons to see if protists differ in percentages present.
2. Examine water samples from other waterways to compare protists found there with those found in activated sludge.
3. Do library research to determine the individual role of each type of protist being observed.
4. Do library research to determine the water condition indicated by the presence of different microorganisms.

Extensions

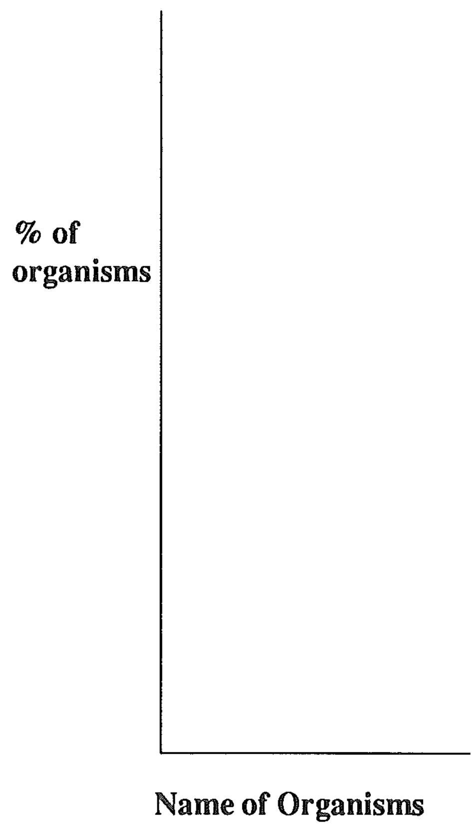
Industrial plants in any major city have wastewater treatment facilities. Trips to more then one of these areas could be made to compare techniques used. Examination of EPA standards industries must meet would add another dimension to the activity suggested.

Suggested Worksheets

1. Chart to organize and record data:

Organism Name	Number in Field-of-view	% of Total
Ciliates		
Amoeba		
Flagellates		
Rotifers		
Nematodes		
Filamentous Bacteria		
Other		
TOTALS		

2. Histogram (bar graph)



Microorganisms Review Mathematics

A. The basic areas of mathematics used in this experiment are: chart completion, addition, writing fractions, and changing fractions to their decimal equivalents.

1. A student should be able to make and complete an information chart. They will need to label the columns appropriately and insert the information collected in the experiment.
2. To add whole numbers, a student must line up the place values and add right to left. Any time the sum is greater than nine, the ten's digit should be carried to the next column.
3. When writing fractions, the numerator represents the part described and the denominator represents the number of divisions in an object or the number of objects in a set.
4. A fraction can be changed to a decimal by performing the indicated division. The numerator should be divided by the denominator. If not exact, the quotient should be rounded to the nearest hundredth.

B. Use the information given below in numbers one through four to make and complete an information chart. A completed chart can be found at the end of this section. The percent column will be filled in later in this outline.

1. On a prepared slide, we saw 3 Ciliates, 4 Ameoba, 10 Rotifers, and 3 Nematodes. We will need to find the fraction, decimal fraction, and percent of the total number of organisms seen.
2. Find the total number of organisms by adding the number of each type seen. (3+4+10+3=20)
3. Find the fraction of the total by placing the number seen on the slide over the total number of organisms found in #2. (Ciliates 3/20, Ameoba 4/20, Rotifers 10/20, Nematodes 3/20)
4. Find the decimal fraction of the total by changing each fraction in #3 to its decimal equivalent. Divide the numerator by the denominator. (Ciliates 3/20=.15, Ameoba 4/20=.20, Rotifers 10/20=.50, Nematodes 3/20=.15)

Current Mathematics

A. The new content areas necessary for completion of this experiment are a basic knowledge of percents, conversions of decimals and fractions to percents, and construction of bar graphs.

B. The new content areas will be discussed in detail in this section.

1. Percent means per hundred or out of one hundred. The symbol for percent is %. 16% means 16 per 100 or 16 out of 100. 25% means 25 per 100 or 25 out of 100. If you answered 86 out of 100 test questions correctly, your score would be 86%. If you read 75 pages in a book with 100 pages, you have read 75% of the book
2. Conversions are used when you need to replace fractions or decimals or vice versa.

All percents can be written as fractions or decimals because the words per or out of can represent the fraction bar or a division symbol. Look at the examples below.

Percent	Words	Fraction	Decimal
16%	16 per 100	16/100	.16
25%	25 per 100	25/100	.25
86%	86 per 100	86/100	.86
75%	75 per 100	75/100	.75

Notice that to go directly from a percent to a decimal all you need to do is take away the percent sign and move the decimal two places to the left. What would happen if I asked you to do the opposite, which is to change a decimal to a percent? All you need to do is move the decimal two places to the right and add the percent sign. Look at the examples below.

Decimal	Fraction	Words	Percent
14	14/100	14 per 100	14%
29	29/100	29 per 100	29%
.56	56/100	56 per 100	56%

Organisms	Number in Field of View	Fraction of Total	Decimal of Total	Percent of Total
Ciliates	3	3/20	.15	
Ameoba	4	4/20	.20	
Rotifers	10	10/20	.50	
Nematodes	3	3/20	.15	

If you are given a fraction, you should change it to a decimal first and then make it a percent. You will not always be dealing with 100 items in your experiments, therefore we should look at examples with different numbers of items as seen below.

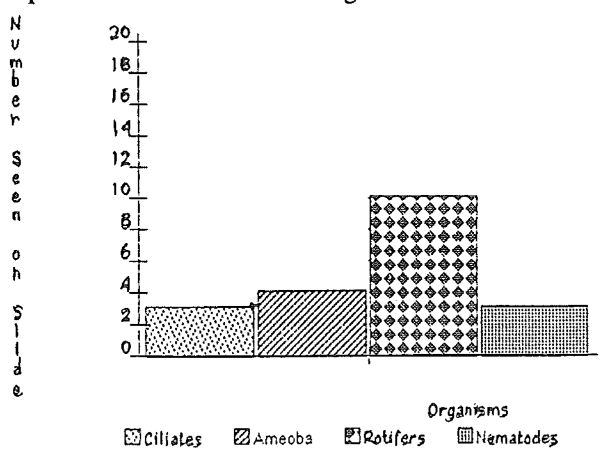
Fraction	Decimal	Percent
1/5	.20	20%
7/8	.875	87.5%
5/20	.25	25%

Now I will show the percent column of the review problem completed.

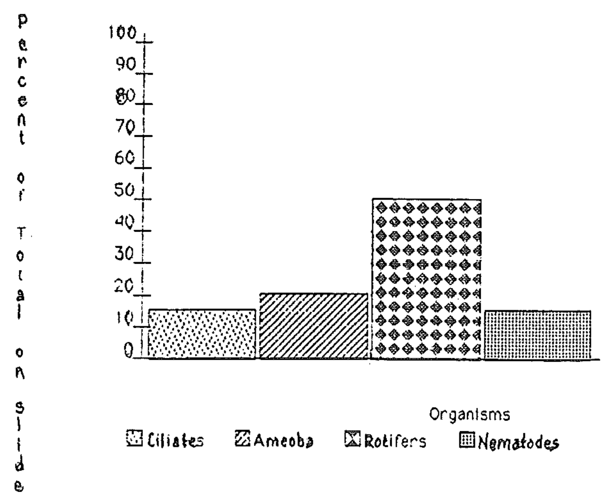
Organisms	Number in Field of View	Fraction of Total	Decimal of Total	Percent of Total
Ciliates	3	3/20	.15	15%
Ameoba	4	4/20	.20	20%
Rotifers	10	10/20	.50	50%
Nematodes	3	3/20	.15	15%

3. Graphs are used to present numerical information in picture form. In our experiment we will be constructing a bar graph. When we draw graphs, the quantities plotted vertically and horizontally should be clearly labeled. On the vertical scale the major divisions should be divisible by two or ten to make it easier to read. To make a bar graph, you should draw each axis and give it a general label, make the divisions needed on each axis for your specific label, and then make the bars that represent the information given.

This graph represents the number of each organism found on the slide.



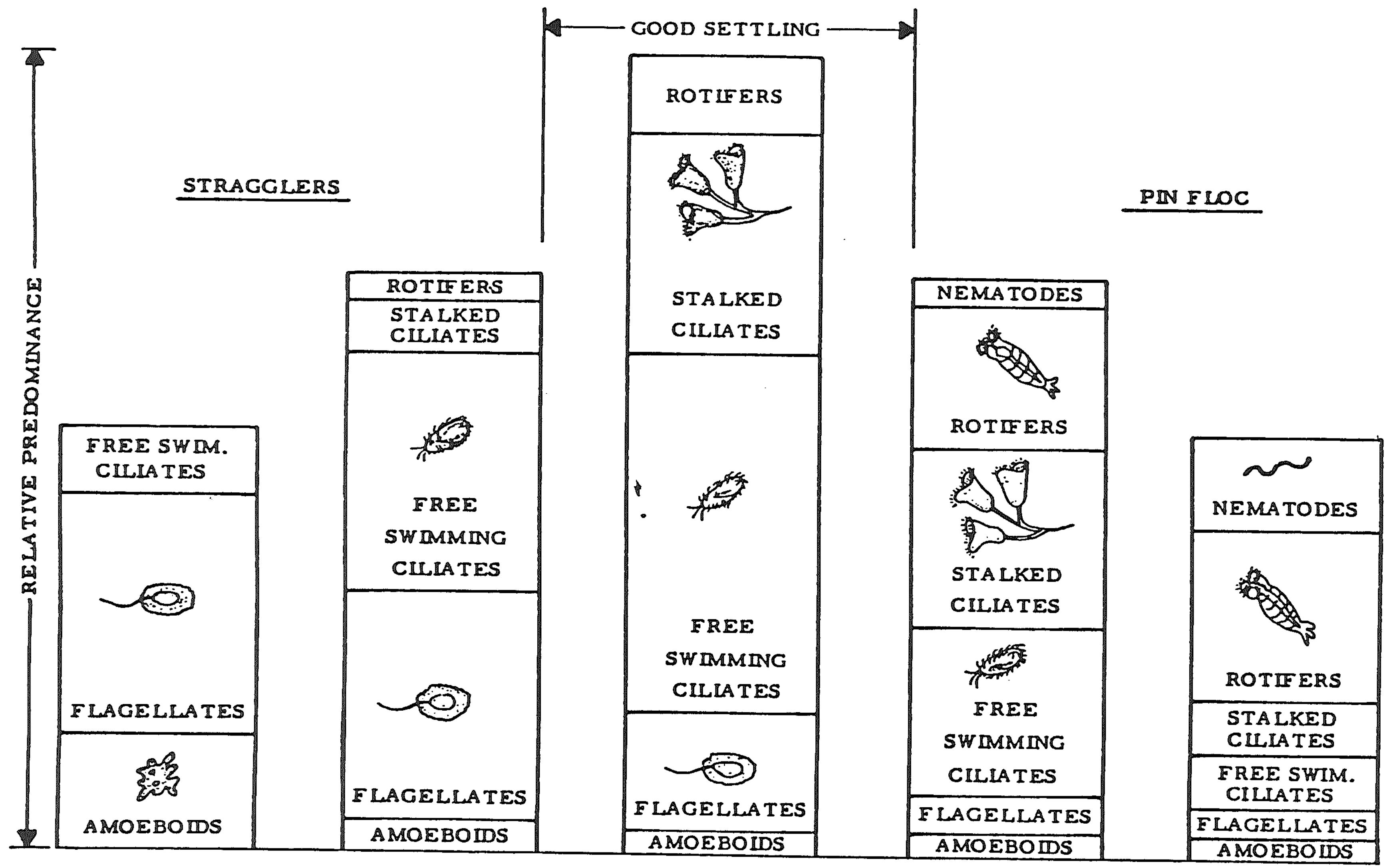
This graph represents the percent of the total for each organism on the slide.



C. You can see percents and or graphs used daily in terms of your grades, weather reports, agricultural reports, and sales on specific merchandise, along with many other ways. You may want to discuss these with the class using newspaper and magazine clippings if possible. Explore the other kinds of graphs which could be used such as line graphs and circle graphs. Discuss the advantages and disadvantages of each kind of graph. Which graph seems the most appropriate for representing the data collected in this experiment?

D. You may want to relate the significance of the numbers found with what the students are familiar with such as grades. What is the difference between the knowledge of a student who scores 86% with one who scores 87%?

Significance of the data in this experiment will depend on the conditions at the time of collection. Conditions include temperature and the chemical nature of the sludge.



GOOD SETTLING
STRAGGLERS
PIN FLOC
RELATIVE PREDOMINANCE
FREE SWIM. CILIATES
FLAGELLATES
AMOEBOIDS
ROTIFERS
STALKED CILIATES
FREE SWIMMING CILIATES
FLAGELLATES
AMOEBOIDS
ROTIFERS
STALKED CILIATES
FREE SWIMMING CILIATES
FLAGELLATES
AMOEBOIDS
NEMATODES
ROTIFERS
STALKED CILIATES
FREE SWIMMING CILIATES
FLAGELLATES
AMOEBOIDS
NEMATODES
ROTIFERS
STALKED CILIATES
FREE SWIM. CILIATES
FLAGELLATES
AMOEBOIDS

Three groups of protozoa are important to the operator of an activated sludge process.

1. Amoeboids
2. Flagellates
3. Ciliates

AMOEBOIDS (Fig. 2.8)

Look for amoeboids in the mixed liquor suspended solids floc during start-up periods or when the process is recovering from an upset condition.

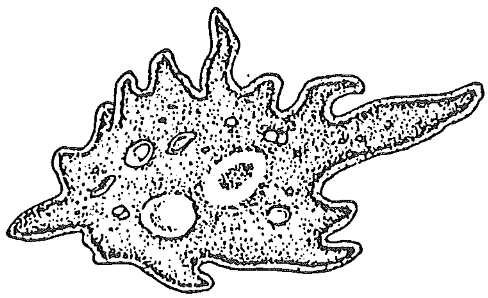


Fig. 2.8 Amoeboids

FLAGELLATES (Fig. 2.9)

Flagellates are usually found with a light, dispersed, straggler floc, a low population of microorganisms, and a high organic (BOD) load. With a high organic (BOD) load, other microorganisms will start to thrive, a more dense sludge floc will develop, and the flagellate population will decrease.

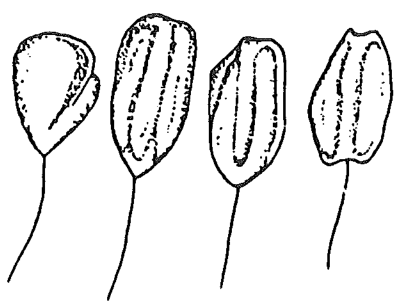


Fig. 2.9 Flagellates

CILIATES

Ciliates are usually found in large numbers when the activated sludge is in a fair to good settling condition. Ciliates are classified into two basic groups, free swimming ciliates (Fig. 2.10) and stalked ciliates (Fig. 2.11).

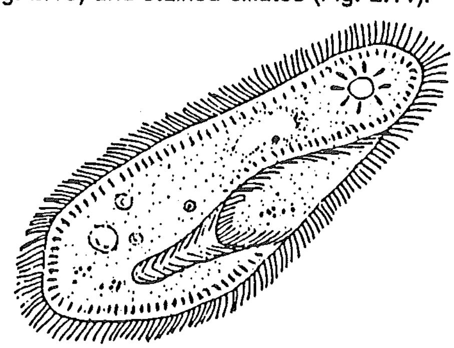


Fig. 2.10 Free swimming ciliates

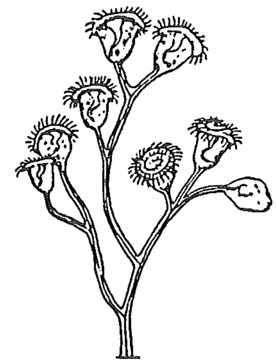


Fig. 2.11 Stalked ciliates

Free swimming ciliates are usually present when there is a large number of bacteria in the activated sludge. These organisms feed on bacteria and help produce a clear effluent. They are associated with a good degree of treatment.

Stalked ciliates are usually present when the free swimming ciliates are unable to compete for the available food. A large number of stalked ciliates and rotifers (Fig. 2.12) will indicate a stable and efficiently operating activated sludge process.

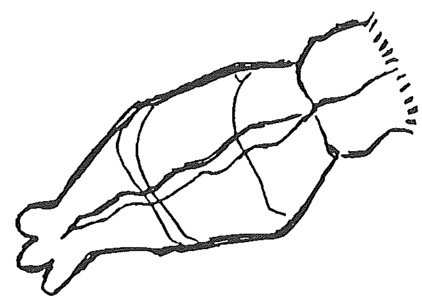


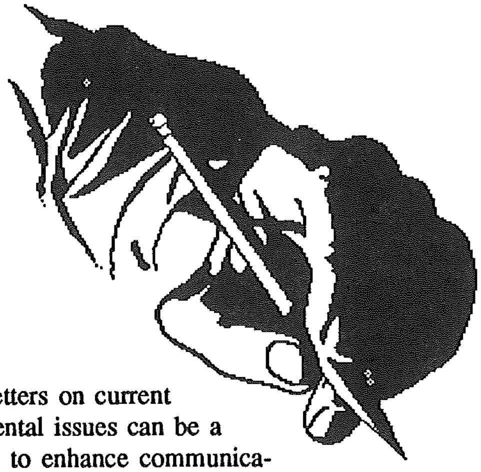
Fig. 2.12 Rotifers

The types of microorganisms and the numbers of microorganisms can be used as a guide in making activated sludge process control adjustments. Figure 2.13 can help you determine whether the mean cell residence time (MCRT) should be increased or decreased. A decline in microorganisms, especially ciliates, is frequently a warning of a poorly settling sludge. If a relatively large number of amoeboids and flagellates are observed, try increasing the MCRT. If the numbers of microorganisms are relatively low with rotifers predominating and you have a pin floc, try decreasing the MCRT.

These observations can allow an operator to detect a change in organic loading or in level of a toxic chemical before the activated sludge process becomes upset. The changes in type and number of microorganisms should be compared with observations of the settling characteristics of the mixed liquor suspended solids in the 30-minute settleability test and with the calculated food to microorganism ratio.

In summary, large numbers of ciliates and rotifers are an indication of a stable activated sludge process that will produce a high quality effluent.

Major portions of this section were taken from *PROCESS CONTROL MANUAL FOR AEROBIC BIOLOGICAL WASTEWATER TREATMENT FACILITIES*, Municipal Operations Branch, Office of Water Program Operations, U. S. Environmental Protection Agency, Washington, D. C. 20460.



Writing letters on current environmental issues can be a great way to enhance communication skills as well as to give students the opportunity to take "real" action on a problem they have studied in class. The following lesson plan has been adapted from information which appeared in the *A.P.E. Vine Newsletter*, (P.O. Box 22505, Sacramento, CA 95822) and could easily be modified to suit any topic of concern.

WRITING EFFECTIVE LETTERS

Materials Required

1. Back-up information on topic of letter.
2. Address of officials, companies, person to whom students are writing.

Objectives

1. Students will learn to express themselves on paper.
2. They will learn to identify key points of an issue, then supply supportive material and present them in a logical manner.
3. They will exercise grammatical and reasoning skills.
4. They will exercise critical thought processes.

Activities

1. In the first paragraph, identify the reason for your letter. (i.e., I have learned you are...and I feel....)
2. In the first sentence of each paragraph of the body of the letter, state one of the reasons you have taken a particular position on the matter in question.
3. Follow that introductory (or topic) sentence with facts taken from your background material that support the first sentence of the paragraph.
4. Use a separate paragraph for each of the points you want to make, using the structure described in #2 and #3.
5. The final, or concluding paragraph, should identify what course of action you would propose, and thank the recipient of the letter for his or her attention to the matter.
6. No matter how strongly students feel about a subject or an action taken by the recipient of their letters, students should express themselves cordially and politely.

AWARDS AND RECOGNITION

FLINN SCIENTIFIC ANNOUNCES CHEMISTRY DEMONSTRATION AWARD

Flinn Scientific: *Your safer source for science supplies*
PO. Box 219 Batavia, Illinois 60510
708/879-6900

The Flinn Chemistry Demonstration Award is a monetary award presented to a selected science teacher who develops or redesigns an existing chemistry demonstration to help students better understand a topic (or topics) in chemistry.
Each proposal must include a detailed description of the following:

- Chemistry topic(s) the demonstration illustrates
- Materials needed, including chemicals, to perform the demonstration. Include preparation instructions for any unique solutions or equipment.
- Step-by-step procedure
- How and why the demonstration works
- Safety requirements and precautions for performing the demonstration
- What inspired the instructor to develop this "new demo"
- References, where applicable
- Any other data the instructor feels are pertinent

Each proposal must be original in some manner. A completely new demonstration or an old one which the individual submitting the proposal has altered or added to in some way to improve the results or level of understanding.
Proposals will be evaluated using the following criteria:

- Originality
- Drama
- Safety
- Availability of materials required
- Effectiveness of improved understanding of topic discussed

Value of Award: $400.00

Application for this award is restricted to ISTA members currently teaching in the state of Illinois. Flinn Scientific, Inc. reserves the right to reprint, circulate and edit any and all entries. Authors of entries selected for reprinting will be acknowledged on any circulated materials. Entries will not be returned.

Send Flinn Chemistry Demonstration Award Application to:
Gerald Foster
DePaul University
School of Education
2323 Seminary Avenue
Chicago, IL 60614

Deadline: June 1, 1993

Lanphier High School
1300 North 11th St.
Springfield, IL 62702

SPRINGFIELD STUDENTS WIN CONTEST

Contestants from Lanphier High School earned both first and second place honors in this year's Science Scholarship Quiz Show, sponsored by the Association of Filipino Physicians of Southern Illinois. Adam Senalik captured the top award of $600, while classmate Erik Stutzman won $300.

The contestants, both seniors at Lanphier High School, also received a trophy, and a travelling plaque was awarded to their school. The dual win marks the first time in the contest's twelve-year history that a single high school has captured both top awards.

Eleven schools participated in this year's contest, which was hosted by Shelbyville High School on Sunday, November 8. The show demonstrates students' abilities in both written and oral competition on questions related to all facets of science.

Kevin Colby of the Illinois Math and Science Academy (Aurora) received third place honors of a trophy and $150.

OPPORTUNITIES

TEACHING ASSISTANTSHIPS IN OUTDOOR/ENVIRONMENTAL EDUCATION AVAILABLE FOR 1993-1994

Northern Illinois University's Faculty in Outdoor Teacher Education annually offers assistantships to qualified graduate students enrolled in the Master of Science in Education degree program based at the Lorado Taft Field Campus, near Oregon, Illinois, 100 miles west of Chicago and 35 miles west of the main campus in DeKalb.

The thirty-three semester credit master's degree program is designed to prepare individuals for leadership and teaching roles in a variety of outdoor instructional environments. Assistants enroll concurrently in internship and course credits while carrying out their responsibilities.

Twelve to fifteen assistantship positions will be filled for the 1993-1994 academic year. Employment is for nine months with a $3,375 (U.S.) stipend. A tuition waiver is granted for three consecutive semesters. Meals are furnished during the fall and spring semesters while groups are in residence, and housing with single rooms is provided for those living on campus. Assistants take a reduced load of courses, but are usually able to complete the program in one year with a full load of courses in the eight-week summer session prior to or following the academic year.

The university's field campus is a modern, well-equipped, multi-use facility for residential outdoor/ environmental programming, teaching graduate courses, and hosting weekend conference and workshop groups. Assistants are primarily responsible for teaching and coordinating elementary school groups, and university education majors who are in residence for three to five day periods.

Graduate students come from throughout the United States and beyond. In the past several years students from England, Canada, Australia, Japan, Wales, Malaysia, Sweden, and the Netherlands have graduated in outdoor teacher education at NIU. Persons not able to come for the entire year have attended the four and eight week summer sessions.

For information about the degree program, requirements, admission application, and the assistantship write or call: Dr. Morris 'Bud' Wiener, Faculty Chair, Lorado Taft Campus, NIU, Box 299, Oregon, IL 61061, USA. Phone: (815)732-2111.

MUSEUM OF SCIENCE AND INDUSTRY
57th St. and Lake Shore Drive
Chicago, IL 60637-2093
312/684-1414 FAX 312/684-7141

LEARN MORE ABOUT INFORMAL SCIENCE EDUCATION

Increase your knowledge of informal science activities by volunteering at the Museum of Science and Industry. Volunteers are needed to present "Science Connections," a flexible, activities-oriented program for Museum visitors of all ages. "Science Connections" is presented two hours each morning and afternoon on an informal, drop-in basis. Volunteers choose activities most appropriate for the mix of ages and present a program typically up to 20 minutes.

Buildings, in particular the Museum building itself, the only remaining structure from the 1893 Columbia World's Fair is the subject of the next training Friday and Saturday, March 27, 9 a.m. to 4 p.m. This includes a practice session, working on-the-job with trained volunteers, and bi-monthly evening potlucks which give volunteers the opportunity to gain information, exchange ideas and become acquainted.

Weekend volunteers are asked to donate six hours twice a month. Weekday volunteers are asked to donate six hours once a week. Benefits of volunteering include free admission to the Museum, free membership and discounts on food and gift items.

If you would like to join in on this rewarding experience, call the Museum's volunteer coordinator at 312/684-1414, Ext. 2422 for further information and an interview.

NSTA 1994 ANAHEIM NATIONAL CONVENTION

Science for All Cultures: A Golden Opportunity "You Give Us Pride"

Gerry Madrazo's Presidential theme reflects the concern and commitment of our organization while also highlighting NSTA's 50th anniversary as a science teacher organization.

The convention committee, for this golden anniversary year, encourages sessions that will reflect ways that we as science educators will prepare teachers to meet the challenge of raising children from diverse cultural to become scientifically literate citizens.

On behalf of the program committee members, we would like to invite you to submit a proposal to be considered for the program at this historic event.

For more information contact: JoAnne Vasquez-Wolf, Program Coordinator, Mesa Public Schools, 143 S. Alma School Rd., Mesa, AZ 85202-1103.

MEETINGS AND CONFERENCES

THE MED PROJECT ACROSS ILLINOIS

WHEN? **SUMMER AUGUST 2-6, 1993**
WHERE? **International Museum of Surgery, 1524 N. Lake Shore Drive, Chicago, IL 60610**
The program will be held in the museum with excursions to Chicago hospitals, medical schools, and other sites. Participants from outside the greater Chicago area will be housed in a local hotel.

WHAT IS IT ALL ABOUT?

The MED Project is a high interest, motivational summer program for high school sophomores and juniors. During a two-week program students attend classroom sessions in the museum and take excursions to hospitals, medical schools, and other sites. They meet surgeons, physicians, nurses, dentists, and other medical professionals. They see technology employed in medicine, conduct lab tests, and discuss health topics and issues.

The **Implementers Workshop** this summer will enable teachers, administrators, and youth leaders to replicate the MED Project or launch a similar program in their schools or organizations. Although Chicago has many hospitals and other medical sites, smaller communities also have opportunities to connect students to medical and health professionals. Participants in the workshop will receive an *implementers'* kit and leave the workshop with a plan for implementing their own MED Project.

WHO IS ELIGIBLE?

Any Illinois teacher, administrator, or youth organization leader who will implement a program similar to the MED Project in his/her school or community is eligible to apply. Our goal is to replicate the MED Project in schools and communities throughout Illinois. We prefer to have two people per school or organization participate in the Implementers Workshop.

HOW MUCH DOES IT COST?

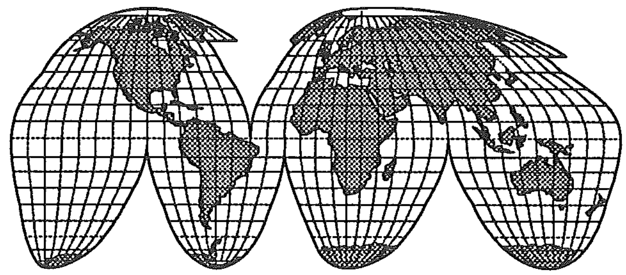
NO FEE for participants. The program has been funded by the Illinois State Board of Education Programs for Scientific Literacy. Each participant from outside of the greater Chicago area will be housed in an area hotel. All participants will receive a per diem for meals and local travel.

WANT TO KNOW MORE?

An 8-minute videotape of the MED Project is available.

HOW DO I APPLY?

CALL 312-642-6502, Tuesday through Friday, to receive an application. There is very **limited** enrollment!



National Science Foundation Sponsored EARTH AND ATMOSPHERIC SCIENCE SUMMER INSTITUTE at The University of Missouri-Rolla

The National Science Foundation has awarded a grant to the University of Missouri-Rolla to conduct an Earth and Atmospheric Science Summer Institute for secondary school teachers. The program is designed to provide an opportunity for teachers to receive formal training in environmental geoscience and atmospheric science and to increase their qualifications and capabilities for teaching responsibilities in these areas. The institute is six-weeks long, beginning June 21, 1993, and six hours of college credit may be earned by the participants. Tuition, a stipend and partial travel expenses will be paid to the participants through funds provided by NSF.

Applications are invited from teachers of earth and physical science as well as teacher of life science and mathematics, regardless of their level of knowledge in these areas. Applications also are welcome from administrators and pre-service students who are interested in teaching in the subject areas. Teachers with experience in teaching underrepresented students are encouraged to apply. For additional information about the Institute and an application form, please contact:

Dr. John Rockaway
Department of Geological Engineering
University of Missouri-Rolla
Rolla, MO 65401
(314)341-4799
FAX: (314)341-6935

"COSTA RICA - NATURALLY

Enjoy ten full days exploring the biodiversity of Costa Rica with people who share your love of nature. See Costa Rica's strong environmental ethic in action as you visit active volcanoes, cloud forests and tropical beaches. The trip includes visits to Poas Volcano National Park and Carara Wildlife Refuge, 2 days in the Caribbean lowland rainforest of the Cordillera Central including a rainforest night hike, 3 days in the Monteverde Cloud Forest Reserve, 2 days in the Pacific coastal forests and beaches of Manuel Antonio National Park, river rafting on the Rio Reventazon, and a night visit to Costa Rica's most spectacular active volcano, Arenal.

Extensive pretrip educational package, college credit available, daily lectures, expert local guides and a group leader with 17 years of environmental education experience.

Trip leader will be Chris Migliaccio, Assistant Professor of Environmental Science, Miami-Dade Community College, Miami, Florida. Chris is a published photographer and experienced world traveler who has led 3 NSTA-sponsored trips to the Galapagos Islands and Ecuador and 2 NSTA trips to Kenya. His specialty is tropical botany and ecology.

Trip cost of $1,729 per person double occupancy, Miami departure, is all inclusive except for items of a personal nature. Limit of 16 persons.

For more information and a detailed daily itinerary, contact Holbrook Travel, Inc., 3540 NW 13th St., Gainesville, FL 32609 (904)377-7111, (800)451-7111 or Chris Migliaccio, 18710 Belmont Dr., Miami, FL 33157 (305)238-5770.

Announcement and Call for Papers

The Central Section of the National Association of Geology Teachers 1993 meeting will be held on the campus of Eastern Illinois University April 16-18. A symposium centered around the theme "Challenges Facing Geology and Earth Science Field Instruction" will be held prior to a field trip. The Outstanding Earth Science Teacher will be announced at the meeting banquet.

Short papers are invited to serve as a basis for a round table discussion on topics such as: field camp/trip problems, what is needed in today's field camp, how to obtain funding and resources, general topics and locations of field trips, techniques and concepts taught in the field, and the relationship between new and traditional curricula concepts.

The goal of the meeting is to have an exchange of ideas that will help Geoscience faculty promote quality instruction at their institution. The field trip to observe Pennsylvanian and Pleistocene geologic features in east-central Illinois will afford a further opportunity for informal discussion of relevant concepts plus the chance to collect specimens.

For details and registration materials contact:

Robert B. Jorstad
Geology/Geography Department
Eastern Illinois University
Charleston, IL 61920-3099
Telephone: 217-581-6244
email: cfrbj@ux1.eiu.edu

NATIONAL HIGH SCHOOL DAY ACS PROGRAM

1. The ACS High School Day program at the National ACS meeting will be held in Chicago on **August 23, 1993.** We [Lee Marek, Nancy Zipprich and other members of CHEM WEST] are planning on bringing to the meeting speakers who have not previously given presentations in the Chicago area. The theme will be "The Theater of Chemistry." The confirmed speakers as of this writing are:

1.) John Ide from Wausau, WI who dresses as historical characters "from Chemistry past!" John also is well known for his chemistry "game shows" where he makes use of TV game shows to teach chemistry concepts.

2.) Dr. Rubin Batino from Wright State University who besides being an excellent demonstrator is o a playwrite.

3.) Bob Becker from the St. Louis area who is one of the most creative young chemistry teachers in the country. Bob will be doing a one man show for Flinn this year at NSTA. He has developed numerous creative demonstrations which are in use all over the country.

4.) *ChemSource* developers who will be there include Sister Mary Virginia Orna [ACS &College of New Rochelle], Dr. Dorothy Gabel [Co-Author of Prentice Hall Chemistry, A Study of Matter, Indiana University], and David Brooks [University of Nebraska & Doing Chemistry]. OK, you say, big deal- what is this *ChemSource*? *ChemSource* consists of *SourceBook*, a comprehensive teaching resource containing content and teaching ideas in a modular form, *SourceView*, video tapes and laserdiscs containing 21 episodes of chemistry teaching by outstanding high school chemistry teachers in their own classrooms [Frank Cardulla from Niles North High School is one of the featured teachers], and CD-ROM/HyperCard interfaced indexes, lesson planning resources, labs and a lab helper. In other words it covers all of chemistry and uses all the latest technology! It also is supposed to be inexpensive. That's all.

5.) Mike Offutt will be there with some new Chem tunes and some new cooperative learning ideas.

6.) Jean and Al Delfiner from a New York alliance group similar to CHEM WEST will speak about their alliance group and the work they are doing with IBM.

WEIRD SCIENCE may do a short set- maybe featuring more "fun" with a 55 gallon drum.

The program will be held at Roosevelt University instead of at a hotel. This allows us much more freedom to do demonstrations and use equipment without all of the usual expense and red tape [or so we hope]. There will also be a luncheon or perhaps we'll order in the famous Chicago Pizzaeria UNO's pizza. The meeting and the lunchon should be free! You may have to pay a registration fee [$10] to ACS but you will be reimbursed if you show up. We have received a grant to take care of expenses.

For more information, or if you want registration forms, contact **Lee Marek, Naperville North High School, 899 N. Mill Street, Naperville, IL 60563, 708-420-7516 after 1:30.**

GREAT NEWS!

CAROL VAN DE WALLE'S HIGHLY ACCLAIMED "CELEBRATING SCIENCE" IS NOW AVAILABLE

NEW FEATURES INCLUDE:
SEPARATE SECTIONS FOR PHYSICAL SCIENCE, EARTH SCIENCE, LIFE SCIENCE
NEWLY ADDED INFORMATION/TIPS FOR EACH ACTIVITY
NEW FORMAT FOR EASE IN FILING/ DUPLICATING

Every Elementary and Middle School teacher should have a copy of this outstanding collection at his/her fingertips. These activities represent a synthesis of dozens of the best science ideas of the Honors Science Teachers of Illinois,
presented in an attractive, easy-to-use format.

These activities:
*actively involve students
*provide concrete and real world experiences
*relate new information to old
*use science process skills and problem solving strategies
*relate well to student lives

In addition, many of these activities can be easily adapted for older students. Cost is only $14.00. This price includes all shipping and handling. All profits will go toward the cost of free ISTA promotional items (e.g., mugs, folders) for future ISTA Conventions.

To order, fill out the bottom half of this form and return with a check or money order for $14.00 made payable to Illinois Science Teachers Association. Send to:

Diana Dummitt
SPECTRUM
College of Education
University of Illinois
1310 S. Sixth Street
Champaign, IL 61820

Yes! Send me _____copy(ies) of "Celebrating Science"at only $14.00 per copy.

Name:____
Address: (name of school or business) ______________________________
(street) ______________________________
(city, state, ZIP) ____________________________
(telephone) (____) ___________
Home: (address) ______________________________
(city, state, ZIP) ____________________________
(telephone) (____) ___________

EDUCATIONAL MATERIALS

THE SUPPLEMENTAL CLASSROOM GUIDE

Edited by Elizabeth Jill Wamble

Math

Family Math Activities has a free brochure that teaches kids how to figure out everyday mathematics problems in a fun way.
National Council of Math Teachers
1906 Association Dr.
Reston, VA 22091

A History of Measurement is a big, colorful chart suitable for hanging. It traces the history of measuring things from prehistoric time to the space age. It's free to TEACHERS ONLY. Included are as follows:
*"Ford on the American Road" pamphlet with photos of automobiles from 1896
*8X10 black and white photos of Henry Ford, and both the Model A and T Fords
*"A Car Is Born" booklet on the production of the automobile
*"A History of Measurement" poster
Ford Motor Company
The American Road
P.O. Box 1899
Dearborn, Michigan 48121-1899

IBM has made math a little more fun with these posters.
*Access the Future
*You Can Do Anything!
*Be A Computer Whiz
IBM
2130 Townline Rd.
Peoria, IL 61615

Universal Technical Systems, Inc. offers a free "Mini TK" disk for either the IBM or Macintosh computer. This is a problem solving program and is very helpful in the mathematical field. Specification of Macintosh or IBM is necessary.
Universal Technical Systems
1220 Rock St.
Rockford, IL 61101

U.S. Department of Commerce has made available to the public information concerning the metric system. "Metric Measures Up," is their version of how the metric system works. More material dealing with the metric system can also be received upon request.
U.S. Department of Commerce
Office of Metric Programs
Washington, D.C. 20230

Science

The American Chemical Society offers free literature for students and teachers.
American Chemical Society
Prehigh School Science Program, Room 814
1155-16th St., N.W.
Washington, DC 20036

The American Heart Association has free material available concerning the human body. They are as follows:

CHARTS	*"Your Heart & How It Works"
	"The Circulatory System"
	"About Your Heart & Bloodstream"
PUZZLES	*How The Heart Works Puzzle (booklet)

American Heart Association
205 East 42nd St.
New York, NY 10017

An Albert Einstein Poster is available in color upon request.
Concerned Educators Against Forced Unionism
8001 Braddock Rd.
Springfield, VA 22160

"Anthro Notes" is a natural history bulletin for teachers that concerns itself with national museums.
Anthropology Outreach and Public Information Office
Department of Anthropology
Stop 112
Smithsonian Institution
Washington, D.C. 20560

Bethlehem Steel Corporation explains the making of steel in "The Steelmaking Process" and "A Quick Look At Bethlehem."
Bethlehem Steel Corporation
1170 Eight Avenue
Bethlehem, PA 18016-7699

Chemistry Adds Dimension To Your Life is a chemistry pop-up cube explaining basic factors related to the chemistry field.
Education Division
American Chemistry Society
1155 16th St., N.W.
Washington, DC 20036

"How Do People Use Lighthouses and Navigational Charts?" is a Northern New England Marine Education Project designed for Middle School and Junior High School. Contents include introduction to marine charts, navigational aids, lighthouses, and navigation. Fifteen pages of activities.
Sea Grant Marine Advisory Program
30 Coblem Hall
University of Maine
Orono, Maine 04469

The Human Heart: A Living Pump Easy to understand diagram. Other aids available.
U.S. Department of Health, Education, and Welfare
Publication No. (NIH)78-1058
National Heart, Lung, and Blood Institute
Bethesda, MD 20014

Learn How To Make Paper...At Home!Fun rainy day project for the whole family. Requires just a few things you probably have around the house. A free pamphlet tells you how.
American Paper Institute
260 Madison Ave.
New York, NY 10016

The NEED Project has combined several types of materials concerning energy. They are as follows:

<u>Local Participation Kit</u>
*The Science of Energy
*Solid Waste and Energy Museum
*Energy Conservation Contract
*Let's Talk Energy Show
*The Energy Carnival
*Energy Jeopardy Games

The NEED Project
1920 Association Drive
Reston, VA 22091

It's a Paper World is a gathering of information on how paper can be made by the average individual.
Scott Paper Company
Scott Plaza
Philadelphia, PA 19113

The Petroleum Tree Chart shows the products that are now obtainable from crude oil. It is 10 1/2 x 12 inches in size.
U.S. Department of the Interior
Bureau of Mines
Section of Publications
4800 Forbes St.
Pittsburgh, PA 15213

Real Magnet Samples are available for those interested.
Magnet Sales And MFG. Company
11248 Playa Ct.
Culver City, CA 90230-6100

Recycle This! This exciting video is on rock-n-roll and recycling and included is an information source booklet.
The Dow Chemical Company
2040 Dow Center
Midland, MI 48674

"Restless Ribbons of Sand" is a multi-colored guide that scientifically details the structure and ecology of the Atlantic and Gulf Coastal Barriers. Also available are "Hurricanes Kill!" which has a 4-step checklist to aid in preparation and "Marine Science Teaching Aid" which is full of helpful science lessons.
Louisiana Sea Grant
Communications Office
Louisiana State University
Baton Rouge, LA 70803-7507

Redwoods Forever is a beautifully illustrated book telling the story of the Coast Redwoods that grow in Del Norte County, CA.
Rellim and Miller Redwood Companies
P.O. Box 247
Crescent City, CA 95531

Renewable Energy Information has made available several informative guides to the public concerning energy.
*Solar Energy and You (Information guide)
*Learning About Energy Conservation (Booklet)
*Books on Renewable Energy for Elementary Grades (Bibliography)
Renewable Energy Information
P.O. Box 8900
Silver Springs, MD 20907

The Student Kit on Granite includes a brochure on the Rock of Ages facilities, post cards of granite quarries, and geological information.
ROCK OF AGES CORPORATION
Education Department, Box 482
Barre, VT 05641

A Free Teacher's Recycling Kit and Poster is available specifically for grades K-8.
Amaco Foam Products Company
P.O. Box 566728
Atlanta, GA 30356-6013

Environment

Acid Rain contains interesting information on acid rain available from the National Wildlife Federation.
National Wildlife Federation
1400 16th St., N.W.
Washington, DC 20036-2266

Blue Planet is a collection of information, activities, and resources on environmental and Earth Science topics for teachers of students in grades 3-12.
Office of Education
National Air and Space Museum
Smithsonian Institution
Washington, DC 20560

Earth Explorer Kit
Kit Contains:
*1,620 Wildlife Stickers (30 Sheets in all)
*8 Subject Guides with lesson plan ideas
*6 Copycat pages for reproducing handouts
*2 Discovery poster charts
National Wildlife Federation
1400 16th St., N.W.
Washington, DC 20036-2266

Earthquakes: A Teacher's Package for K-1 is an activity-based earthquake curriculum.
The National Science Teacher's Association
1742 Connecticut Ave.
Washington, DC 20009

Environmental Scorecard is a booklet that reports how members of Congress vote on various environmental issues.
League of Conservative Voters
P.O. Box 66500
Washington, DC 20077

Global Warming and the Greenhouse Effect, Acid Rain, Convection: A Current Event as well as other teacher guides are available from LHS GEMS.
Lawrence Hall of Science
University of California
Berkeley, CA 94720

Greenhouse Gas-ette Newsletter can be received by requesting it on your school's letterhead.
Climate Protection Institute
5833 Balmoral Dr.
Oakland, CA 94619

Here's How to Put Nature in a Can is a poster 14 1/2 s 11. On the backside, there is an extremely interesting learning game about cooking vegetables.
Stokley-Van Camp, Inc.
Home Economics Department
941 North Meridian St.
Indianapolis, IN 46204

Kids F.A.C.E. is a newsletter for kids instructing students on the concerns for a cleaner environment.
Kids F.A.C.E.
P.O. Box 158254
Nashville, TN 37215

Leaflets is a booklet on global warming and the greenhouse effect.
The Union of Concerned Scientists
26 Church St.
Cambridge, MA 02238

Nighttime Images contains pictures of individual continents from space.
International Dark-Sky Association
3545 North Stewart
Tucson, AZ 85716

Protecting the Ozone Layer: What You Can Do is available so that all can have the basic knowledge needed to help protect the ozone layer.
Environmental Defense Fund
527 Park Ave.
New York, NY 10010

A Safe Place is a multi-colored poster to help make your home a safer place.
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102

Save Our Streams has been compiled to help the public understand the importance of our waters. Several specific topics are listed below.
*A Stream Watcher's Stream Guide
*Activities for Kids
*Insects and Stream Quality
*Resource List
*Stream Insects And Crustaceans
*Student Projects
*Vocabulary List
*12 Steps to Cleaner Water
Save Our Streams
Izakk Walton League
1401 Wilson Blvd., Level B
Arlington, VA 22209

Think Globally, Act Locally contains ideas dealing with the issues of what we can do to address our environmental problem.
U.S. Environmental Protection Agency
Office of Public Awareness
401 M St., S.W.
Washington, DC 20460

The Waste Case is an activity-based teaching guide on trash and the environment.
Buhl Science Center
Allegheny Square
Pittsburgh, PA 15212-5363

The U.S. Department of Agriculture has made available to the public several beautifully colored transparencies, each with background information and activities. The transparencies are:
*A Soil Ecosystem
*A Soil Profile
Other materials are:
*Ag in the Classroom
*Grass Makes Its Own Food (Pamphlet)
*Soil Erosion By Water (Booklet)
*Soil Erosion By Wind (Booklet)
*Teaching Soil and Water Conservation (A Classroom & Field Guide)
U.S. Department of Agriculture
Soil Conservation Services
P.O. Box 2890
Washington, DC 20013

You Can Do It can be received by sending a postcard requesting this 16 page booklet, which lists ways each person can help improve the environment. You can also receive the theme poster of the year, and the Acid Rain Teacher's Guide made for grades 4 to 12.
The National Wildlife Federation
8925 Leesburg Pike
Vienna, VA 22184-0001

Illinois Department of Conservation

"ILLINOIS BIRDS"

Now appearing in your area!

In an effort to introduce and aid in instructing children on our state's wealth of natural resources, the Illinois Department of Conservation, in cooperation with the Illinois State Board of Education, is announcing the production of the third in a series of resource education kits: **"ILLINOIS BIRDS."** The Conservation Education Program staff has designed this kit to teach the basics about Illinois birds while instilling awareness and respect for our natural resources.

"ILLINOIS BIRDS" contains a videotape, an audiotape, a two-sided full-color poster, lesson plans and activities to supplement an existing curricula. These materials meet established State Goals for Learning in biological and physical science as well as other academic areas. Although this particular kit targets grades three through six, portions are adaptable for other grade levels. A copy of this kit has been distributed to all public and private elementary schools in the state, as well as each Educational Service Center and the county office of Soil and Water Conservation District.

Providing natural resource education for tomorrow's leaders is rapidly becoming a high priority in our country. The Illinois Department of Conservation is committed to providing quality resource education materials for teacher use in instilling conservation/environmental ethics in our students. **WATCH** for **"ILLINOIS BIRDS"** in your school!

Check with your school administrator for the location of the "Wild Mammals of Illinois" kit (grades 4-6, April, 1991) and "Kids for Trees" kit (grades K-3, April, 1992). Or, contact Illinois Dept. of Conservation, Conservation Education Program, 524 So. Second St., Springfield, IL 62701.

TEACHING THE LIFE SCIENCES TO UNDERGRADUATES

What is the role of the life sciences in liberal education and literacy? How can we cope with teaching and assessing the diverse field of biology? What are the pros and cons for survey versus in-depth courses in undergraduate life science education? How do we use new teaching strategies and technology effectively in the classroom? Where are the cost-effective, exemplary models for teaching in the life sciences? These issues will be addressed at the Conference on Strategies for Teaching the Life Sciences to Undergraduates, sponsored by the Coalition for Education in the Life Sciences. The upcoming conference, commonly referred to as CELS III, is scheduled for February 14-17, 1993, at the Marine Biological Laboratory in Woods Hole, MA. Those concerned about undergraduate life science education should attend. For more information about the Coalition or the conference, contact Amy Chang, American Society for Microbiology, 1325 Massachusetts Ave., NW, Washington, DC 20005; phone: (202)737-3600.

NATIONAL SCIENCE AND TECHNOLOGY WEEK

National Science and Technology Week (NSTW) 1993 will be observed April 25 through May 1, 1993. The theme of this NSTW links learning activities with the world of discovery and invention. The National Science Foundation and the corporate sponsors of NSTW have developed a packet of materials to encourage educators and their students to discover the natural world through science and to create technologies to improve that world. To obtain a packet of materials, write to the National Science Foundation, 1800 G Street, N.W., Room 527, Attn: NSTW Coordinator, Washington, DC 20550.

CMA EDUCATION RESOURCE GUIDE

The 1992 edition of the Chemical Manufacturers Association (CMA) Education Resource Guide has been published. The guide, which will be updated annually, lists science education programs, targeted at all levels of K-college, that are supported by CMA member companies. Included are mentor programs, plant tours, summer internships for students and teachers, equipment donation, research support, etc. as well as annual dollar contributions to science education. The guide can be used to review different methods that members of our industry are using to support science education. For additional information, contact Pat Sokoloff at 202-887-1223.

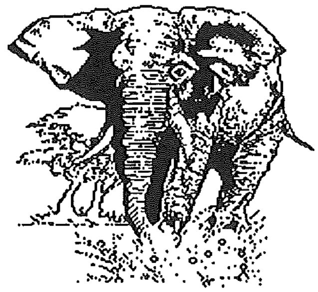
GOOD CHEMISTRY BEGINS AT HOME

Consumer questions about the impact of chemicals on human health and the environment, growing science and chemistry illiteracy and an increasing emphasis on consumer education by the consumer products industry have stimulated the Chemical Specialties Manufacturers Association to develop the CHEM-LIFE program. The information program includes the new brochure "Good Chemistry: Consumer

Products in the Home and Community." This non-technical brochure addresses the basic concerns consumers voice about chemical products. The brochure presents chemicals as the basic elements of life, explains the relationship between natural and synthetic chemicals, and underlines the importance of industry testing and labeling. A single copy is free; 2-25 copies are $0.50 each; 26-500 copies are $0.35 each; and 501-5,000 copies are $0.25 each. Contact the Chemical Specialties Manufacturers Association, 1913 Eye Street, NW, Washington, DC 20006; phone: 202-872-8110.

NUCLEAR SCIENCE EDUCATION

The American Nuclear Science Teachers Association presents the unbiased facts about nuclear science. ANSTA is a professional educational organization, providing knowledge and understanding of all aspects of nuclear physics, nuclear- and radiochemistry, and radiation biology. ANSTA is affiliated with the American Nuclear Society and is associated with the National Science Teachers Association. Current teachers with an interest in nuclear science or former teachers who were active in nuclear science education are eligible for regular membership. For further information contact American Nuclear Society, 555 North Kensington Avenue, La Grange Park, IL 60525; phone: 312-352-6611.



THE CHEMISTRY OF ANCIENT LIFE

"The Chemistry of Ancient Life," the fifth in a series about scientists and their work is now available. The booklet is designed for high school science teachers and motivated students. A single copy of the booklet is free to science teachers on individual request while supplies last. Multiple copies are $1.00 each. Booklets may be ordered by contacting the Publications Office, Carnegie Institution of Washington, 1530 P Street, NW, Washington, DC 20005; phone: 202-387-6411; fax: 202-387-8092.

CHEMISTRY CONFERENCE LISTSERVE

CHEMCONF (CHEMistry CONFerence) is a new LISTSERV (automatic distribution e-mail) list devoted to the operation of on-line computer conferences in any area of academic chemistry research and education. The first conference to be held on CHEMCONF is scheduled for June 14 to August 20, 1993, on the topic "Application of Technology in Teaching Chemistry," covering the use of computers, video, audio, films, and other technologies in the teaching of chemistry at the secondary, college, and graduate level. For more information on the LISTSERV, e-mail: LISTSERVE@UMDD.UMD.EDU in which the body of the message reads SUBSCRIBE CHEMCONF <your name>, substituting your full name for <your name>. Further instruction will be sent by return e-mail.

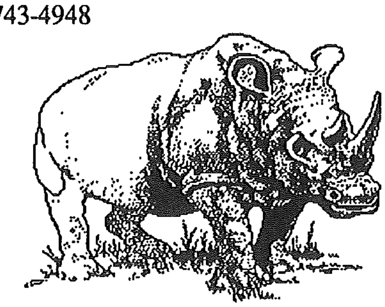
IDEAS AND ACTIVITIES FOR PHYSICAL SCIENCE

A 400-page resource full of activities for physical science courses. Contains background information, paper and pencil exercises, demonstrations, and laboratory exercises for chemistry and physics. The paper/pencil and laboratory exercises are constructed in sets—a teacher's version with explanations and answers, and a students' version without these details. Experienced and successful science teachers developed the activities. The manual also contains teaching tips and a questionnaire to assess students' attitudes toward their science courses.

Send a check, payable to <u>University of Houston</u>, for $15 plus $1.50 shipping and handling for one manual to:

Dr. Eugene L. Chiappetta
Dept. of Curriculum & Instruction
University of Houston
Houston, TX 77204-5872

Or call: 713/743-4948



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- Thought provoking ideas or commentary about science or science education
- Original research/curriculum development
- Reports of relevant personal experiences

IN FOCUS
IN FOCUS appears in every third issue of SPECTRUM. Topic is chosen by the editorial staff. Submissions are invited.

SPECIAL INTEREST
- Important news for specific audiences
- News from other science organizations

MINI IDEAS
- Instructional pieces
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Activities for professional and/or student involvement

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Your reaction to science-related books, films, audio-visuals, computer programs, curriculum materials, etc.

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Business and pleasure gatherings for science educators

AWARDS/RECOGNITION
Any legitimate honor bestowed upon educators or students of science

POTPOURRI

FIELD TRIPS/WORKSHOPS
Any relevant offerings by not-for-profit organizations

EDUCATIONAL MATERIALS
Free or inexpensive items offered by not-for-profit organizations

SUBMISSION DEADLINES

Fall	June 1 (to members in September)
Winter	September 1 (to members in December)
Spring	December 1 (to members in March
Summer	March 1 (to members in June)

GUIDELINES FOR SUBMISSIONS
- Copy should be typed or word processed in double-space format. SPECTRUM accepts word processed submissions on disk in either, Macintosh, or IBM format. All submissions on disk should be accompanied by a printed copy.
- Line drawings, glossy black and white photos and/or computer generated graphics are welcome. Receipt of all submissions to ARTICLES, IN FOCUS, MINI IDEAS, REVIEWS and POTPOURRI will be acknowledged by the associate editor.
- Submitted items, including computer disks, will not be returned unless accompanied by a self-addressed, stamped envelope.

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SPECTRUM welcomes black and white glossy photographs. We can sometimes use color pictures but they must be sharp with high contrast. Please enclose a stamped self-addressed envelope if you want your photos returned.

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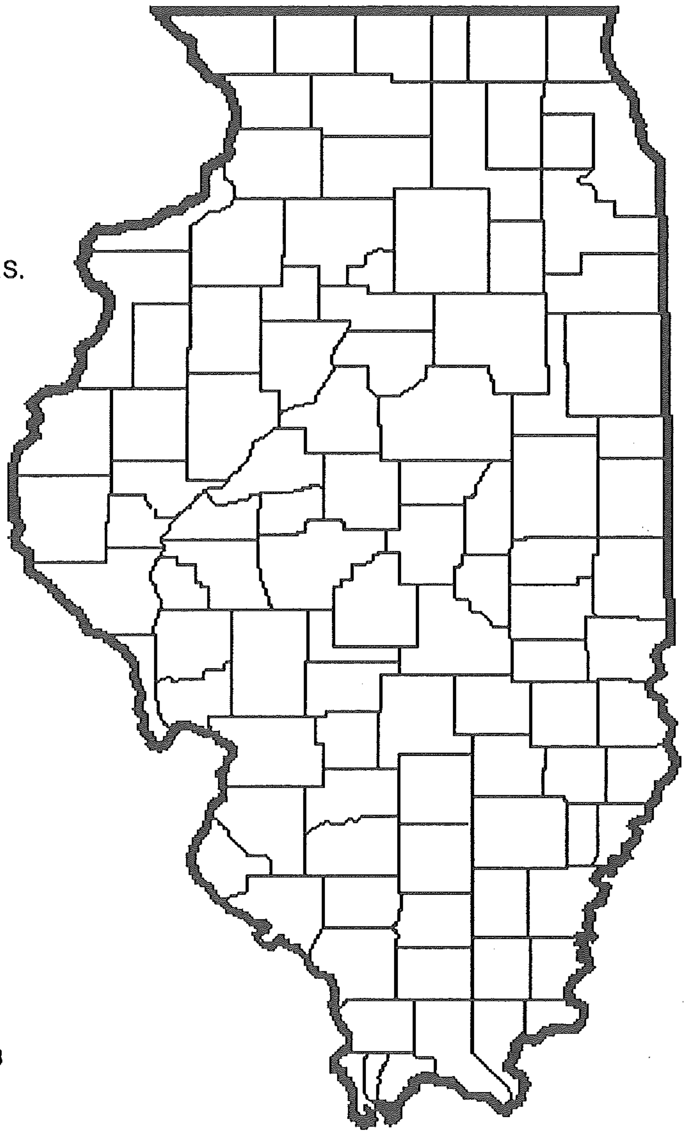

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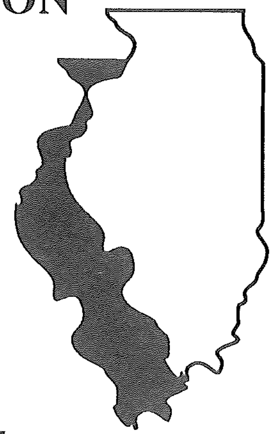

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