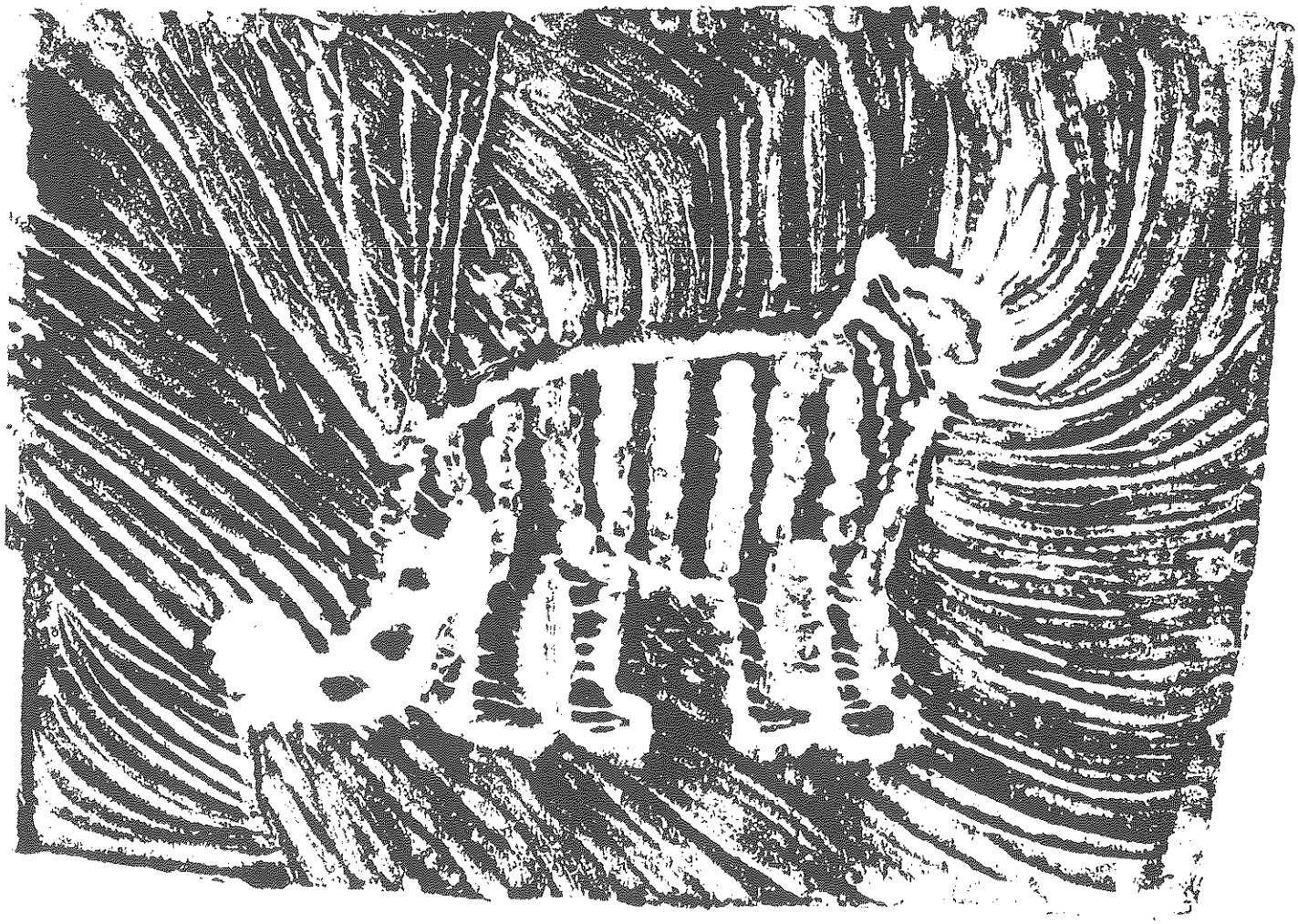
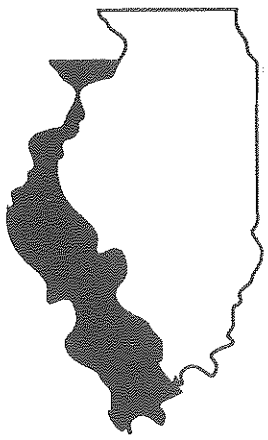
SPECTRUM

THE JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION



SUMMER 1992



ILLINOIS SCIENCE TEACHERS ASSOCIATION

SPECTRUM

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ISTA NEWS

PRESIDENT'S LETTER SUMMER 1992

Dear ISTA Colleague:

It's hard to believe that another school year has passed! I hope this past year has been a rewarding and successful one for you. This spring was a busy time for me and included attending the NSTA Annual Convention as well as chairing the spring ISTA Board meeting. I would like to share some of the highlights from these meetings with you.

One of the responsibilities of the President of ISTA is to attend the NSTA Convention, particularly several sessions devoted to CAG's (Chapters and Associated Groups). These sessions are attended by officers of state chapters of NSTA and other science education organizations. From the officers I talked to, it seems that, like ISTA, membership in state science teaching organizations has been steadily increasing over the last several years and state conferences are increasingly well-attended. One of the problems we share with other state organizations is selecting a site to hold our convention. Many states that are geographically long like Illinois hold their convention in different ends of the state on alternate years and some hold their convention in a central location each year. Both schemes have their flaws. Alternating the convention in different ends of the state means that people have a difficult time getting to the convention on the years when it is held at the opposite end. In addition to detracting from the attendance at the convention, this leads many members to skip dues payments on the years they do not attend the convention. On the other hand, consistently holding the convention in a central location detracts from the uniqueness of the convention and also makes planning tours to all of the scientifically significant areas of the state impossible. It also tends to tap (and drain) many of the same people to serve on the local steering committee each year.

One of the CAG's sessions was devoted to state newsletters. Our Associate Editor Diana Dummitt spent an afternoon exchanging ideas and techniques with her colleagues from across the country. I stopped by the session and got a chance to look at the publications of several other states and was not surprised to see that ISTA's *Spectrum* is among the best journals both in format and content. This is due to Diana's hard work and the excellent articles and teaching tips that our members send in. Keep up the good work!

For me, one of the high points of the NSTA Convention is the commercial exhibit hall. In addition to spending time looking for ideas and materials to use in my own classroom, I spent a good deal of time thanking those vendors who have been past exhibitors at ISTA Conventions as well as recruiting new vendors for future conferences.

For those ISTA members who have never attended an NSTA Convention, I highly recommend it. You may want to consider attending next year's conference which will be held in neighboring Kansas City, Missouri on April 1-4, 1993.

The ISTA Spring Board meeting was held in Springfield on April 5. Treasurer Wayne Green reported that we are in good fiscal shape although we may run slightly over budget this year due to increased expenses and our overestimation of new memberships. Wayne assured us that our reserves are healthy enough to provide a comfortable cushion, but suggested that we pay close attention to next year's budget.

Membership Chair George Zahrobsky reported that ISTA currently has about 2,100 members in good standing continuing a trend of steady growth of approximately ten percent per year. We also have several hundred individuals who have not paid dues but who we keep on our database in hopes that they will pay by the end of the year or will renew their membership next year. George likes to keep previous members on the database for a couple of years because experience has shown that members occasionally skip a year of membership when they do not attend the convention but rejoin the following year.

Jerry Dillashaw, 1991 Convention Chair, reported that we had a total registration of 1,246 at Peoria and that we made a profit of about $3,000 not including profit from the exhibit hall. Because we have made profits in recent years at our conventions and have built up a convention reserve, the Board voted not to increase registration fees for the 1992 Pheasant Run Convention. We anticipate that Pheasant Run will be a relatively expensive site so we may lose money on the 1992 convention. However, the Board felt that hard economic times would make it difficult enough for school districts to send teachers to the conference and especially difficult for those who pay their own way.

The final business of the Board meeting was to install the newly elected regional directors. They are Barbara Sandall (Region I), John Carlton (Region II), John Beaver (Region III), Gary Butler (Region IV), Paulette Burns (Region V), and Wes Heyduck (Region VI). I welcome those individuals who are new to the Board and thank those who have held office previously for their continued support of ISTA. I urge those of you who are interested in serving ISTA as an elected official or as a committee member to make yourselves known to your regional directors so they may submit your name as we search for candidates. One such opportunity will be at the 1992 convention where convention chair Doug Dirks will be setting aside time for regional directors to meet the members from their regions.

By now I feel that my letter would be incomplete without a message about my son Max who is now 21 months old and learning at an ever increasing rate. Max reminds me daily that curiosity is one of the best motivators. He is increasingly interested in how the universe around him works (as my increasingly messy house will attest!). He can spend great amounts of time tinkering with the most mundane things around the house or with more sophisticated gizmos such as the robot in the photo below. I am convinced that Max's early learning experiences will have a strong effect on his future success in school.

In closing , I would like to remind you to mark your calendar for the 1992 convention to be held October 2 and 3 at Pheasant Run and to check to see that you are current with your membership dues. I hope you have a rejuvenating summer so that you can begin the fall with renewed enthusiasm.

Sincerely,

Mark Wagner

Mark Wagner

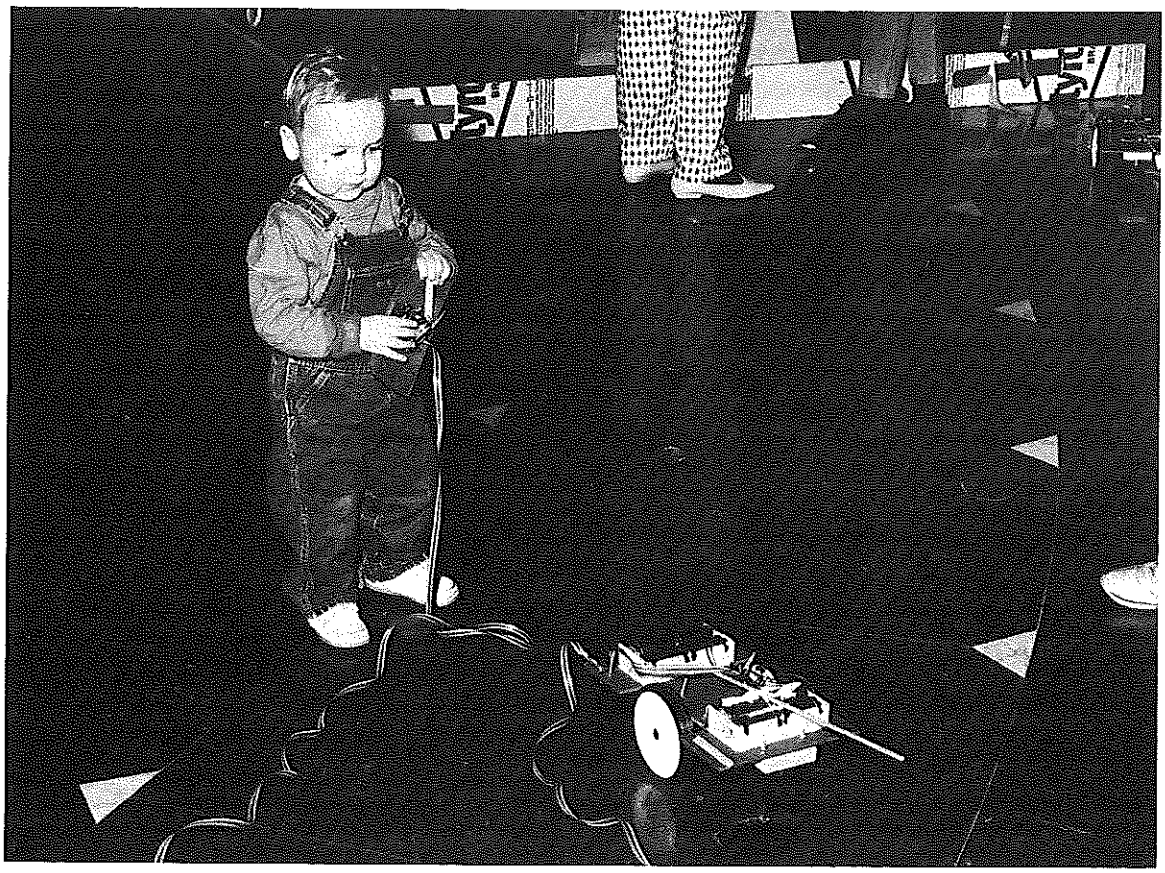
FUTURE ISTA CONVENTIONS

1992 ISTA Convention

October 2-3, 1992
Pheasant Run Resort
St. Charles, Illinois
Doug Dirks, Convention Chair

1993 ISTA Convention

Collinsville, Illinois
Rion Turley, Convention Chair



Meet your new Regional Directors... Congratulations and Welcome!

Region 1

BARBARA R. SANDALL
Teachers Academy for
Math and Science
10W 35th Street
Chicago, IL 60616
312/808-0100

Region 2

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Hononegah Community
High School
307 Salem St.
Rockton, IL 61072
815/624-8951 Ext. 52

Region 3

JOHN B. BEAVER
Western Illinois University
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Macomb, IL 61455
309/298-2065

Region 4

GARY L. BUTLER
Sangamon State University
Biology Program
Springfield, IL 62794
217/786-6630

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Pontiac Jr. High School
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Fairview Heights, IL 62208
618/233-6004

Region 6

WES HEYDUCK
Fairfield High School
300 W. King
Fairfield, Il 62837
618/842-2649

IN FOCUS TOPIC

STS IN THE CLASSROOM

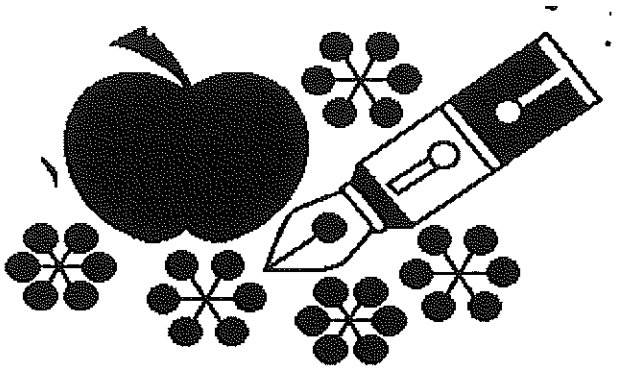
WINTER 1992

SHARE WITH SPECTRUM
HOW YOU HAVE
IMPLEMENTED
SCIENCE
TECHNOLOGY
SOCIETY
IN YOUR CLASSROOM

- MINI IDEAS THAT ARE READY TO USE
- ARTICLES ON THE IMPORTANCE OF STS IN THE CURRICULUM

DEADLINE FOR SUBMISSIONS:

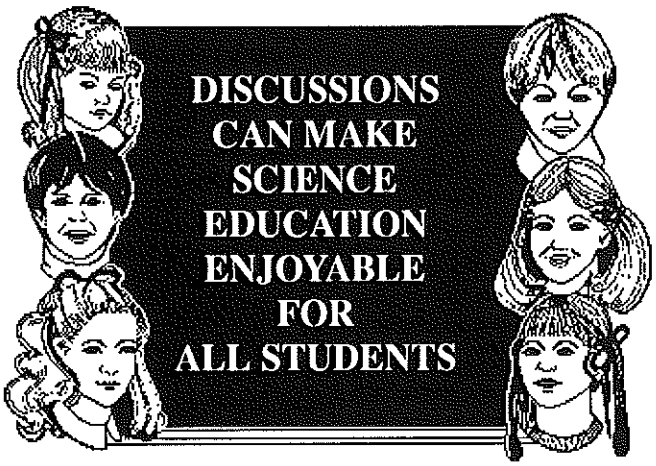
SEPTEMBER 15, 1992



ARTICLES

Dick Trent
Elk Grove High School
500 Elk Grove Blvd.
Elk Grove, IL 60007

And gladly wolde he lerne, and gladly teche.
Geoffrey Chaucer, *The Canterbury Tales*



Summer vacation, a time when students worked and played, but rarely studied: A time when teachers pursued other vocations, played and relaxed. During this time, though, a group of science and engineering professors from Cornell University went back to school for an "interesting week of poetry."

For five days, fourteen of these professors spent their mornings listening to English professors talk about Chaucer and Wordsworth and discussing the material which ranged from *The Canterbury Tales* (in Middle English) to Wordsworth's poems. The students had reading and writing assignments including three graded essays. The purpose of the experiment was to determine what makes science education difficult for some students and why students give up on science in favor of the humanities.

The results of this experiment suggested to the authors of the study some ideas about graduate and undergraduate curricula, both in the sciences and the humanities. The results also provide insight into precollege science instruction.

In the study, the students found that the most noticeable difference in instructional technique was that the humanities lecturers talked. "They wrote very little on the blackboard. They used no diagrams, no equations, no tables, not even key words or concepts. Class discussions followed unpredictable courses."

Considering the differences in subject matter this different technique seems obvious, but how do these different techniques affect the student? More concrete, logical thinkers would gravitate toward the sciences while more abstract thinking students would prefer the conversation type of presentation. The science students in this experiment were impressed by "a professor who just sat in his chair the whole time and talked, making a lucid presentation of all kinds of contexts and connections."

As a result of the experience, the students now try to be more verbal with their own classes. One "tries to paint a little bit of background for what [he] is doing on the blackboard." Another speaks more and writes less. He allows the "textbook and the homework assignments to do much more of the formula writing." A third participant said the experience made him think about his teaching style. He realized the discussion type of presentation is missing in science education and summarized the experience by saying "we need to change the way that we teach engineering to make it an enjoyable experience for students and *not just something they have to suffer through*" (emphasis added).

Science lecturers need to consider all types of learners while teaching. Educational psychologist Jean Piaget would say that secondary school students are entering or have already entered the Formal Operations stage of development. Students now are able to extend their thoughts to abstract ideas. They are able to problem solve by going through a logical sequence of steps and they can apply their thoughts to possibilities rather than just to the concrete. Piaget says that mental and physical activity produces cognitive growth. We must do more than make students observe, more than just lecture. Educational psychologist Jerome Bruner would agree. He says that people learn best when they are shown the big picture. People must understand the structure of the subject. Bruner says that when learning includes the structure, the material is remembered longer. The results of this Cornell study go hand in hand with these thoughts on learning. Discussions allow the students' minds to explore the structure of the subject more than simply copying equations off the board.

One teaching technique which might come from this study could include a lecture format of discussion of the concept followed by a summation with notes and equations. If we are to achieve a greater range of scientific literacy among our population we must communicate with our students in a manner which they can follow, understand and enjoy.

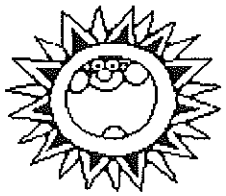
In terms of content, one of the biggest surprises for the Cornell students was the similarity between thinking about literature and science. The students noticed "that the search for 'layers of meaning' was not unlike what they have to do in science." Often at the precollege level we ignore these layers and the connections of topics, or we, as instructors,

understand all the connections but do not communicate these to the students. Most of the beauties of math and science reside in the connections between our "disciplines" and between the "chapters of the book." For example, chemistry is often called "the study of matter." It is not called the study of electrons, balanced equations and energy. We must conscientiously show the big picture of how these individual topics relate to matter and to each other. We must be careful not to keep these interrelationships to ourselves.

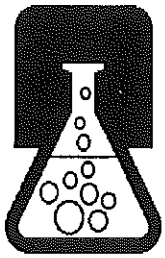
We must also not come in with all the answers. If we allow the students to unearth the layers they will remember and understand the material more fully. We understand that the theories and laws we teach are simply approximations of the truth and ambiguities are presented by the facts, but do we convey this knowledge to our students? The students must be allowed to see the facts, the ambiguities and the connections in order to get an understanding of the basis for the laws and theories. For example, chemistry teachers teach the ideal gas law, but gasses are not always ideal. Often our answers are not correct, just more correct than some other explanations. A discussion of the ambiguities and contradictions provide an excellent opportunity for the humanities-like discussions found missing in science education.

Science teachers often avoid open-ended discussions in favor of the blackboard lecture because of the perceived need to cover mountains of material. One participant in the exercise noted that "building up a basic competence [in science] takes a long time because everything is connected in a tightly woven structure, you can get quite far in appreciating a poem because it's relatively short, discrete and sits by itself on a page. There's much less baggage required." Is it possible to break science into short, discrete units? Probably not, but finding the not so short connecting threads in our material might solidify our teaching. In chemistry, we teach atomic structure, bonding and the periodic table. All depend on the electron. Could this electron be the thread for these units? Would following the thread explicitly help in understanding?

These are not ethereal observations that come from this experiment. They are simply observations that need to be considered when preparing a lesson. Much has been said about science education and teaching techniques lately. We have been inundated with learning aids and new textbooks. Maybe a thought on our part about our individual situations, though, would also go a long way to improving our classrooms. Just like Chaucer's clerk, we must learn from our experiences, possibly changing our styles if we are to be good teachers. I have presented some things to consider which might help. Think about it.



Jerry W. Ellis
Eastern Ill. University
Illinois Association of Chemistry Teachers Newsletter



WHO IS GOING TO TAKE THE FIRST STEP?

Much has been said and written recently concerning the current status of chemical education. The gist of most of this rhetoric is that the current texts and courses are too long, too abstract and too advanced, and therefore overwhelming for many students. (For example, see the Winter 1991 *ChED Newsletter*, page 18.) Even the (at-least-to-some) sacred Chem Study approach has come under attack. (See Barrow, G. M., *J. Chem. Ed.*, 1991, *68*, 449.) For the high school scene, *Chemistry in the Community (ChemCom)* seems to be on the right track. And for the college non-science student, a team headed by A. Truman Schwartz is developing a new text, *Chemistry in Context* which appears to be the college level counterpart to *ChemCom*. (See the Winter 1991 *ChED Newsletter*, page 20, or *Chemunity News*, 1, no. 4, November 1991, page 17.)

The next step might be to offer a different freshman text for the college chemistry major. The same rhetoric seems to exist for this level and I hope a new text is underway, but this may be a bit more difficult. It has been suggested that some of the current texts seem to have been written (or adopted) more to impress one's peers across the country than to serve the students. For the thirty years or more the trend has been bigger and better as with most of the other facets of our society. Bucking this trend will take some courage. Who will take the first step? Who will write a text that does not include all those neat topics that have been gradually added over the years in a sincere and true spirit of innovation? Who will leave out the factor method for solving problems and attempt to return to understanding? Who will ask, "What is wrong with using equivalents?" Who is going to take the first small step backwards for the textbook authors and the great step forward for chemical education?

In all fairness I must confess that I have not taught freshman chemistry lectures for almost twenty years but I do teach a laboratory section periodically. Most of my efforts are in teaching organic chemistry. The same predicament exists in beginning organic texts. More and more has been added over the years. However in the case of organic, the "short course" texts seem to serve as a diversion to defuse the situation a little. It is interesting to note that in a recent letter to teachers concerning the new Sixth Edition of the famous Morrison and Boyd text, the publishers state, "the authors have carefully deleted more than 150 pages of unnecessary material." It sounds like someone is listening...At all levels, let's put the fun back into chemistry!

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STATE INDICATORS IN SCIENCE AND MATHEMATICS EDUCATION: A COMPARISON OF ILLINOIS AND OTHER STATES

The Council of Chief State School Officers (CCSSO) has issued a report, *State Indicators of Science and Mathematics Education 1990*, that provides the first state-by-state data on key indicators of the condition of science and mathematics in schools. This report is a product of the CCSSO Project on Science and Mathematics Indicators, supported by a grant from the National Science Foundation. The project identified two objectives: (1) to improve the quality and usefulness of data on science and mathematics education, so state policymakers and program managers can make more informed decisions; and (2) to define and implement a set of indicators, national and state level analyses of progress in improving science and mathematics education.

Two sources of data were used. First, state departments of education complied data on students and teachers in public schools and reported these data using common definitions and categories, including course enrollment data from 38 states and teacher data from 47 states. Second, data from the National Center for Education Statistics' Schools and Staffing Survey were analyzed to obtain additional indicators. Additional reports will follow, with increased state participation and with the inclusion of other indicators, such as data on implemented curriculum.

This article presents summaries of national and Illinois data for the key CCSSO indicators, thus providing a basis for comparison for Illinois mathematics and science educators.

Part I. Instruction and Participation in Science and Mathematics

Course Taking in Mathematics.

As of the 1989-90 school year, it is estimated that nine percent of public high school students in the U.S. take calculus by the time they graduate. Nationally, 49 percent take Algebra II, and 81 percent take Algebra I. (Refer to Table 1). Two percent of students take advanced placement calculus. (Refer to Table 2.) These statistics are based on state course taking data reported by common categories and definitions. Course taking varies by state at all levels, e.g., the proportion of students taking Algebra II varies among states from 65 percent to 33 percent. High school mathematics courses taught with an integrated curriculum approach are incorporated in the state indicators.

In Illinois nine percent of students take calculus; 39 percent take Algebra II; and 77 percent take Algebra I. (Refer to Table 1.)

Course Taking in Science.

Using 1989-90 state course taking data in science, it is estimated that 20 percent of public high school students in the U.S. take physics by the time they graduate, 45 percent take chemistry, and 95 percent take biology. (Refer to Table 1.) The proportion of students taking chemistry varies by state from 62 percent to 33 percent. Enrollments in advanced placement courses are two percent in biology, one percent in chemistry, and less than one percent in physics. (Refer to Table 2.)

In Illinois 20 percent of public school students take physics; 40 percent take chemistry; and 78 percent take Biology I. (Refer to Table 1.)

Table 1.

Secondary Students in Science and Mathematics Courses: Illinois and the United States (Public Schools, 1989)

Mathematics Courses Taken	USA	Illinois
Algebra I	81%	77%
Algebra II	49%	39%
Calculus	9%	9%
Science Courses Taken		
Biology I	95+%	78%
Chemistry I	45%	40%
Chemistry I	45%	40%
Physics	20%	20%

Source: CCSSO, State Education Assessment Center, Washington, DC, 1990

Table 2.

A Comparison of Illinois and United States Twelfth Grade Students' Enrollment in Advanced Science and Mathematics Courses (Public Schools, 1989)

Advanced Courses	USA		Illinois	
	Advanced Placement	Second Year	Advanced Placement	Second Year
Calculus	2%	7%	1%	8%
Biology	2%	16%	N.A.	14%
Chemistry	1%	3%	N.A.	4%
Earth Science	N.A.	4%	N.A.	.9%
Physics	.5%	1%	N.A.	9%

N.A. = Data Not Available
Source: CCSSO, State Education Assessment Center, Washington, DC, 1990

Elementary Instruction.

Elementary teachers report that they spend 4.9 hours per week on mathematics and 3 hours per week on science in grades 4-6 in the median state. The state figure for mathematics vary from 4.1 hours to 5.5 hours per week, and the time spent on science varies from 2.2 to 4.1 hours per week. (Refer to Table 3.)

In Illinois elementary teachers report they spend 4.6 hours per week on mathematics in grades 1-3 and 4.8 hours per week in grades 4-6. For science 2.2 hours are reported in grades 1-3 and 3.3 hours per week in grades 4-6. (Refer to Table 3.)

Table 3.

A Comparison of United States and Illinois Weekly Instructional Time for Elementary Science and Mathematics (Public Schools, 1989)

Subject	USA (Median State)	Illinois
Science		
Grades 1-3	2.3 hrs/wk	2.2 hrs/wk
Grades 4-6	3.0	3.3 hrs/wk
Mathematics		
Grades 1-3	4.8 hrs/wk	4.6 hrs/wk
Grades 4-6	4.9 hrs/wk	4.8 hrs/wk

Source: CCSSO, State Education Assessment Center, Washington, DC, 1990

Part II. State Policies and Course Taking in Science and Mathematics

The state indicators on high school course taking as of 1989-90 confirm other research showing *increased* enrollments in science and mathematics during the 1980s when state graduation requirements were raised in many states. State course taking rates show somewhat higher enrollments at all levels but the largest increases were at the level of Algebra I (to 81 percent of students) and first year biology (to 95 percent of students).

State Policies and Mathematics.

Eleven states require from two and a half to three mathematics Carnegie credits for graduation; 20 states, including Illinois, require two credits; and four states have no requirements. The states requiring from two and a half to three credits of mathematics have a median of 10 percent more students taking mathematics courses than states requiring two credits or less. However, the high requirement states have a median of only two percent more students taking upper level mathematics courses, e.g., geometry through calculus. These results indicate that, on average, higher state graduation requirements do not necessarily lead to substantially more students taking upper level mathematics courses.

The median state reports 91 percent of students taking mathematics; 35 percent taking upper level mathematics; and 34 percent taking review and informal mathematics. Illinois reports 70 percent of students taking mathematics; 33 percent taking upper level mathematics; and 16 percent taking review and informal mathematics. (Refer to Table 4.)

Table 4.

A Comparison of Illinois and Other States By Percent of Students Taking Mathematics Courses in Grades 9-12 (Public Schools, 1989)

Credits Required	Taking Mathematics	Taking Upper Level Mathematics	Taking Review & Informal Mathematics
2.5-3 Credits (11 states)			
Median State	91%	35%	34%
2 Credits (20 states)			
Median State	81%	33%	26%
Illinois	70%	33%	16%
0 Credits (4 states)			
Median State	74%	36%	17%
Total (35 states)	84%	34%	27%

Source: CCSSO, State Education Assessment Center, Washington, DC, 1990

State Policies and Science.

Five states require two and a half credits of science for graduation; twenty three states require two credits; and seven states, including Illinois, require one or no credits. The five states requiring two and a half to three science credits have a median of nine percent more students enrolled in science than state requiring two or fewer credits. The high requirements states have a median of four percent more students taking upper level science courses, e.g., chemistry, physics, and advanced biology. There is some evidence that a science graduation requirement above two credits is related to more upper level science course taking, but the data are not conclusive because of the small number of states with higher science requirements. (Refer to Table 5.)

The median for all states indicated that 72 percent of students are taking science; 21 percent are taking upper level science; and 23 percent are taking introductory science. In Illinois 56 percent of the students are taking science; 19 percent are taking upper level science; and 15 percent are taking introductory science.

Table 5.

A Comparison of Illinois and Other States ByPercent of Students Taking Science Courses in Grades 9-12 (Public Schools, 1989)

Credits Required	Taking Science	Taking Upper Level Science	Taking Introductory Science
2.5-3 Credits (5 states)			
Median State	80%	25%	29%
2 Credits (23 states)			
Median State	71%	21%	24%
1 or 0 Credits (7 states)			
Median State	71%	20%	22%
Illinois	56%	19%	15%
Total (35 states)	72%	21%	23%

Source: CCSSO, State Education Assessment Center, Washington, DC, 1990

Gender Differences. Girls and boys in all 16 states that reported data by gender have almost equivalent rate of enrollment in science and mathematics courses up to advanced course levels. In most states, boys have higher enrollments in physics and advanced mathematics courses, e.g., trigonometry and calculus, and girls have higher enrollments in advanced biology courses.

Part III. Teacher Quality and Teacher Supply and Demand

In grades 9-12, there are a total of approximately 111,000 teachers of mathematics and 102,000 teachers of science in the 50 states and D.C. In Illinois there are 3,745 mathematics teachers and 3,791 science teachers. One of the central objectives of national and state education policy of the 1980s was the improvement of the quality of teachers. The National Science Board (1983) and the Carnegie Forum on Education and the Economy (1986) identified the problem of underqualified teachers in science and mathematics and impending teacher shortages. The National Science Teachers Association (1984) reported that 30 percent of all secondary science teachers were severely underqualified or unqualified. Although state initiatives during the 1980s such as alternative certification programs have mitigated predicted teacher shortages, attrition rates still run between four and five percent and shortages are still present in the harder to hire fields of chemistry and physics.

Teacher Preparation — Teaching Out-of-Field.

One indicator of teacher shortage and/or teacher preparation is courses taught by teachers not certified in that field, i.e., out-of-field. Among teachers in 30 reporting states, nine percent of high school mathematics teaches are not certified in math, and eight percent of biology teachers, eight percent of chemistry teachers, and 12 percent of physics teachers are not certified in these fields. State-by-state data show that some states have 20 to 30 percent of mathematics and science teachers assigned out-of-field while others have none out-of-field. Data indicate that states with many rural, small high schools (e.g., Illinois) tend to have more teachers placed out-of-field. Further, teachers with secondary assignments, particularly in chemistry and physics are less likely to be certified in that field. Illinois data indicated that 21 percent of its mathematics teachers, 22 percent of its biology teachers, 16 percent of its chemistry teachers, and 19 percent of its physics teachers were teaching out-of-field.

Table 6.

A Comparison of the Percentages of Mathematics and Science Teachers with Specific versus Broad-Field Certification (Public Schools, 1989)

	Certified in Specific Field	Certified in Broad Field	Assigned Out-of-Area
Mathematics	81%	——	9%
Biology	61%	31%	8%
Chemistry	57%	45%	8%
Physics	50%	38%	12%

Source: CCSSO, State Education Assessment Center, Washington, DC, 1990

Table 7.

A Comparison of the Percentages of Mathematics and Science Teachers with Specific versus Broad-Field Certification in Illinois By Primary Assignment (Public Schools, 1989)

	Certified in Specific Field	Certified in Broad Field	Assigned Out-of-Area
Mathematics	****	75%	21%
Biology	0%	75%	22%
Chemistry	0%	84%	16%
Physics	0%	79%	19%

Source: CCSSO, State Education Assessment Center, Washington, DC, 1990

College Majors

Forty-two percent of all high school teachers of mathematics have a mathematics major, and 54 percent of all teachers of science majored in a science field. The percent of teachers with majors in mathematics varies by state from 20 to 62 percent, and in science from 31 to 73 percent. In Illinois 67 percent of all mathematics teachers had a college major in mathematics or mathematics education. For science 63 percent of all science teachers had a college science or science education major.

Equity in the Teaching Force — Gender.

The majority of high school science and mathematics teachers are male, but the gender distribution varies by field. Forty-five percent of mathematics teachers are female, while 22 percent of physics teachers are female. The percent of female teachers in mathematics varies by state from 21 to 69 percent, and the percent of female teachers in physics varies by state from 10 to 49 percent.

Fifty-eight percent of Illinois mathematics teachers are male and 42 percent female. Of Illinois science teachers, 34 percent of biology teachers, 30 percent of chemistry teachers, and 13 percent of physics teachers are female. (See Table 8.)

Table 8.

A Comparison of the Gender of United States and Illinois Science and Mathematics Teachers (Public Schools, 1989)

	USA		Illinois	
	Male	Female	Male	Female
All High School Teachers	50%	50%	55%	45%
Mathematics	55%	45%	58%	42%
Biology	63%	37%	66%	34%
Chemistry	66%	34%	70%	30%
Physics	78%	22%	87%	13%

Source: CCSSO, State Education Assessment Center, Washington, DC, 1990

Race/Ethnicity. State data on the race/ethnicity of science and mathematics teachers show that there is a wide disparity between the supply of minority science and mathematics teachers and the proportion of minority students in virtually all states.

Table 9.

Minority Teachers in Science and Mathematics in Texas and the United States (Public Schools, 1989)

	Mathematics	Biology	Chemistry	Physics
USA	11%	10%	7%	5%
Illinois	11%	11.3%	7.5%	4.3%

Source: CCSSO, State Education Assessment Center, Washington, DC, 1990

Current Teacher Supply — Primary Assignments.

State indicators of science and mathematics teachers are reported by primary vs. secondary assignments. In the median state, 82 percent of high school teachers of mathematics have their primary assignment in mathematics; 63 percent of teachers of biology have their primary assignment in biology; 52 percent of chemistry teachers have their primary assignment in chemistry; and 24 percent of teachers of physics have their primary assignment in physics. In Illinois data concerning the primary assignment of mathematics and science teachers were not reported.

Teacher Age.

Based on state data, 19 percent of high school mathematics teachers and 22 percent of science teachers are over age 50. By comparison, 21 percent of all high school teachers are over age 50. The proportion of mathematics and science teachers over age 50 varies by state from 10 percent to over 30 percent. In Illinois 66 percent of all mathematics were between 30-49 and 23 percent were over age 50. Sixty percent of chemistry teachers were between 30-49 and 30 percent were over age 50. Fifty six percent of physics teachers were between 30-49 and 32 percent were over age 50.

School Conditions — Class Size.

The average class size in high school mathematics is 21 students per class, and the average class size in science is 22 students per class. These figures compare with an average class size in high school English of 22 students per class. States vary in average mathematics class size from 14 to 29 students and in science class size from 15 to 28 students.

The average reported Illinois class size was 23 in mathematics and 23 in science.

In Closing.

The intent of this article is to present summaries of important data that characterize the status of science and mathematics education nationally and in Illinois. Copies of the entire CCSSO report can be obtained from the Council of Chief State School Officers, State Educational Assessment Center, 400 North Capital Street, Suite 337, Washington, D.C. 20001 at a cost of $12 per copy.

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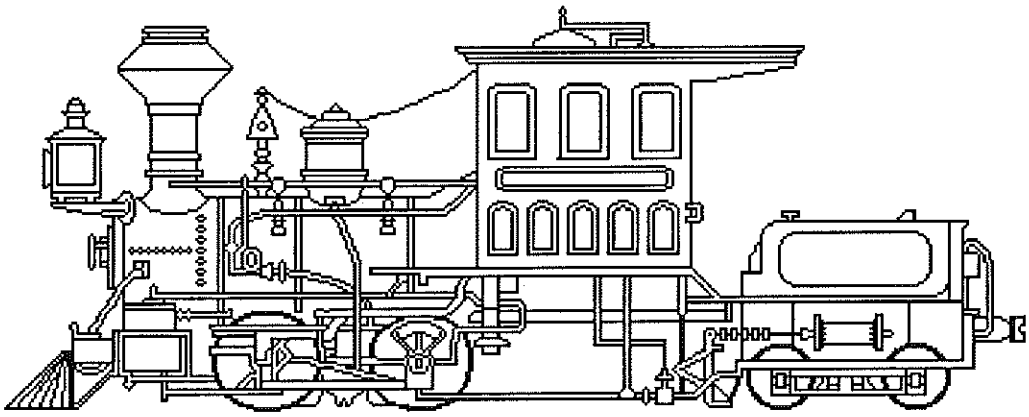

Moving?

Keep Your Spectrum Coming
Send Address Changes to:

George Zahrobsky
Membership Chair
Glenbard West H. S.
670 Crescent Blvd.
Glen Ellyn, IL 60137

SierraEcology, *Sierra Club Newsletter*
Tony DeHaan
Age 13, 7th Grade

THE DESTRUCTION OF PLANET EARTH

I am garbage.
The earth will soon be mine.
I live in the past, the present, and the future.
I am in the oceans, on the streets, and in the air.
I am everywhere.

I am garbage.
I am constantly being fed.
My allies are people, factories, and government.
I am growing and will someday destroy the earth.
No one will stop me.

I am garbage.
The earth is cluttered with me.
I am buried, dripped, or even dumped.
The land and sea are full of me.
I spread around the earth.

I am garbage.
My only weakness is caring people.
Conservation slows me by recycling what is mine
An educated and caring youth scares me.
The earth is mine . . . or is it?

SPECIAL INTERESTS

BLUEBIRDS

Bluebirds have been a symbol of happiness, hope, love and the onset of spring in song, poetry and prose probably for as long as humanity has been expressing itself in those mediums.

For centuries, man has sought to lure this colorful and sweet-singing member of the thrush family to share his living space by using nesting containers of one kind or another. For example, explorers reported seeing birdhouses made of hollowed gourds in the camps of Native American tribes.

In North America, there are three species of bluebirds—eastern, western and mountain. It is the eastern bluebird that is found in Illinois and throughout the nation east of the Rocky Mountains.

The flash of the eastern bluebird's brilliant plumage once was commonly seen everywhere in its range. That situation began to change at the turn of the century and the bird's population continued to decline until about a decade ago.

Reasons for the decline of the eastern bluebird include widespread use of pesticides and other chemicals, destruction of the bird's nesting habitat, and the introduction of the house sparrow into North American in 1851 and the starling in 1890.

Unlike other thrushes, the eastern bluebird is a cavity nester. Neatness and progress in agricultural practices during the past 100 years produced a crisis in nesting sites for the bird. Farmers began using metal and concrete fenceposts, rather than wood posts which rotted quickly and provided hollows for nesting. Farmers, orchardists, woodland owners and other landowners felled dead trees and pruned low-hanging hollow limbs. Forests were cut down for profit, expanded agriculture and urban development.

The aggressive sparrows and starlings have added to the bluebird's nesting problems. Both species took over much of the bluebird's natural nesting habitat and also ousted it from rafters in barns as well as from nooks and crannies under the eaves of homes. Worse, a sparrow seeking a nest site sometimes invades a cavity containing a nesting bluebird and kills the occupant, destroys its eggs, then builds a nest on top of the carnage.

In addition, the interlopers from Europe, who will eat almost anything, also created feeding competition for the more fastidious, insectivorous bluebird.

Worse than the loss of nesting accommodations and competition from sparrows and starlings was the exuberant use of pesticides since 1900 in farming and in many other applications. Not only was the bluebird's food source heavily reduced, the birds also were poisoned when they ate pesticide-contaminated insects. Sometimes, nestlings or nesting adults died when they were sprayed.

The turnaround in the eastern bluebird's population decline has occurred largely because of the widespread interest of the public in building nesting boxes for the birds. Thousands of these boxes have been built in Illinois during the past 10 years as a result of the bluebird workshops made possible by taxpayer donations to the Non-game Wildlife Conservation Fund on the IL-1040 Line 15a. Bluebird numbers here have shown a notable increase. Similar results are reported nationwide.

Eastern bluebirds are between 6 1/2 to 7 1/2 inches long and weigh about an ounce. Their most identifying feature is their color—bright blue wings, back and head, which literally glow when sunlight strikes them, plus a rusty-colored breast and white belly.

Nesting occurs between mid-March and early May. A pair may produce two families of three to six young. The male finds the nest site, but the female makes the final decision on its acceptance. She may reject several.

For more information on Bluebird nesting boxes contact:

Illinois Department of Conservation
524 S. Second Street,
Springfield, IL 62701-1787

Harry Hendrickson
ENR Groundwater Education Coordinator
325 West Adams, Room 300
Springfield, IL 62704-1892

This article is second in a 12-part informational series on groundwater presented by Illinois departments concerned with groundwater quality and public safety. The subjects discussed in the series and the sponsoring agencies are listed below:

- *What is Groundwater? - Geological Survey Division, Department of Energy and Natural Resources*
- *Is Your Water Safe? - Water Survey Division, Department of Energy and Natural Resources*
- *Hazards to Groundwater In and Around the Home - Department of Public Health*
- *The Dangers of Fuel Storage Tanks - Office of the State Fire Marshal*
- *Livestock Waste Management - Department of Agriculture*
- *Septic Systems and Groundwater - Department of Public Health*
- *Sealing Abandoned Wells - Department of Public Health*
- *Creating a New Well - Department of Public Health*
- *Well Maintenance - Department of Public Health*
- *What if the Water is Bad? - Cooperative Extension Service*
- *Ag Chemicals in My Water? - Department of Agriculture*
- *Series Wrap-Up and Who Can Help? - Department of Energy and Natural Resources*

For additional information or clarification on the water quality issues discussed in the following article, please call the author at the telephone number listed at the end. For more information on the series, contact Harry Henderson at the above address.

See page 28 of this issue of SPECTRUM for an activity "Trouble in Bitter Creek" related to water quality.

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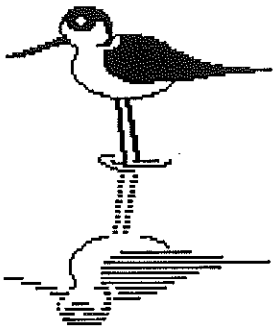
IS YOUR WATER SAFE?



Probably the words most frequently heard by a chemist or lab manager when a well owner brings in a sample of water to be tested are, "I just want to know if it's safe!" These days, people are highly conscious of their health and what they are consuming. They want to know that their air, food, and water supplies are free of contaminants that could change or shorten their family's lives.

98% of wells in Illinois are privately owned supplies.

Folks who get their drinking water from a public water supply may not have to worry quite as much about their water quality as those who have a well in their back yards. Public water supplies are regulated by federal and state standards. When these standards are not met, the utility is required to notify its customers of the problem. However, the 1.3 million Illinoisans who drink from their own wells have to take the responsibility for checking their water quality themselves. How do they decide whether their water is contaminated or not? How much contamination can they allow in their well water before they must be concerned about it? And where is the contamination coming from, anyway?

How does water become contaminated?

One definition of contamination may be that which makes the water unfit for a particular use. In the case of drinking water, then, a contaminant would be anything that makes the water unpleasant or unhealthy to consume. Bad odors or tastes can make the water unpleasant. Nobody enjoys drinking water that smells like rotten eggs or tastes salty or bitter. On the other hand, some contaminants that cannot be seen, smelled, or tasted can be a danger to health. Many bacteria, trace metals, organics, etc., can go undetected by human senses but can cause sickness or even death.

Contaminants can be found in water due to human activities or may occur in water naturally. As rain water seeps into the ground it dissolves minerals and nutrients from the soil and rocks. Anything that is normally found in he earth's geology can end up in well water. Likewise, anything that has been spread upon the earth's surface or buried in the soil by man can also be picked up by rain or surface water and end up in the well water.

What are some examples of contaminants?

The Federal Safe Drinking Water Act (SDWA) limits the kinds of contaminants and the amount of the contaminant that are allowed in public water supplies. The Environmental Protection Agency has also issued Health Advisories for some contaminants that may not be regulated by the SDWA. These two resources provide good guidelines by which to evaluate the private well water of rural citizens. Some of the contaminants are measured in milligrams per liter (mg/L). An equivalent expression is parts per million (ppm). Other contaminants are measured in micrograms per liter (pg/L), also known as parts per billion (ppb).

1 mg/L = 1 ppm; 1 mg/L = 1 ppb; 1 ppm = 1000 ppb

1 ppb = 1 drop of water in 13,210 gallons of water

(equivalent to a 24' x 4' round swimming pool)

Contaminants that can be found naturally in water include radon gas and radium. These are products of radioactive decay and are known to be carcinogens. Some trace metals occur in nature. Arsenic, barium, cadmium, mercury, and silver can be found in geologic formations and may affect the nervous system, the circulatory system, and some organs. Coliform bacteria are indicators of the sanitary quality of water. Although these bacteria are found almost everywhere, their presence in well water indicates possible contamination by organisms that can cause gastroenteritis as well as typhoid fever, cholera and other infectious diseases.

Although nitrates can be found naturally in well water, any amount near the SDWA limit of 10 ppm as N is usually due to the actions of man. Large amounts of nitrates in water are probably due to nitrogen fertilizers or to human or animal wastes. Infants are most susceptible to nitrate poisoning, in which a condition known as methemoglobinemia can occur. Pesticides spread by man can work their way into groundwater and cause nervous system and organ disorders Solvents and cleaning agents such as benzene and carbon tetrachloride might contaminate well water from leaking storage drums or improper disposal and are possible carcinogens. Lead in drinking water can cause nervous system damage and is usually due to corrosion of plumbing system materials.

People are not the only creatures concerned with safe drinking water. Livestock and pets need water free from contaminants if they are to survive and reproduce. Rural water well users must take the initiative to see that they protect their water supply from contamination and must routinely make a check of their well water quality. These actions will help ensure that they are not jeopardizing their health or livelihood.

For more information obtain a copy of "Safe Drinking Water: Testing and Treating Home Drinking Water" from your local Cooperative Extension Service Office or contact your local health department.

National Mole Day Foundation Inc.
1220 South 5th Street
Prairie du Chien, Wisconsin 53821
Maurice Oehler, President

The National Mole Day Foundation was born in the spring of 1991. It was organized to encourage all persons, young and old, students and non-students, to get excited about chemistry, especially by celebrating Mole Day each year on *October 23rd.* (The date comes from Avogadro's number (6.02×10^{23}) and is appropriately celebrated from 6:02 a.m. to 6:02 p.m. on 10/23.)

A group headed by Maurice Oehler, a long-time chemistry teacher in Prairie du Chien, Wisconsin, formed the National Mole Day Foundation as a way to make Mole Day national. The National Mole Day Foundation is a non-profit organization operated by volunteers to collect, collate, and distribute ideas that can be used to celebrate Mole Day.

The response generated from listing National Mole Day in CHASE'S ANNUAL EVENTS, from news releases sent to the national chemical education media, and from promotion at Chem Ed '91, has resulted in over a thousand inquiries and nearly four hundred 1991 memberships from the U.S. and abroad.

It would be difficult to quantify the impact of the foundation through its first Mole day celebration, but many teachers who had never heard of Mole Day did celebrate the day for the first time. And experienced Mole Day-ers used ideas from the 1991 Mole Day activity kit to celebrate the day bigger and better than ever before.

So, what is in store for the National Mole Day Foundation?

1. It is now the National Mole Day Foundation, Inc., and donations are tax deductible.
2. An informational brochure is now available. This brochure will be sent to those who inquire about the NMDF and will be used to promote the NMDF at meetings, including the 12th Biennial Conference in Davis, CA, next August.
3. The annual membership fee for 1992 is US $10. That fee costs for printing and postage and for two newsletters (planned for July and January) and a 1992 Mole Day activity kit. The 1992 kit will include the ideas for Mole day sent in by teachers since Mole Day 1991 and also many ideas that were included in the 1991 kit.
4. Checks for 1992 membership should be made out to the National Mole Day Foundation, Inc., and sent to the National Mole Day Foundation, Inc., 1220 S. 5th St., Prairie du Chien, Wisconsin, 53821. Inquiries and correspondence should also be sent to that address as well as any ideas teachers might want included in the 1992 kit.
5. The theme for Mole Day 1992 is GO FOR THE MOLE because 1992 is a Molympics Year!

ILLINOIS, IOWA JOIN FORCES TO RE-INTRODUCE PEREGRINE FALCONS

Illinois and Iowa are joining forces to reintroduce peregrine falcons to the Quad Cities area. With help from the Illinois Non-game Wildlife Conservation Fund and a similar fund administered by the Iowa Department of Natural Resources, the states will oversee the coordination, administration and the biological aspects of a two-year program to release 10 falcons each year. The project is a cooperative venture, with 95 percent of its cost coming from a local fund-raising committee, the Quad Cities Conservation Alliance.

The Illinois Non-game Wildlife Conservation Fund is providing $4,000 to hire attendants for eight weeks for the project's first year of operation. The attendants will work at "hack sites" where falcons are sequestered prior to release.

Prompting the program is the peregrine's listing on federal and state endangered species lists. As a predator high on the food chain, it was vulnerable to the effects of DDT, chlordane, PCBs and other chemicals which interfered with the production of viable eggs. Although the species formerly nested on cliffs along Lake Superior, Lake Michigan and the Upper Mississippi River, by 1964 it no longer was viable as a breeding bird in the eastern part of the country.

The Quad Cities release program involves placing 4- to 5-week-old falcons in hack boxes—boxes 4 by 3 by 3 feet constructed on 8-square-foot platforms. While kept in the hack boxes, the falcons will be fed quail through a delayed feeding chute, never associating the hack site attendants as the food source. After about a month, the marked and banded peregrines will be ready to make their first food kills, and the attendants will release the falcons from the hack boxes by raising a removable panel of bars. The attendants will maintain regular food levels while recording the birds' eating habits, behavior and flight attempts, and monitoring where the falcons fly. After six to eight weeks, the peregrines should be capturing their own prey exclusively and begin dispersing. At this point volunteers will monitor any peregrines remaining in the area.

As an urban area with tall buildings, the Quad Cities provide roost sites comparable to the natural cliffs and palisades favored by peregrines in the wild. House sparrows, pigeons and other types of birds found in urban areas provide the peregrines with readily available food sources. Yet another consideration in releasing the birds in an urban area is that cities tend to have few great horned owls, the most serious predator of hacked peregrines.

The Quad Cities project is patterned after a similar urban release of peregrine falcons in Chicago by the Chicago Academy of Sciences. The Chicago Peregrine Release and

Restoration Project is a past and current recipient of Non-game Wildlife Conservation Fund monies, this year receiving $1,000 for continuing to monitor and manage the Chicago-area peregrine population. The project includes analyzing nesting successes and failures, banding chicks, assessing diets, and, if necessary, building and installing nest boxes.

The Chicago Peregrine Release project also educates the public about the peregrine falcon and other endangered species. This involves presentations and educational videos to schools and community groups, lectures and exhibits at the Chicago Academy of Sciences, informational handouts, and a telephone hotline for the general public.

As a result of the Chicago peregrine release, there currently are four breeding pairs and one unpaired male in the Chicago metropolitan area.

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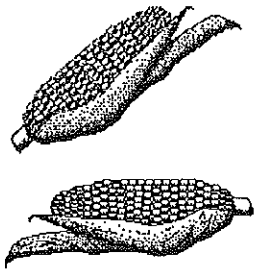
Western Illinois University
Macomb, IL 61455

THE NEW ILLINOIS CORN FASTBACK: CORN AND THE ENVIRONMENT



The latest in the Corn Fastback Series published jointly by the Illinois Corn Marketing Board, the Illinois Corn Growers Association, and the Illinois State Board of Education was released in late December, 1991. Like past fastbacks, *The Nature of Corn: Corn and the Environment*, examines various uses of corn and corn products.

The *Corn and the Environment* idea was conceived in June 1990 when the Illinois Advisory Board on Conservation Education requested that development of the fastback be undertaken in response to needs for instructional materials on corn-related environmental impacts. A writing project coordinator was identified, who in turn selected writing team members. The entire team convened to plan the fastback format in late November of 1990. Team members included Kevin Finson (Western Illinois University) as team coordinator, Eric Donaldson and Doug Kuban (Pecatonica School District), Dean Rockwell (Macomb School District), and Don Roderick (Illinois Department of Education). At the initial planning meeting, team members agreed that the focus of the fastback should be the impacts of corn and corn products on air, water and soil quality.

Rationale for the Fastback

The rationale for the fastback focus is twofold. First, as Illinois is one of the major corn-growing regions in the world, corn is very important to the economics of the state, and our students should know about the grain and the industry that has developed around it. Second, from an environmental perspective, the growing of corn and the use of the grain (including the products made from it) appear to contribute to both the improvement and degradation of environmental quality. Exactly how such impacts occur are often not readily apparent to students. Hence, the intent of the fastback writing team was to explore and attempt to explain some of the ways corn and corn products affect our environment.

The Fastback Sections

The first section of the corn fastback is *Man & Corn*. Throughout the previous fastbacks, corn and its uses has been discussed, but little, if any description of the history behind the growing of corn has been included. Similarly, little has been included concerning how corn develops and grows. The writing team believes students should be grounded in these basics in order to better understand how the growing of corn and the production of corn products impact various aspects of our environment. This first section thus gives the reader a historical overview from 7,000 years ago up to an introduction to the hybrid corn varieties used today. The sprouting of the seed through the development of the corn plant is also presented, along with reproduction of the plant (from fertilization to the formation of grain kernels).

The fastback's second section looks at air *quality*. As in the other sections of the fastback, some background information about air quality is presented first, then related to corn. Example of corn products that impact air quality include oxygenated fuels (such as ethanol). The ways in which the actual growing of the corn crop affect air quality are also presented (from the production of nitrogen fertilizers to grow the crop to the natural gas used to dry the harvested grain). The beneficial aspects of corn production on air quality are pointed out as well.

Soil quality is the focus of the third section. Characteristics of soil are discussed first, followed by information on soil chemical reactions, tillage techniques, erosion concerns and pollution (such as how corn products can help alleviate Illinois' landfill shortage problem).

Illinois' water resources are introduced in the *water quality* section along with factors affecting water quality, tests for water quality and corn's impacts on water quality. Examples of corn products that have environmental impacts are the road de-icer CMA and runoff from cornfields.

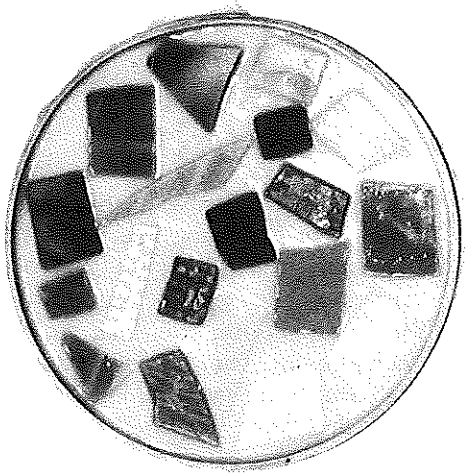
The last major section of the fastback is *Activities*. The writing team made a concerted effort to avoid such overused activities as word finds and crossword puzzles. Many of the activities are laboratory/investigation oriented, intended to require students to employ higher order thinking skills and integrated science process skills. Finally, some field trip suggestions are provided, as are references for further reading and sources of environmental education resources.

Each section of the fastback was developed by a different member of the writing team. Each section was edited and submitted to other team members for review. Throughout the writing of the fastback drafts, specialists were consulted for accuracy and readability. This process was followed several times throughout 1991 until the entire fastback draft was ready for review by the Illinois Corn Growers Association staff in early 1992. After an in-depth review, final editing changes were made and artwork was created. In the spring of 1992, the fastback was sent to the printers. Readers can now obtain copies of *The Nature of Corn: Corn and the Environment* by contacting the Illinois Corn Growers Association office in Bloomington, IL (309/557-3257). Feedback concerning the fastback and its use is always welcome.

MINI IDEAS

Beverly Sussman
Twin Groves School
Buffalo Grove, IL 60089

NOW YOU SEE IT—NOW YOU DON'T
TRANSPARENT, TRANSLUCENT, OPAQUE



Objectives:
To identify the differences and similarities between transparent, translucent and opaque

Background:
In addition to meeting the above objectives, this activity shows the interdisciplinary nature of science and art. The finished product is a beautiful stained glass design with a translucent quality from the glue. Children are also recycling stained glass pieces that would otherwise be thrown out. Tie a ribbon on the top of the hoop before using the glue and this becomes a great "science gift" for someone special. Finish by putting a picture hook on the back of the frame.

Materials:
1. Elmer's Glue
2. Waxed Paper
3. Variety of Stained Glass Pieces (cut into small pieces)
    1. different colors
    2. different shapes
    3. different sizes
4. Any of the following:
    1. small picture frames
    2. embroidery hoops
    3. wooden popsicle sticks
5. Gloves
6. Safety Glasses

Procedure:
1. Place frame on top of waxed paper. If popsicle sticks are being used, arrange them in the shape of a square and glue them together at the corners. Allow a few minutes for the corners to dry.
2. Select a variety of stained glass pieces and arrange them inside the hoop or picture frame. Children can select and place the stained glass at random or else they can divide their hoop or frame into three sections and place the stained glass into a specific section.
3. Make sure that none of the stained glass pieces touch each other.
4. Leave an imaginary border around the inside edge of the hoop and between all of the pieces of stained glass.
5. Squeeze Elmer's Glue carefully around the entire edge of the frame and between all stained glass pieces.
6. Do NOT get glue on the pieces of stained glass.
7. Make sure all of the empty spaces have been filled with Elmer's Glue.
8. Keep the picture frame or hoop on the waxed paper and allow it to dry for 3 days.
9. Peel off the waxed paper from the back of the frame on the fourth day.
10. Have children predict which stained glass pieces are transparent, translucent or opaque and then hold the projects up to the light to see if their predictions are correct.

SierraEcology
Newsletter of the Sierra Club's National
Environmental Education Committee
Vol. 9, No. 3

TOO MANY OF US?

There are now more than 5.3 billion people on the planet, and the total is increasing by nearly 0.1 billion per year. If growth continues in current patterns, the total will be 8.4 billion by 2020. Can the planet support 8.4 billion people at our present level of consumption? Can we all live within renewable resource limits?

What's the problem?
Use the following ideas as discussion starters.

- Many environmental problems are intensified by population growth. (Can you name some that are not?)
- As our numbers increase, we use more and more non-renewable resources such as oil. Population increases offset conservation efforts. (Explain how.) Eventually we must run out of these resources, with serious social and economic results. (Identify some limited resources and predict the effects of their exhaustion.)
- It takes decades of replacement-level reproduction (2 children per family) to achieve population stability. (Make a series of age distribution charts to show population momentum.)
- Most of the population growth is occurring in developing countries where people have neither education nor means to limit pregnancies. (Develop a graph of world population growth by continent.)
- Developing countries tend to lack resources to support their rapidly-growing populations. (Why do they lack resources, and where might they get them?)
- Each additional person in a developed country is about 25 times more harmful to resources than an additional person in a developing country. (Derive this from energy use figures. What conflicts might this cause between developing and developed countries?)

What can we do about it?
The primary tool for population stability must be education and understanding.

- Discuss the effects of personal choices on society as a whole. (Read and discuss Hardin's "Tragedy of the Commons".)
- Identify and discuss the reasons why people choose to have children.
- Support international, state and local family planning education and funding.

For a list of educational aids and units for teaching about population issues, write: Population Committee, Frank Orem, 1720 Argonne Drive, Concord, CA 94518.

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District 39
Wilmette, IL 90091

A WHALE OF A TIME

As a culminating activity for a study of whales or mammals why not engage several classes in the dramatic and exciting activity of painting a life-sized Blue Whale on the school playground? This activity not only enables the children to experience the size of the largest mammal on Earth while incorporating math-science concepts and skills in an unforgettable way, but also underscores the need for children to act responsibly and cooperate together when working on a large group project. It's easier than you think.

Blue Whales can grow to be 30.5 meters (100 feet) long and 9 meters (approximately 30 feet) tall. First graph the whale on centimeter graph paper with each square representing 3 square meters. The whale can be designed by an especially capable child using photographs or illustrations from books as a model but when working with younger children it's a good idea to provide a pattern.

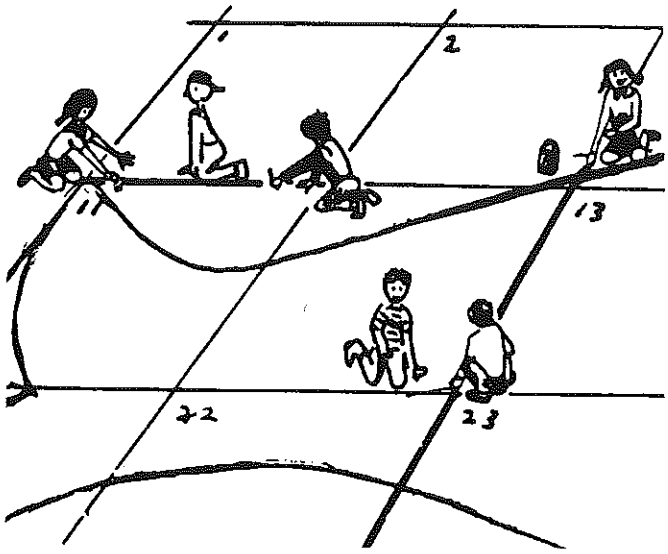
Next reproduce the whale on consecutively larger graph paper. This is not only a good math activity but it enables children to gain confidence for the life-sized model.

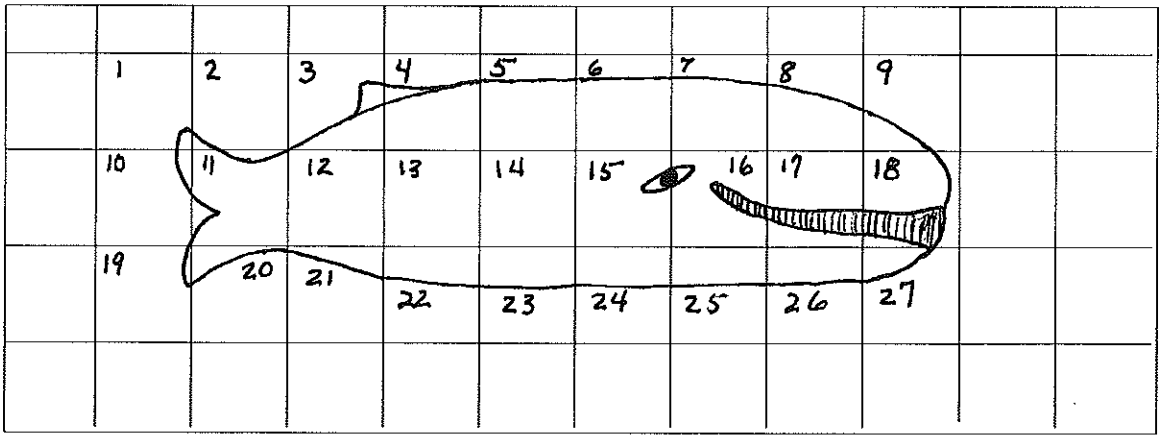
The hardest part, of course, is to transfer the huge depiction of the whale to the playground. Assemble a number of adult volunteers to help. Then make the whole project easier in the following ways:

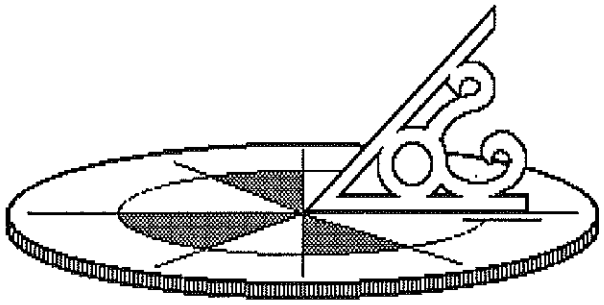
1. Assign a child or pair of children to each square. If this is done with several classes, pair older children with younger ones.
2. Using masking tape, make one large 3 meter space on the classroom floor so that the children can practice the lines they will need to make their given square on the playground.
3. Volunteers need to make the 30.5 x 9 meter playground grid by marking off 3 meter intervals using lengths of masking tape. The grid does not have to be exactly square.
4. When the grid is completed the children should go to assigned places close to the square in which they will draw. To keep them occupied while waiting their turn, they can be given a "fun pack" (dot to dots, puzzles, games about whales) to do with their partner.
5. When it is time for each square to be rendered the children can complete their portion with chalk. Volunteers can then copy the lines with tempera paint using blue for the outline and white for baleen and the eye. (This will last through a few rainfalls before it disappears.)
6. While some of the children transfer the whale to the playground grid, other students can make a 9 meter spout out of white butcher paper. This can be placed on the whale after it is drawn, as a grand finale.

Extensions include estimating and math calculations. How many children could lie head to toe the length of the whale? Then have the children trace around each other to find out. How many children can join hands around the periphery of the whale? Are all the children in the school needed? How many children can stand inside one square of the grid? Then how many classes can fit inside the whole whale? Can everyone in the school fit in?

The time and effort involved in a colossal project like this is well worth the trouble because of the interest and enthusiasm engendered in students, faculty and parents and because of all the accompanying skills and competencies inherent in its completion.







TWO WAYS TO FIND YOUR WAY

A) If you have a wristwatch with hour and minute hands, you can use it to find north and south. Point the hour hand directly at the sun. To be sure you are pointing directly at the sun, hold a small straight stick against the face of the watch. Whenthe shadow of the stick falls across the hour hand, your watch is properly aligned.

B) In northern latitudes, the sun is nearly due south at 1:00 p.m. Daylight Savings Time (NOON Standard Time). To find north and south, just drawan imaginary line midway between the hour hand and the 1:00 p.m. mark! When Daylight Savings time ends, the north-south line will be midway between the hour hand and the 12 o'clock mark.)

Or

.A) Push a straight stick into the ground so that it is pointing exactly at the sun. (You can tell when it is pointing exactly at the sun because no shadow will be cast on the ground.)

B) Wait about 10 minutes and mark the exact end of the shadow now being made by the stick. After another 10 or 15 minutes, mark the end of the new shadow.

C) By connecting the two marks you have made, you will find east and west (remember, the sun moves east to the west). The stick is south of your line.

Bob Edmondson
Hawaii Science Teachers

FOOTBALL CLASSIFICATION

Here's an activity that can be used as an introduction to classification. The purpose is to help students gain an understanding of the classification system by going through the process of making one. There are many types of cards that can be used. Football cards are ideal since we usually begin the classification unit in the fall. It helps students relate to something with which they are familiar before technical science words are added.

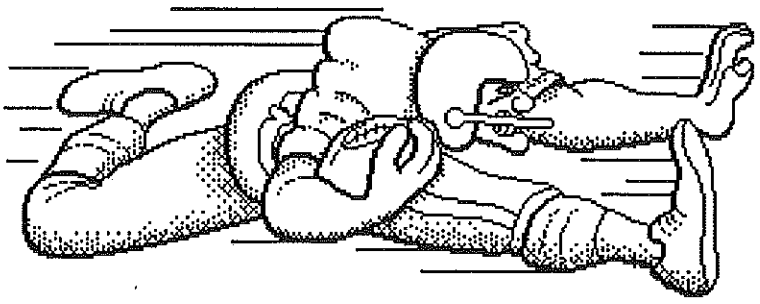
Give each group a random selection of thirty football cards. Allow the groups to look through their pile. Have each group develop a type of classification system that would help them organize their cards. To do this, have them decide what kind of groups and subgroups they will use. Some helpful hints are teams, positions, colors, names, color of hair, etc. Be creative. Try to start with a broad category and slowly break it down into specifics. After each group decides what system worked best for their group, list them under the data and observations below.

Have the groups share their findings with the rest of the class.

Data and Observations:

Questions:

1. What problems did you have in deciding what groups to use?
2. Was your system easy to use once you developed it? Why or why not?
3. What improvements could you make in your classification system now that you have used it?
4. What problems do you think scientists might encounter when trying either to develop or use a classification system?
5. Who are your favorite teams and players?



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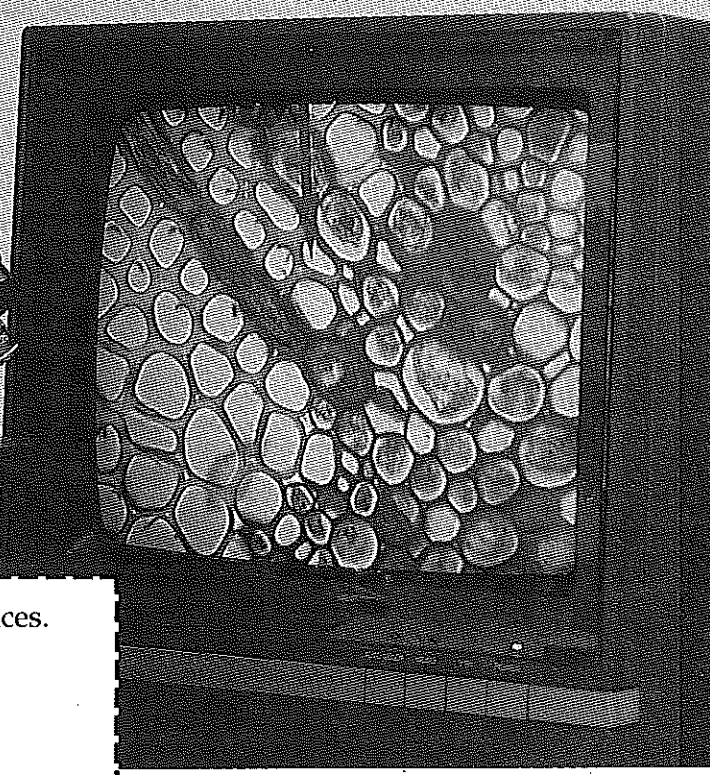

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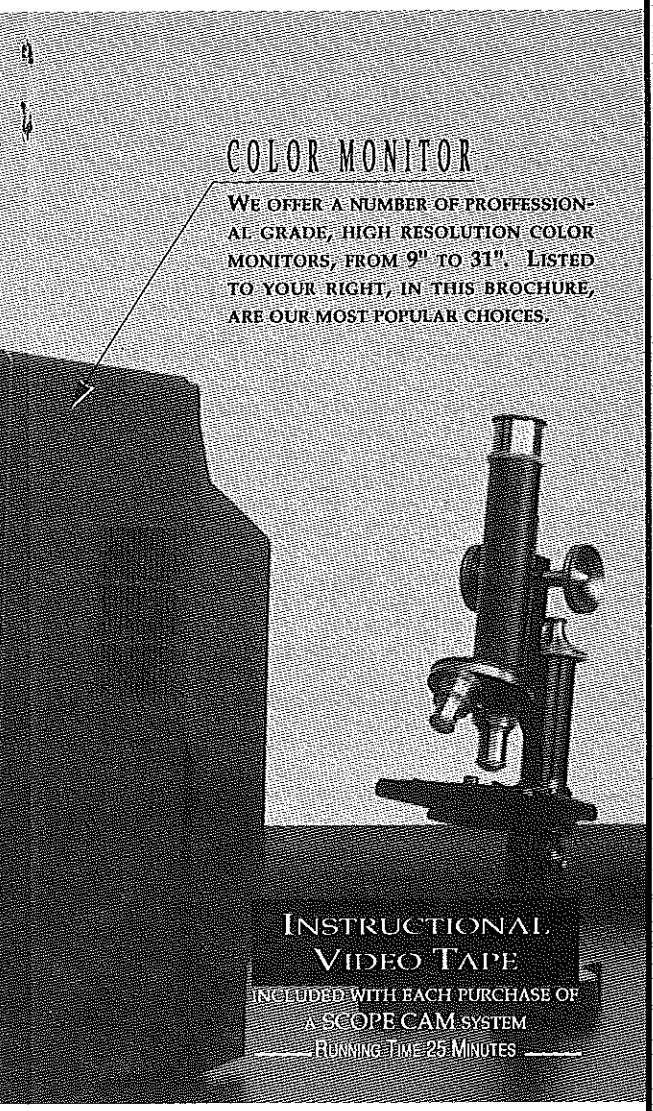

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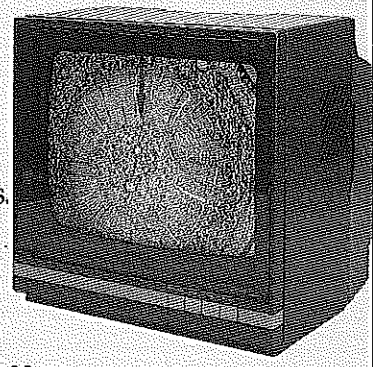

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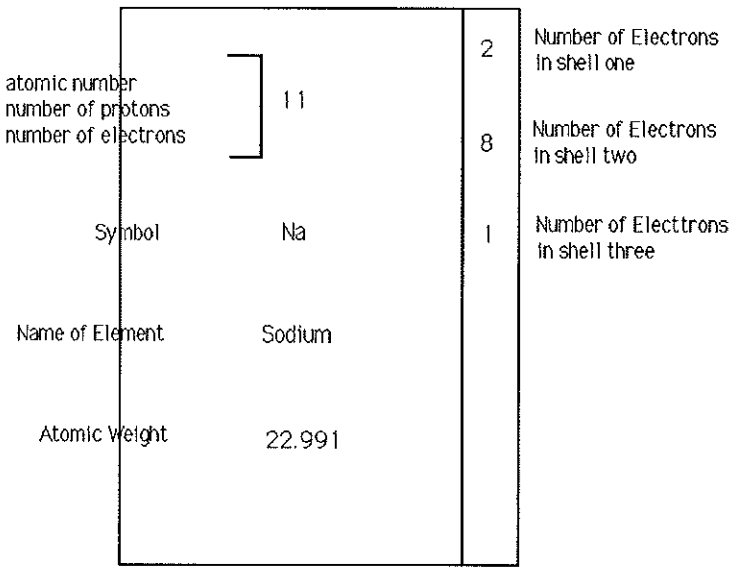
Beverly Sussman
Twin Groves School
Buffalo Grove, Il 60089

SHELL BY SHELL - CONSTRUCTING 3-DIMENSIONAL ATOMS

When learning about matter, children learn that an atom is the smallest part of an element. The terms proton, neutron and electron are used to describe different parts of an atom. It is very helpful for children to visualize where these different parts of the atom are located; the best way of accomplishing this is by drawing diagrams and making models of atoms. Scientists use models to explain and demonstrate how things look and work.

Children should be able to use the Periodic Table to determine the following information for any element:

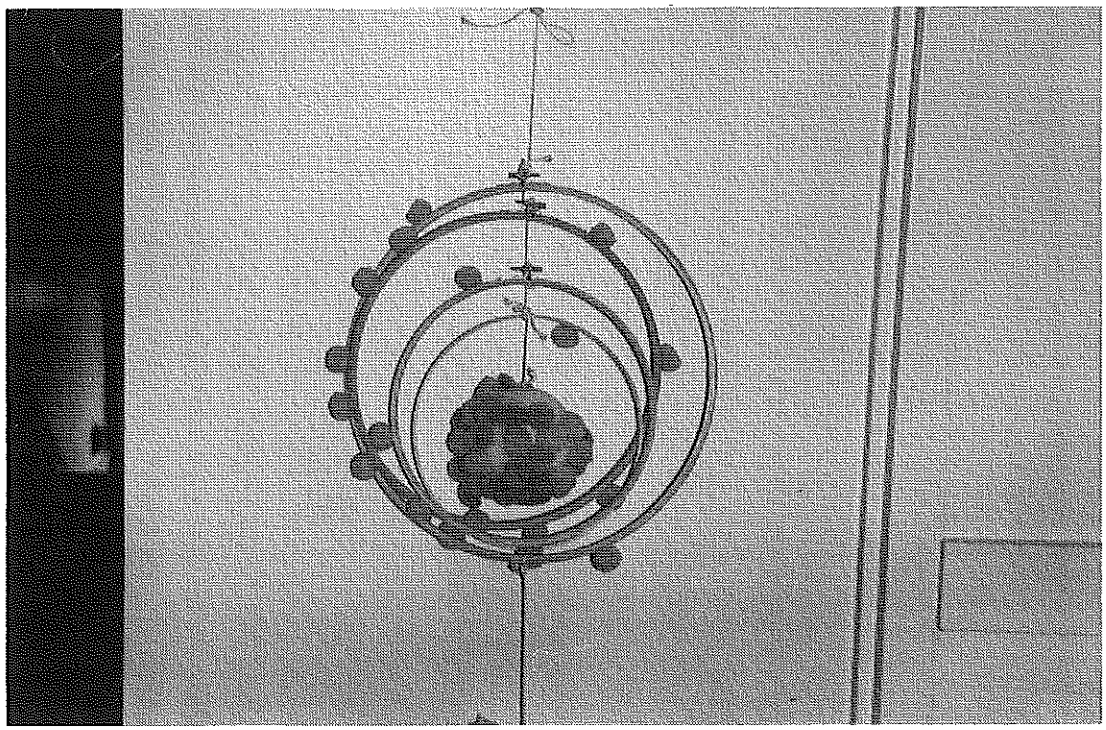
1. The name of the element.
2. The symbol for the element.
3. Its atomic number.
4. Its atomic weight.
5. The number of protons.
6. The number of neutrons.
7. The number of electrons.
8. The number of shells.
9. The number of electrons in each shell.



Neutrons – To calculate the number of Neutrons:

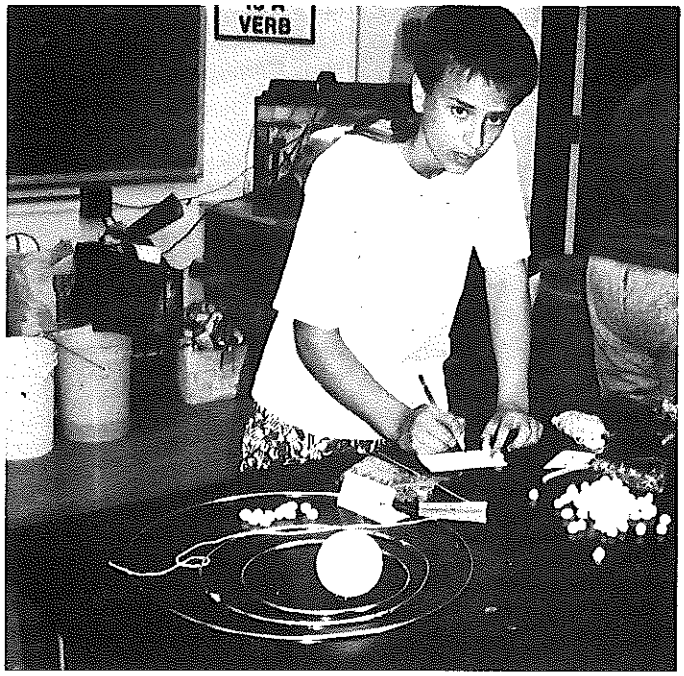
Subtract the atomic number from the atomic weight.

$$\begin{array}{r} 22.991 \\ -\ 11.000 \\ \hline 11.991 \end{array} \quad \underline{\text{OR}} \quad \begin{array}{r} 23 \\ -\ 11 \\ \hline 12 \end{array}$$



Materials

Each student will need the following:
1. Chart of the Elements
2. Blank Paper
3. Compass
4. Markers
5. 1 Index Card
6. Glue (Glue Gun can be used)
7. 3 Rings of graduated sizes (The number depends on the element used and the number of shells). Rings can be made of:
    1. Metal
    2. Wood (wooden embroidery hoops)
    3. Cardboard
    4. Wire
8. Straight Pins
9. Styrofoam Ball which serves as the nucleus. It fits inside the smallest ring.
10. Pom Pons: 3 different colors to represent protons, neutrons an electrons.
11. String
12. Scissors
13. Hooks - floral arrangement hooks work very well
14. Hole Puncher



Procedure

1. Teach children how to read the box of information about the element.
2. Make a diagram of the atom before attempting to construct the model.
3. Draw a circle for the nucleus.
4. Determine the number of shells and draw that many circles around the nucleus.
5. Determine the number of protons and neutrons and place them inside the nucleus.
6. Use one color to represent the protons and a different color to represent the neutrons. Use the same colors to correspond to the colors of the pom pons.
7. Determine the number of electrons. Use a third color to represent the electrons. Begin with the inside shell (first shell) and place the correct number of electrons on this shell.
8. Go to the second shell and put the number of electrons found on the second shell.
9. Continue doing this until you have placed all of the electrons on the correct shells.
10. Complete the diagram making sure the protons, neutrons and electrons have all been placed correctly.
11. Correct your students' diagrams before they begin constructing their models. Use the same colors to represent the protons, neutrons and electrons.
12. Assemble the materials needed to construct the model.
13. Start with the nucleus.
14. Glue the correct number of protons and neutrons to the styrofoam ball. You can also use straight pins and push them through the pom pon and into the styrofoam.
15. Beginning with the first shell (inside shell), glue the correct number of pom pon electrons onto the shell. Glue guns work very well.
16. Continue until you have completed all of the shells.
17. Stick a hood into the top of the styrofoam ball.
18. Attach string inside the hook and make a knot.
19. Leave enough string to attach to each shell and still have ten inches of string left at the top to hang from the ceiling.
20. Open up a paper clip or metal hanger and attach the end of the string to it.
21. Hang from the ceiling and you have an atomic mobile.

If a picture is worth a thousand words, then a model has to be worth even more than that. This completed model of the atom affords your students the opportunity to visualize the placement of protons, neutrons and electrons and further enables them to visualize how bonding takes place when they are ready for that additional information.

Washington Science Teachers' Journal Fall 1990
Greg Friesen, Clovis High School, Clovis, CA
Howard Pixton, Fontana High School, Fontana, CA
Dennis Porter, J.F. Kennedy High School, Carmichael, CA

TROUBLE IN BITTER CREEK

Introduction by Sam Throm, Hazen H. S., Renton, WA

This laboratory exercise was designed during the Toxic Substances Institute at Sonoma State University, California during the summer of 1990. The laboratory is not only an excellent application of science processes, but also introduces teachers to the constructivist approach to conceptual change.

To achieve conceptual change, according to the constructivist theory, misconceptions and existing attitudes must be brought forward early. Once out in the open, these ideas can be built on or modified to form a more complete, more accurate or more sophisticated model of the concept. A typical constructivist approach to conceptual change consists of three stages.

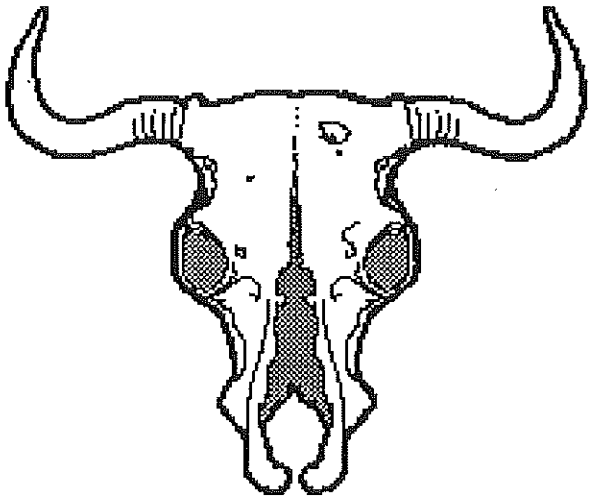
In the first stage, the **focus** brings misconception and pre-existing attitudes out in the open. This can be done by recording student responses on a transparency or flip chart. Allow only limited discussion at this point since these ideas will be revisited at the end of the lesson to check for conceptual change.

The second stage is the **challenge**. This is the problem-solving phase. Here a simple titration is used to analyze water samples taken from selected areas in and around Bitter Creek. Concept development occurs during this phase. Student teams write their report on transparencies, flip charts or other means and defend them during a class discussion. This is when the old ideas are reviewed and compared to the new ideas. (Has conceptual change occurred?)

Application of the concept—the third stage—helps increase the probability of transference so necessary to the permanence of the conceptual change. In this investigation, further study of the problem is encouraged. In this case a *local news search* would be a good strategy.

Introduction

Farmer Smith of Bitter Creek was concerned about his need for water for his pasture land because the amount of available river water was decreasing each year. Farmer Smith decided to drill a well for irrigation. When the well was drilled, he noticed that the water from it had a slight odor and tasted funny. He sent a sample of the water to the Water Quality Control District of Bitter Creek County to be tested for pollutants. When the report came back, he found that his well water contained 250 parts per million (ppm) of a toxic substance. Farmer Smith approached the W.Q.C.D. about doing other tests in the area.



Like many cities in the United States today, Bitter Creek is facing a pollution problem in their local environment. Some of the wells in the county have been found to contain pollutants that make the water unfit for drinking, cooking, and washing purposes. The city has joined forces with the county W.Q.C.D. to determine the source of the pollution.

Since you have been studying chemistry, biology, and environmental science, they have hired you to help them find the source. You will have a budget of $60,000 to drill and test six wells in the county. Since the cost of testing a well is $10,000, you can afford to test only six wells. Therefore, you must look at the county map and examine it carefully before you choose your six test wells. You decide to conduct a two-phase program by drilling three wells first and then, based on the results, select three other sites for drilling. Once you have completed your testing, you are to indicate a possible source of the pollutants and how far into the environment they have spread.

Materials
depression plate
10 ml graduated cylinder
map of Bitter Creek County
blank overhead transparency

Reagents
.1 M $AgN0_3$
.1 M K_2CrO_4
selected well samples

Part I - Testing clean water

1. Place 1 ml of distilled water into a clean spot on the depression plate.
2. Add 1 drop of K_2CrO_4 to the clean water sample.
3. Now add 1 drop of $AgN0_3$ to the mixture and note the color of the precipitate. You will be looking for this color change throughout this experiment.

Part II - Testing water from 6 well sites

1. Study the map on page30, which shows the 30 possible locations for the wells. Select three to test as the first phase of the study.
2. From the dropper bottles which are numbered to correspond to the well sites, obtain a 1 ml sample from each bottle which corresponds to your three sites.
3. Put one sample in the depression plate and add one drop of K_2CrO_4. Add $AgNO_3$, one drop at a time, until a reddish-brown precipitate is formed. Repeat this procedure for the other two samples.
4. Record in the data table below, the well numbers and number of drops of $AgNO_3$ used.
5. Determine the concentration of pollutant for each well tested by using the testing standards given here:

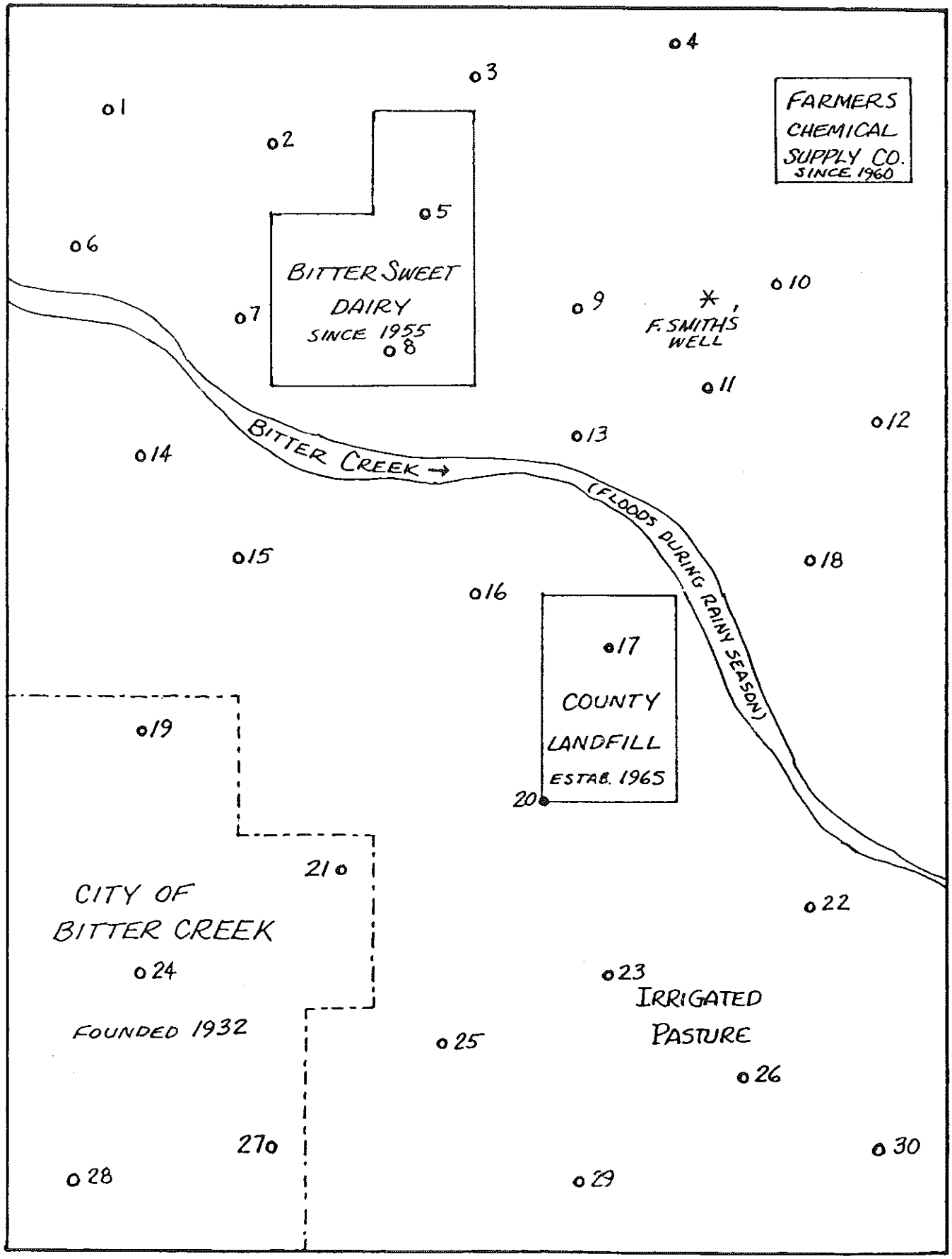
Pollution Testing Standards:
(Number of drops of $AgNO_3$ to form precipitate)
1 drop = 0-250 ppm (safe level)
2-3 drops = 250 ppm (slightly contaminated)
4 drops = 500 ppm (contaminated—not safe)
6-8 drops = 1000 ppm (dangerously contaminated)

6. After studying your results, begin the second phase of your drilling program by selecting three more sites for testing. Repeat the procedure for these three samples.

Part III - Conclusions

1. Record the results of your testing on the proper location on the well map.
2. Draw boundaries representing the spread of the polluted ground water. See map on page 31. Include the source of the pollution if your data indicate a source.
3. Indicate where the water is clean and where it is polluted on your map.
4. Develop a hypothesis which will explain why the ground water has become polluted. What do you feel is the source of the pollution? Why has it spread in the manner that is indicated by your data?
5. To share with the rest of the class, place a sheet of clear acetate over your map and trace the boundaries on the transparency. Be prepared to explain and defend your hypothesis in #4.
6. What relevance does this experiment have to your local ground water problem? What types of pollutants have been found in your ground water? What can you do to alleviate these problems? Answer on a separate sheet of paper.

Test#	Well#	Drops of $AgNO_3$	Concentration of Pollutant
1.			
2.			
3.			
4.			
5.			
6.			


1
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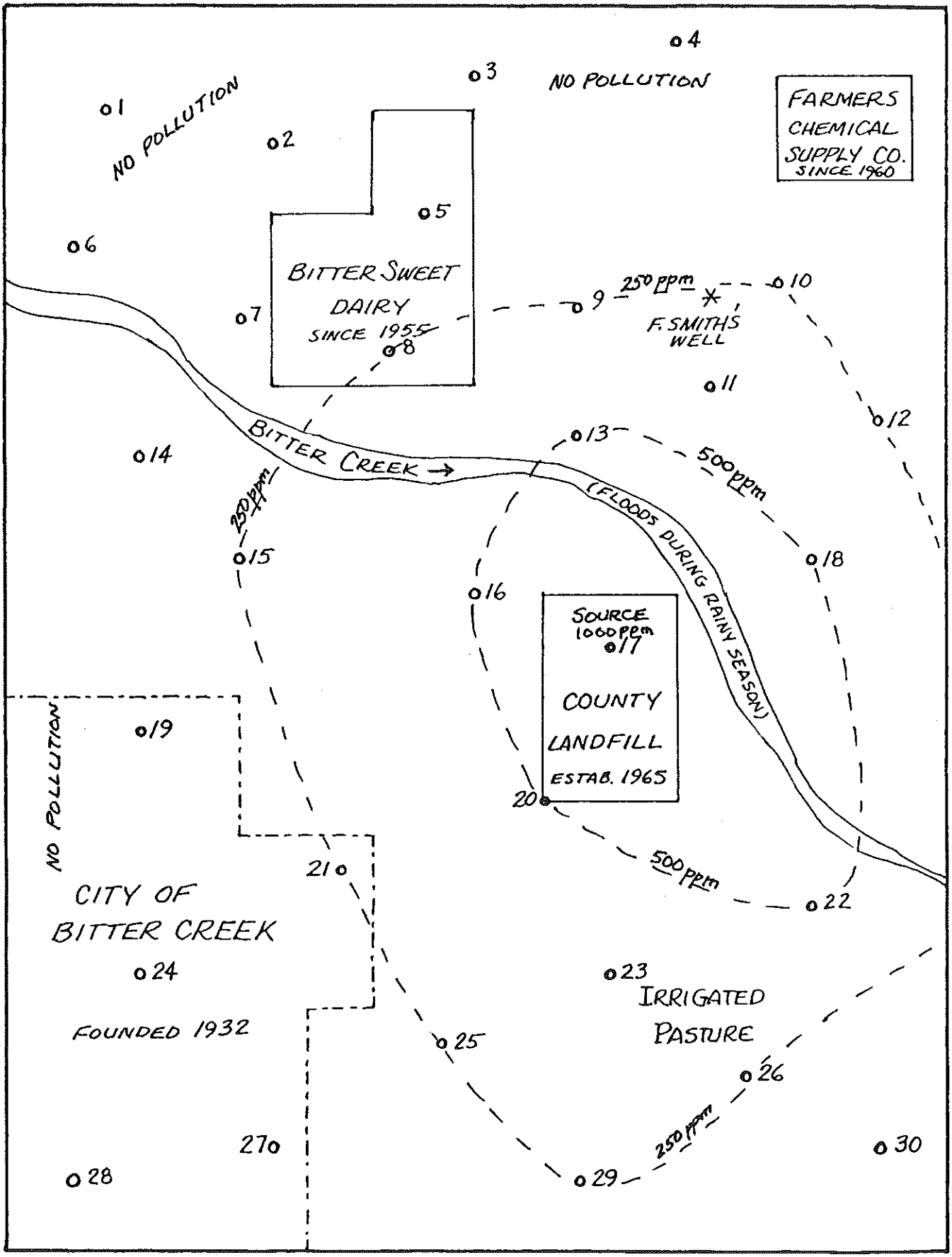
FARMERS CHEMICAL SUPPLY CO. SINCE 1960
BITTER SWEET DAIRY SINCE 1955
F. SMITH'S WELL
BITTER CREEK →
(FLOODS DURING RAINY SEASON)
COUNTY LANDFILL ESTAB. 1965
CITY OF BITTER CREEK
FOUNDED 1932
IRRIGATED PASTURE


1
NO POLLUTION
2
3
4
NO POLLUTION
FARMERS CHEMICAL SUPPLY CO. SINCE 1960
5
6
BITTER SWEET DAIRY SINCE 1955
7
8
9
250 ppm
10
F. SMITHS WELL
11
12
13
500 ppm
14
BITTER CREEK
(FLOODS DURING RAINY SEASON)
250 ppm
15
16
18
SOURCE 1000 ppm
17
COUNTY LANDFILL ESTAB. 1965
20
19
NO POLLUTION
21
CITY OF BITTER CREEK
22
500 ppm
24
FOUNDED 1932
23
IRRIGATED PASTURE
25
26
27
250 ppm
28
29
30

TEACHING NOTES

The purpose of this lesson is to determine the possible sources of water pollution in the students' environment using a conceptual change teaching strategy.

I. Focus:
Have students make a list of all possible sources of pollution in their environment. (Use acetates or share sheets.)

II. Challenge:
Have the students do the activity. Following the activity, teachers should have the students show their transparencies or share sheets prepared in the conclusion presented to the class, and have them explain how they came to their conclusions. Allow fellow students the opportunity to ask questions.

III. Application:
Discuss with the students the ground water problems that affect your area, including the type of pollutants and their sources. Conclusion #6 would be a good take-home or further investigation problem.

Student materials needed by each lab group
10 ml graduated cylinder
depression plate
dropper bottle with .1 M $AgNO_3$
dropper bottle with .1 M K_2CrO_4
blank overhead transparency

Teacher materials
30 dropper bottles, numbered 1-30, containing salt solutions of the following concentrations: 250 ppm, 500 ppm, 1000 ppm, and distilled water.

Teacher procedures
It is recommended that you "localize" this simulation by making a map of your own local water problems. One "well" should be picked to be the source of the pollution: this should have a concentration of 1000 ppm. Several wells surrounding the source should be filled with salt water at 500 ppm. Wells surrounding those should have concentrations of 250 ppm. And the wells farthest from the source should contain distilled water.

If you decide to use the Bitter Creek County map, one possible scenario is shown on the accompanying map. For this scenario, you would prepare the bottles to give the results as plotted on the map. (For examples, bottles numbered 13, 16, 18, 20 and 22 contain 500 ppm solutions.) The authors wanted to emphasize the fact that a chemical supply company is not necessarily a source of pollution, whereas landfills may be a source. You could vary the results by making the Bitter Creek Dairy the source of the pollution.

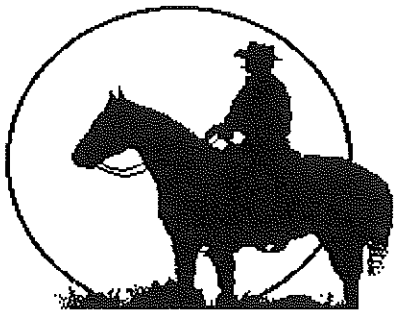
A 1000 ppm solution of NaCl can be prepared by mixing 1 gram of NaCl with 1 liter of distilled water. A 500 ppm solution can be made by mixing equal parts of the 1000 ppm solution with distilled water. The 250 ppm solution can likewise be made by mixing equal parts of the 500 ppm solution with distilled water.

Additional teacher information
The initial reaction taking place is the formation of the white precipitate of silver chloride. When all of the chloride ions have been removed from the salt water solution, the silver will then combine with the potassium chromate to form the reddish-brown silver chromate precipitate. Therefore, the greater the amount of $AgNO_3$ needed to form the reddish-brown precipitate, the higher the concentration of NaCl.

Management Suggestions
Make sure the numbered dropper bottles are returned to a central location where all students have access to them.

It will be important that each group does the experiment independent of any other group. If groups are allowed to "share" results, the number of wells tested could grow significantly and decrease the real-life accuracy of this simulation. One means of accomplishing might be to offer extra credit to the group that draws the "best" map.

Safety precautions
1. Students should wear safety goggles and aprons.
2. Remind students that silver nitrate will stain clothes and should not be touched.
3. Silver chromate precipitate should be disposed of in a heavy metal waste container.



Beverly Sussman
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Buffalo Grove, IL 60089

MALL MADNESS — RIGHT UP OUR ALLEY*

*Original title suggested by a sixth grader in my class — JARED WHITE

Shopping at malls is a great American pasttime. Shopping with 160 children and 35 chaperones is a unique experience. The teachers in my unit and I decided to take this field trip to a shopping mall for many reasons. It was an excellent way for children to learn about modern technology and to see it in action; it gave us an opportunity to continue using community resources for our field trips and we further made this into an interdisciplinary approach by relating our experiences at the mall to science, mathematics, reading, language arts and social studies.

Upon our arrival at Hawthorn Mall which is located in Vernon Hills, we were greeted by the security officer who took us to our first point of interest which was the water fountain located on the first floor. An engineer from the mall talked to us about heating, air conditioning and lighting in the mall and the effect of the skylight on their electric bills. Electric bills were approximately $140,000 per month. Everyone had a chance to ask questions and our students further discovered that the pennies thrown into the water fountain were donated to United Way. With all their technology, they didn't have a microphone and it was difficult to hear everything. This was the first time that such a large group had descended upon them and they were "technologically unprepared" for us.

After this introduction to Hawthorn Mall, we split up into four groups. There were approximately 45 people in each group. On a rotation basis, we were going to listen to four different presentations in the mall. Our first stop was CPI Photo Finish. We learned about many technological advancements in developing film and film processing. Some of the advancements were: pictures no longer fade, much less time is needed to develop film, computer imagery, film is no longer flammable and there is a tremendous amount of new equipment. We also learned that a great deal of materials in this industry are recycled such as silver nitrate, cameras and even the cannisters the film comes in. The presenter was a former police officer and he told us a great deal about computer imagery.

Our second group presentation was to Hawthorn Stamps and Coins. The speaker was the owner of the shop. He talked about different kinds of collections and we asked some of the following questions:

1. What makes something valuable?
2. What could a child invest in with money received for a present?
3. If a child has $40.00 to spend should he buy one baseball card for $40.00 or many baseball cards?
4. How would you have handled the situation where the boy bought a baseball card that was worth much more than he paid for it?

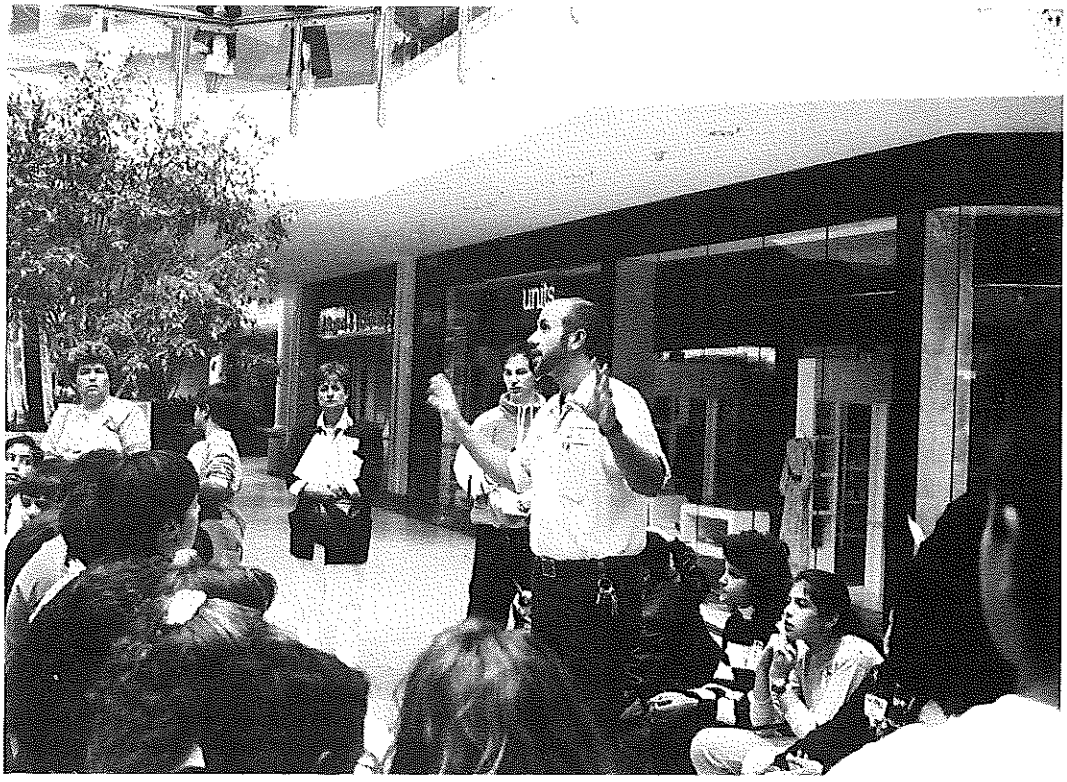
Our third stop was in the Management Office. We learned about renting and leasing spaces and why prime locations were more expensive. We found out about the types of jobs and training that people need to work at the mall.

Our last presentation was from the Security Manager at the mall. We saw the twenty-four hour emergency generator, found out about the smoke detectors, alarm systems including the fire alarms and trouble alarms, procedures for dealing with rowdy people and shop lifters. The children were fascinated with the equipment in the room and the manner in which everything worked to help ensure safety and security at the mall at all times.

A trip to the mall, like all field trips, requires a great deal of beforehand planning. Call ahead of time and discuss the purpose of the trip with the person in charge of the mall. Line up stores that you will visit ahead of time so they are prepared for your group and let them know the purpose of their talk so they can gear it to your specific objectives. Select the stores based on these objectives. One of our main objectives was modern technology at the mall and we tried to cover this in addition to some other topics.

Divide children into groups beforehand by color coding their name tags so you spend a minimum of time breaking children up into groups. Know the rotation you will be using so each group attends a different presentation at a specific time. Have questions ready for the presenters so you can keep the talks going in the correct direction. Have someone from the mall stay with each group and walk them to their presentations. This saves time that you might waste getting lost and security in case of an emergency. The other unexpected advantage of having someone take you from place to place was that it enabled us to walk behind the scenes and see all of those places that shoppers never get to see. It was like walking through tunnels to get from one store to the next. We saw ductwork, fuse boxes, pipes, and the "guts" of the mall. It was great getting this behind the scenes tour. This was an unexpected bonus.

We provided our students with 47 questions about the mall related to science, mathematics, reading, language arts and social studies. The teachers in my unit (Ann Berk, Keith Freedman, Marilyn Greenwald, Ruth Lind and Joyce Todd) made several trips to the mall to prepare these questions. After the presentations were completed, children were divided into groups with their chaperones. These groups had been arranged before leaving for the mall. We kept the groups small, five students per chaperone, and each chaperone had an opportunity to walk around the mall and try to answer the questions with her group.



Samples of questions we used for sixth graders. These can easily be adapted for younger or older children.

1. If Carson Pirie Scott were north, which stores would be at the east and west end of the mall?
2. What geometric shape are the umbrellas on top of the tables in the food area?
3. The store Saturday Matinee is running a special 1/2 price for two movies. How much would it cost to get 10 movies that originally cost $30.00?
4. There is store between Gantos and Johnston and Murphy that has some numbers in its name. What is the product of these numbers?
5. What is the greatest common factor of these numbers?
6. What store has a can crusher and recycling bags in its window?
7. Why is recycling important to the environment?
8. There is a store named after a city in a western state. What is the name of that store?
9. On a place value chart, the first period is often called the "Ones." There is a store whose name is a synonym for "Ones." What is the name of that store?
10. Why are most of the fall and winter fashions in the store windows shown in dark colors, but the spring and summer fashions are in light colors?
11. What is the chemical formula for water?
12. Is water being wasted in the waterfall?
13. Name one of the restaurants in the Food Court with healthy foods. Write down a few of these foods.
14. Give one example of changing electrical energy to heat energy or light energy in the mall.
15. Find the name of the #1 Best Selling book written by the famous modern author who is king of horror and mystery.
16. Find the name of a book that is a biography of a famous member of the British royalty.
17. Which store has the same name as a famous character in children's literature.
18. What game played in Alice in Wonderland is displayed in the doorway of Brookstone?
19. What 2 athletic stores opposite one another on the second level use the same punctuation mark in their names?
20. If you broke your heel while walking in the mall, where could you go to have it fixed?
21. How might the economy of Germany be more like the U.S. economy now that the Berlin Wall has been torn down?
22. What food staple of the Russian economy is sold in the Food Court?
23. What products carried or sold at the mall would be very popular in Russia today?

These questions were part of our scavenger hunt. Our students were not allowed to go into the stores or bother the salespeople; all of the answers were possible without having to do this. Our students ate lunch at the Food Court and the amount of time we spent inside the mall was 2 1/2 hours. This trip was so successful that if we repeated it next year, we would remain in the mall after lunch and plan additional presentations from the storekeepers. After our time at the mall, our students went bowling at Hawthorn Lanes in Vernon Hills. This was supposed to be strictly for fun. However, the theme of technology could have easily been carried out over at the bowling lanes. The pins and scoring were all done automatically. At one point, the pins had to be reset and we got to see the inside of the equipment.

Our students, parents and teachers really enjoyed this experience at the mall. We were able to see the mall from a totally new perspective, no longer just a place to shop.

Joyce R. Crebase
Griffin School
26 Davis St.
Oakville, CT 06779

RAINFOREST IN CONNECTICUT?

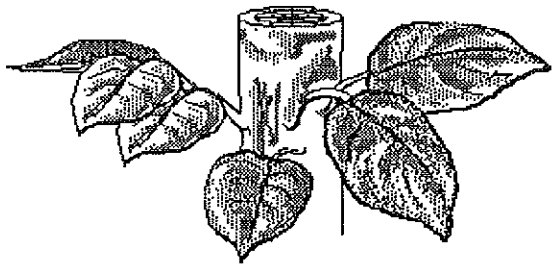
"Build a rainforest? In the classroom? How? That's crazy. Nobody can do that. How could we get trees in here? What about animals? I could bring in my pet parrot."

These were some of the comments made by students who had been studying the rainforest and its problems. I initiated this study by showing the students slides from an eleven day workshop I attended in the rainforest of Trinidad, a tiny island country off the coast of South America. I explained the lush growth of this incredibly beautiful habitat, and the intricate interrelationships between plants and animals that have developed. I then showed them pictures of areas where the "slash and burn" technique had been used to clear the land for farming, even though the soil is too poor to sustain agriculture for many years. All the nutrients are in the lush growth, and are quickly recycled by other living things.

The students were outraged that such a valuable habitat was being rapidly destroyed by human activity. The thought of 25 to 50 acres being destroyed every minute was almost unimaginable! They could not understand why people would do such a thing. Further research was clearly needed to understand what was happening to rainforests throughout the world and why. It was also important to find out whether this was as detrimental to the world as it appeared to be.

The students were hooked! They were highly motivated to learn all they could. Research skills were exercised both in and out of school. Careful notes were taken, and new bits of information were excitedly shared with others. It gradually became evident that we benefit both directly and indirectly from rainforests in many ways. For example, we eat foods grown there, chew gum, use industrial products and take medicines derived from plants which grow in the rainforest and enjoy our songbirds that winter there. It suddenly became a personal issue to protect and save rainforests. But how could a group of elementary school students do that? The students in the program for gifted and talented in grades two through five at Griffin School in Oakville (Watertown School District), Connecticut were involved in these studies. Each grade level group had a brainstorming session to come up with ideas. Out of those sessions, which encourage all kinds of ideas, no matter how outrageous they may sound initially, came the idea of building a rainforest in the classroom. What better way to teach others about a rainforest than to let them experience one? everyone agreed it was an *awesome* idea. But, how to do it? More brainstorming sessions promoted numerous suggestions. Where can it be located? How big should it be? What should it include? How can we accomplish this? Where can we get the materials we need? Do we want to solicit help from others in collecting plants and animals? What should we call it? How can we create the "feeling" of a rain forest? These are some of the questions that needed to be answered.

A plan was developed by the students, and the first Griffin School Rainforest began to "grow." As it "grew," it gradually became an all school project, with students loaning appropriate stuffed animals and bringing in plants from home. All types of philodendrons can be used, as students learned from their research. Bromeliads are becoming popular as houseplants, and many florists now sell them. Some florists will loan plants for a limited time for use in such a school project. They will also sometimes trim branches or leaves that can be used to fill in bare areas for added plant effects. We had many bromeliads and trimmings to use. Students found an amazing array of stuffed and rubber animals, such as monkeys, snakes, parrots, frogs, spiders and insects.



Next, the proper setting for all these had to be created. Students stretched their imaginations to figure out ways in which they could create the desired effect. Twelve foot long cardboard tubes on which new carpets are rolled served as tall tree trunks. They were obtained free of charge from a carpet store. Twelve foot tubes are tall enough to wedge between floor and ceiling of most classrooms, so no additional support is required. Thick green or brown yarn vines, stapled from tree to tree at varying heights, with cut-out leaves fastened to them, created the effect of plant growth overhead. A mural along one wall provided the opportunity to add pictures of more plants and animals. Students drew or cut out magazine pictures of birds, frogs, monkeys and other animals and fastened them throughout the forest mural. Blue material became a nice tropical pool surrounded by rocks and plants. Wood chips simulated the forest floor. The final touch was a tape of rainforest sounds with birds, monkeys, insects and frogs creating a noisy, authentic atmosphere.

Once the model was completed, students were anxious to have others see it. They had not forgotten that the purpose behind building it was to teach others about rainforests. More brainstorming sessions were required to decide how to do this. Every class in the school had a half hour lesson and tour of the rainforest. It was decided that an evening Open House would be held. A program was planned so that students could teach their parents and another guests what they had learned. Skits, songs, commercials, an original rap, interviews and posters wee planned and prepared. Each of the three years we have done this, the program has been different. These studies made the students more aware of the need to take care of the environment at home, and this message was included in the program.

Students then gave guided tours of the classroom rainforest to small groups of four or five at a time, explaining things as they went.

Students felt that they had fulfilled their first goal of teaching others about the rainforest and its importance to us and the world. Fulfilling their second goal of actually doing something themselves to save the rainforest seemed more difficult. Again, research paid off. They learned that they could donate money to the Monteverde Conservation League in Costa Rica. The money would be used for the express purpose of purchasing rainforest land to become part of the preserve to be protected forever. It was exciting to learn that so many other children around the world had been working toward the same goal: that a part of the Monteverde preserve, purchased with money donated by children around the world, is called The Children's Rainforest. Through a bake sale of goodies baked by parents and teachers, donations and the raffle of a beautiful Bromeliad, enough money was raised to purchase 6-1/2 acres at $50 per acre. A lovely certificate was received, and is hanging in the school lobby. The next year, spurred to even greater efforts, $800 was raised! Sixteen more acres will be saved!

Interesting side effects have resulted from all this work. The proverbial pebble thrown in the pool has created ripples in many directions. Some students have chosen to do independent studies on topics related to their rainforest studies. One student, for example, questioned why birds migrate north in the summer if conditions are so ideal in the rainforest. She found the answer! Many letters have been written to government officials urging them to protect rainforests. They have also begun a pen pal relationship with students from Shelton, Connecticut who are also interested in rainforests. The local Garden Club invited the fifth grades to attend their noon business meeting to explain the work they had done. They received a standing ovation at the end of their presentation, and later a donation toward their fund-raising efforts! Under the auspices of World Wildlife Fund, our rainforest and students were filmed by a television company from Washington, D.C. for broadcast on national television news in the spring of 1990. That filming was an exciting event for the students. A reporter from the *Ladies' Home Journal* called and interviewed three students and me by telephone for an article she was writing for a fall 1990 issue. Our local cable company filmed a reenactment of the program put on by the students and a tour of their rainforest, and aired it every Friday evening in June. How thrilling for the students to see themselves and their work on television!

These students know that they have made a real difference in the world. They have achieved their two-fold goal of educating others about the rainforest, and actually saving some rainforest themselves. I also have achieved my goals as a teacher. Students became highly motivated to learn, and developed skills of research, planning and organization, creative thinking, public speaking and cooperation as they called on their already developed reading, math, art, science and language arts abilities. Learning was exciting, rewarding and meaningful!

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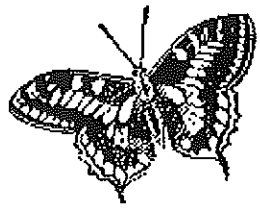


AWARDS AND RECOGNITION

ISTA member Jim Zimmerman teaches 5th grade at Thomas Paine School, but his talents and skills extend far beyond Urbana to touch hundreds of other educators and students around the globe.

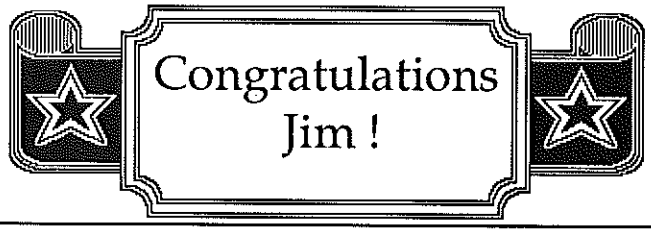
Zimmerman specializes in telecommunications that link up classrooms world-wide. He also uses new technologies to help educators improve their instruction of science through scores of state and national workshops. For his leadership in using telecommunications to promote global understanding among students and educators, Zimmerman, a member of the Urbana Education Association (UEA), was recently named as a 1992 Christa McAuliffe Educator.

Zimmerman, a 16-year classroom veteran, was one of only five teachers nationwide to receive the honor from the NEA's National Foundation for the Improvement of Education (NFIE) and its Christa McAuliffe Institute for Educational Pioneering. The other winners this year are from California, Michigan, South Dakota, and Virginia.

NFIE was established by the NEA in 1969 to support teacher innovation to improve education. The McAuliffe Institute was createdin memory of the first teacher-astronaut, Christa McAuliffe, who perished in the space shuttle Challenger explosion in 1986.

The McAuliffe Educator awards are presented annually to teachers who best exemplify McAuliffe's educational leadership and trailblazing spirit. The winners are selected after a national search for "pioneering" educators such as Zimmerman.One of his earlier grants also carried the Christa McAuliffe name. In 1987 he received a Christa McAuliffe Fellowship award from the U.S. Department of Education. He receive the program's maximum grant—$25,313.In all, Zimmerman has applied for and won nearly $400,000 in educational grants to further his work. Three scientific literacy grants have provided the bulk of the funding, but, in all, he has received about 20 grants.

Throughout his career, Zimmerman has received numerous honors and achievement awards. The honors include Outstanding Educator of the Year (Urbana), State Board of Education "Those Who Excel" Recognition Award, and Outstanding Teacher of Science in Illinois.



MEETINGS AND CONFERENCES

INTERNATIONAL EXPEDITIONS ENVIRONMENTAL LEADERSHIP PROGRAM AND THE INTERNATIONAL RAINFOREST WORKSHOPS FOR EDUCATORS

An Interdisciplinary Environmental Leadership Program for educators of Science/Social Studies/Math/Art/ Language Arts/Music

Join other action-oriented educators in each 8-day "hands-on" rainforest workshop. Earn academic credit while immersed in the educational thrill of a lifetime.

Topics include: Rainforest Ecology, Rainforest Conservation, Tropical Mammals, Neotropical Insects, Tropical Birds, and Medicinal Use of Plants. The Educators' version of the International Rainforest Workshop will be held in The Amazon Rainforest July 11-18, 1992, $1498 all inclusive from Miami. A newsletter is also available called the Educator Exchange Newsletter. Call 1-800-633-4734 for more information

To find out more about the Amazon Workshop, call 1-800-633 4734 or 205-428-2700.

PERIODIC CABLE FROM THE CHEM WEST GROUP

June 22 - July 10 *Chicago Summer Institute for Science and Math Teachers* conducted at Chicago State University is open to all teachers in the area. The institute strengthens the teacher's mastery of subject matter and presents new teaching techniques, current advances in research, and interdisciplinary topics. A $900 stipend and 3 graduate credit-hours are awarded. Contact Kristin Ciesemier, MS 777, Fermilab, P.O. Box 500, Batavia, IL 60510; 708-840-8258.

July 6 - 10. *Dreyfus Outreach Program* funded by Woodrow Wilson National Fellowship Foundation and hosted by the University of Illinois at Chicago. This institute is for high school teachers and combines demos, labs, computers, and lectures on the "nuts and bolts" of chemistry. Four hours of graduate credit in chemistry is available. Contact Wade Freeman, Dept. of Chemistry, University of Illinois at Chicago, Box 4348, Chicago, IL 60680 (312) 996-3161 for more information.

August 2 - 6 *12th Biennial Conference on Chemistry Education* University of California, Davis. The theme is "Changing the Image of Chemistry." WEIRD SCIENCE will be there, Mary Good, former President of ACS, along with many symposia, workshops and tours. Combine vacation and chemistry. For more information contact Jim Hill, 12th Biennial Conference, Department of Chemistry, California State University, Sacramento, 6000 J. St., Sacramento, CA 95815-60571; 916/278-6684.

MIDWEST REGIONAL ENVIRONMENTAL EDUCATION CONFERENCE SLATED

The goal of environmental education is to encourage people to take action on behalf of the environment. Each step along the way: awareness, knowledge, attitudes, skills, and action, is important to the process. "EcoDreams: Awareness to Action," the theme of the 1992 Midwest Regional Environmental Education Conference, will address these steps with a diversity of concurrent sessions, presentations, field trips, and entertainment.

The conference is scheduled for October 1 - 4, 1992 at the 4-H Education and Natural Resources Center in central Iowa. Session strands will address awareness, knowledge, attitudes, skills, and action steps, as well as specific audiences, including nonformal and formal education, focusing on grades K-12. Sessions will deal with topics as varied as Ecological Nightmares and Environmental Daydreams.

The conference will attract noteworthy presenters and participants from across the Midwest to explore and learn about the latest developments in environmental education and environmental issues. Lou Gold, a dynamic speaker and proponent for the nation's northwest rainforests, will be a keynote speaker. Entertainment will be provided by environmental songwriter and singer Doug Wood, professional dancer and instructor Faith Kubic, and others.

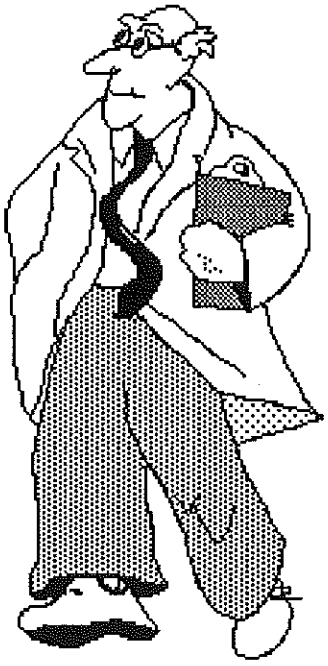
Registration fees and expenses for lodging and meals at the center will be kept to a minimum to encourage participation by educators and conservationists from all walks of life. For more information about the 1992 Midwest Environmental Education Conference, contact Duane Toomsen, Program Chair, Bureau of Instruction and Curriculum, Iowa Department of Education, Grimes State Office Building, Des Moines, Iowa 50319 (515) 281-3146 or Judy Levings, Facilities Chair, State Youth and 4-H Office, 33 Curtiss Hall, Iowa State University, Ames, Iowa 50011 (515) 294-6116.

OPPORTUNITIES

FIELD TESTERS NEEDED FOR BIOLOGY EDUCATION PROJECT

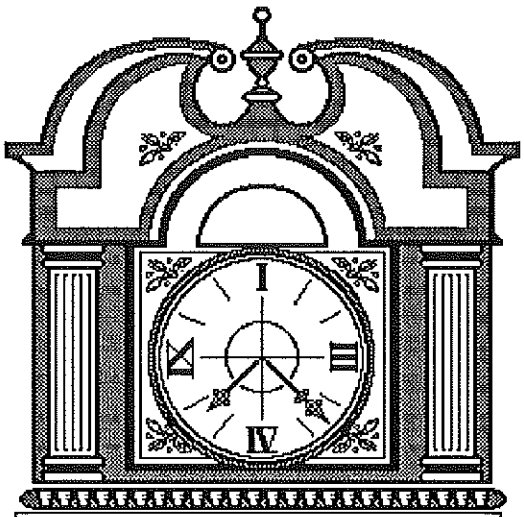
The National Association of Biology Teachers (NABT) has received a grant from the National Science Foundation for a new project, Teaching Hands-On Investigative Biology in High School "On a Shoestring." Field testing will be conducted during the school year 1992-1993. Field testers will receive a consulting fee of $450 plus $25 to implement the materials in their classrooms. The deadline for applying to field test is September 15, 1992.

If you are interested in applying to be a field tester, contact Dr. Mary Louise Bellamy, Education Director, National Association of Biology Teachers, 11250 Roger Bacon Dr. #19, Reston VA 22090 or call 703-471-1134.



ST. LOUIS CHEMICAL EDUCATION GROUP

Illinois chemistry teachers living in the greater St. Louis area may participate in the Education Topical Group of the St. Louis Section of the ACS. You don't have to be a member of ACS, but you can be affiliated with the group for $5 per year. You would receive the section publication, *The Chemical Bond*, and the group's newsletter, now named *The Octet Gazette*, of which a co-editor is our former v.p., Steve Vaughn. There usually are 8 or 9 meetings a year. Send your check to Dale B. Fox, 1407 Timberwood Lane, St. Louis, MO 63146.



SUMMER SCIENCE IN ENGLAND

The University of North Carolina at Asheville (UNCA) conducts a summer comparative science education program through the cooperation of the College of Education of the University of Bath, England from July 8 to August 4, 1992. U.S. science teachers can visit English classrooms that are still in session and attend lectures on the historical development of the British education system and on global environmental problems. Field trips to areas of special educational interest and seminars are also part of this program.

Any person who is or has been involved with science education, K-12 is eligible. The $1,600 fee covers tuition and housing, which will be on the University of Bath campus.

The spouse and/or dependent adolescent child of the participant also may attend, at a cost of $900.

For information, contact Dr. Gary Miller, UNCA, One University Heights, Asheville, NC 28804-3299; (704) 251-6441 (days) or (704) 891-9595 (evenings). **The registration deadline is May 15, 1992 but applications will be taken until the course is filled.**

EDUCATIONAL MATERIALS

CONTACT NASA'S SPACELINK FOR RECENT SPACE NEWS!

Spacelink is an electronic information system for educators, with information stored on a computer at the Marshall Space Flight Center in Huntsville, Alabama.

The system explains NASA's Centers as well as educational services. It gives historical data on space exploration, aeronautics, and products developed as a result of space research. It provides classroom materials and gives access to current NASA news. The electronic menu also provides the opportunity to communicate a message directly to NASA.

The system may be accessed over regular telephone lines and is designed to communicate with a wide variety of computers and modems, especially those most commonly found in classrooms and homes. The service is free, but you will be billed by your phone company for long distance phone calls. The system has a main memory of 14 megabytes (14 million characters) and disk storage space for 708 megabytes. It can communicate with 12 callers simultaneously at 300, 1200, or 2400 baud.

Use the instructions that came with your modem and communications software when calling NASA Spacelink. The computer access number is 205-895-0028 and the data word format is 8 data bits, no parity and 1 stop bit. Your computer may send carriage returns or line feeds, but not both.

When your computer connects with NASA Spacelink, a welcome screen will appear with instructions for logging onto the system. When you press Return, Spacelink will ask you for a username and a password. To log on as a first-time caller, you must enter the username NEWUSER and the password NEWUSER, after which you will be asked to enter the number of lines your computer will display at one time (usually 24). NASA Spacelink will pause each time this number of lines is displayed, to allow time for reading. To continue after a pause, press Return. Any time you type a response to the system, enter the response by pressing Return.

As a first-time caller, you will receive an introduction to the system and be asked to provide some background information, including your name and address. NASA will need this information should you request material to be sent by mail. The information will also be helpful in planning future development of NASA Spacelink. Most importantly, you will be asked to assign yourself a personal Username and Password to be used when you call again.

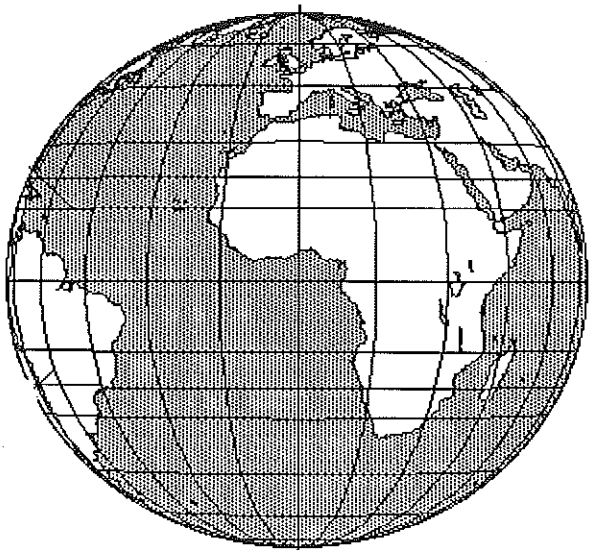
After the introduction, the NASA Spacelink Main Menu will be displayed. Type the number of a menu item and press Return. You will find one or more submenus under each item in the main menu.

Choose menu items until you reach the desired document. For example, if you want to plan a 6th grade lesson around food for astronauts, choose Item 9 from the main menu (materials for classroom use). From the next menu, choose Item 2 (Food Lesson Plans). Your final menu choice will be Item 6 (Grades 4-6), a document containing suggested activities for sixth grade students. Before NASA Spacelink sends most documents, you will be asked to choose a method for receiving it (View or XMODEM). To view the document on your computer, just press the Return key.

When you log off NASA Spacelink using Option 1 from the main menu, you will be asked if you wish to leave a message for NASA. You may enter as many as 15 lines to be read by the NASA Spacelink System Administrator. To end your message, enter a blank line. The System Administrator reads messages each business day and will respond to you through regular mail or with a note which will appear the next time you log on.

SCIENCE OF FOOD AND AGRICULTURE

The Council for Agricultural Science and Technology is a nonprofit consortium of 29 scientific societies and many individual, company, and nonprofit members. CAST has published a magazine for high school science students since 1983. Called *Science of Food and Agriculture*, it explains how research is changing what we eat and how it is produced. Published in January and July, each new issue contains articles written by scientists, activites, resources, and reports of new research in food and agricultural sciences. A two-year four-issue subscription is $10.00. For a subscription or a free sample issue, write to *Science of Food and Agriculture*, CAST, 137 Lynn Avenue, Ames, IA 50010-7197.



GO ON-LINE WITH GOVERNMENT RESEARCH–RELATED INFORMATION

For on-line database services providing access to Federal government research and education-related information, the Federal Information Exchange (FIE) currently offers two databases for use nationwide. FEDIX is a database that is available for timely information on federal research and education programs, available used Government research equipment, minority assistance programs, current events, and general agency information. The MOLIS database provides information on Black and Hispanic Colleges and Universities, including research centers, facilities, equipment, education programs; capabilities, enrollment, degrees awarded, faculty, administrative personnel data, and finances.

Ten agencies are now contributing this information in addition to NASA: the Department of Energy, the Department of Commerce, the Department of Education, the Department of Housing and Urban Development, the Federal Aviation Administration, the National Science Foundation, the National Security Agency, the Office of Naval Research, the U.S. Agency for International Development, and the Air Force Office of Scientific Research.

Both on-line services are now available on INTERNET for those using workstations connected to mainframe computers and through a modem for those with a personal computer.

FIE's INTERNET address is fedix.fie.com. At the first login type "fedix" for FEDIX access or "molis" for MOLIS access. At the second login, type your USERID. The data line number is (800) 232-4879. For further assistance, call the HELPLINE at (301) 975-0103.

Ohio Sea Grant Education
The Ohio State University
059 Ramseyer Hall
29 West Woodruff
Columbus, Ohio 43210
(614) 292-1078

GLOBAL CHANGE SCENARIOS FOR THE GREAT LAKES REGION NOW AVAILABLE

Because global change issues are often difficult to understand, many people—including important decision makers—are hesitant to support global change policy suggestions by the scientific community. Instead, these people take a "wait and see" attitude toward global change which, unfortunately, defeats the purpose of any proactive suggestions the scientific community may offer.

The Ohio Sea Grant Education Program is currently preparing a series of short publications designed to help people understand how global change may affect the Great Lakes region. By explaining the possible implications of global change for this region of the world, it is hoped that policy makers and individuals will be more inclined to make responsible decisions about global change policy issues.

The publications, called 'scenarios,' describe the prevailing interpretations of the scientific community concerning what may happen to the Great Lakes region in the face of global warming. The scenarios are written in terms the general public can understand and their content is reviewed for accuracy by a panel of experts. They are between two and five pages in length and include the most recent information available on a variety of subjects, including the potential effects of global change on:

- Agriculture in the Great Lakes Region
- Global Warming and Airborne Circulation of Toxins
- Lowered Water Levels in Great Lakes Estuaries
- Fish Populations in the Great Lakes Region
- Biological Diversity in the Great Lakes

The scenarios are available to educators and other interested individuals. A limited number of classroom activities illustrating these possibilities have been developed as well. To be included on a mailing list for information about the scenarios, contact the Ohio Sea Grant Education Program, 059 Ramseyer Hall, 29 W. Woodruff Avenue, Columbus, OH 43210. Tel: (614) 292-1078.

NEW EDUCATOR MATERIALS AVAILABLE!

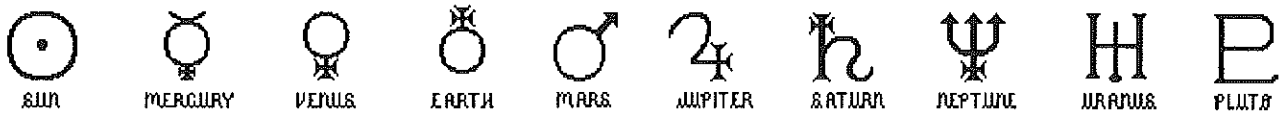
New publications and videos available from NASA, 4th Quarter 1991

From NASA Central Operation of Resources for Educators (CORE), Lorain County JVS, 15181 Rt. 58 South, Oberlin, Ohio 44074 (216) 774-1051
Launching the School Year with President Bush (Videotape)
Liftoff to Learning: Go for EVA (Videotape)
Magellan: Mapping the Planet Venus (Videotape)
Magellan: Mission to Venus (Slide Set)

From NASA Educational Publications, Code FEP, Washington, D.C. 20546 (202) 453-8332
Publications
Educational Brief—*International Microgravity Laboratory*, EB-105
Space Flight: The First 30 Years, NP-150
Atlas-1 Teacher's Guide, EP-282
Second National Space Grant Conference '91, EP-278
Doing Business with NASA, NP-151
Spinoff '91, NP-147
Mission Watch—offering information about Space Shuttle missions and appropriate classroom activities prior to the mission's launch—Text only available from *Spacelink*
Mission Highlights—available after each mission summarizing important activities and investigation results—Text only available from *Spacelink*
Lithographs
Liftoff of the Space Shuttle Discovery, HQL-302
National Aerospace Plane, HQL 274
Space Station Freedom Set, HQL 312-316
Five Astronauts from NASA's Space Shuttle Program, HQL-317
Wallsheets
Hubble Space Telescope, WAL-138
Space Station Freedom, WAL-136

From NASA Scientific and Technical Information, NASA Center for Aerospace Information, 800 Elkridge Landing Rd., Linthicum, MD 21090, (301) 621-0146
STAR—Vol. 29, Nos. 15-20
Aerospace Medicine and Biology, SP-7011, Nos. 355-357
Aeronautical Engineering, SP-7037, Nos. 270-272
NASA Thesaurus, SP-7096
Working with People to Improve Productivity and Quality, SP-7097
COSMIC 1992, CR-188973
Large Space Structures and Systems in the Space Station ERA, SP-7085, No. 3
NASA Engineers and the Age of Apollo, SP-4104
Atlas of Mars, SP-506
Cataclysmic Variables, SP-507
Planetary Geosciences, SP-508
AGARD Reports Quarterly, nos. 3-4
STI Bulletin, Fall/Winter 1991

From Langley Research Center, Mail Stop 146, Hampton, Virginia 23665-5225, Audrey Coppeage (804) 864-3297
The Process for Inventors—Activity book explaining patents, copyrights, trademarks, and their applications
Exploration of the Solar System—An interactive computer-laser-video-disk program and activity book to assist educators in presenting the solar system to third grades
Landing of a Giant—Activity book that highlights the Space Shuttle, presenting the concepts of friction, surface texture, pressure and propulsion as they affect the Orbiter
The Sky's the Limit—Aeronautical activity book with paper airplane designs and other flying objects to build and test



OPTICAL DATA CORPORATION'S 1992 CATALOG FEATURES NEW EDUCATIONAL VIDEODISCS AND MULTIMEDIA PRODUCTS.

Optical Data Corporation is offering a 52-page catalog featuring its line of science, social studies and health videodiscs and multimedia products.

The catalog introduces three new features to "Windows on Science,"™ the company's videodisc-based basal curriculum for grades one to six. These include Curriculum Publishing Kit™, a planning and publishing software; Update™, an annual videodisc- based collection of video clips and lesson plans covering science issues and recent discoveries; and The Language Laboratory™, designed to help develop reading and writing skills. For more product or catalog-ordering information, call Optical Data's Customer Service Group at 800-524-2481.

FREE BIOLOGICAL CATALOG / REFERENCE MANUAL

Flinn Scientific enthusiastically announces the availability of the new 1992 Flinn Biological Catalog / Reference Manual!
Highlights are:
- AIDS: Simulated Transfer of Body Fluids Kit
- DNA Fingerprinting/Electrophoresis Starter Kit for under $35.00
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P.O. Box 219
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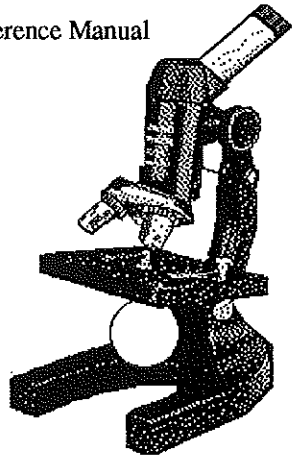


ENR
325 West Adams, Room 300
Springfield, IL 62704-1892

THE GROUNDWATER EDUCATION NETWORK

The Department of Energy and Natural Resources is pleased to announce a new electronic bulletin board, the Groundwater Education Network (GWEN). GWEN contains the complete text of this newsletter, available for downloading for inclusion in your newsletter or correspondence. Also available on GWEN will be groundwater-related stories, information, and editorials. Users of GWEN can also upload information they would like included in the network, whether it is an article or just a bit of news.

You will need a telephone and a modem-equipped computer to access GWEN. Set your system for 300 or 1200 baud, 7-bit word length, no parity, and 1 stop bit (7N1). Then dial GWEN's number—(217) 785-8572.

After you make the connection, you will be given step-by-step instructions on how to sign up. There is no charge for using GWEN. If you have comments on how GWEN can be improved, feel free to leave a message for the system operator (sysop).

ZPG RELEASES NEW POPULATION EDUCATION TEACHING KIT

ZPG announces publication of a new teaching kit, *Earth Matters: Studies for Our Global Future.* This resource is designed to help high school students examine some of the most pressing environmental, social and economic issues of our time.

Through 32 separate teaching activities and 12 readings, *Earth Matters* helps high school students understand how overpopulation contributes to climate change, air and water pollution, energy consumption, hunger, garbage, species extinction, deforestation, poverty, the status of women and more. The 177-page, spiral-bound book also lets students explore underlying clashes between economic growth and environmental health. *Earth Matters* aims to enlighten students, as well as to build the skills, concern and commitment necessary for effective global citizenship.

Because the issues covered in *Earth Matters* are interdisciplinary, the book is designed for use in several curriculum areas: social studies, science, math, language arts and family life education, and can be easily integrated into existing curriculum plans. The "Teacher's Guide" at the beginning of the book clearly outlines which activities are most appropriate for each subject area. A variety of teaching strategies such as role-playing simulations, laboratory experiments, problem solving challenges, mathematical exercises, cooperative learning projects, research, discussion and values-clarification activities are included to meet the needs of different educators and their individual teaching styles.

In one activity, students make economic and environmental decisions regarding tropical rainforests in a board game. In another, students attend an unconventional luncheon where the food, ambience and seating assignments are determined by their global economic status.

In other activities, students act as United Nations delegates at a meeting on climate change issues, observe the population growth of duckweed plants in the laboratory, and test their environmental scruples in a card game of economic and social dilemmas.

An extensive resource list included in the book guides teachers and students to further information on a wide variety of population and environmental resources, including books, bulletins, software, audiovisual aids and other teaching materials.

Earth Matters: Studies for Our Global Future (177 pp.) is available from ZPG for $19.95, plus $3.00 shipping and handling. To order a copy, contact ZPG, 1400 16th Street, NW, Suite 320, Washington, DC 20036.

Zero Population Growth, Inc. (ZPG) is a national, nonprofit membership organization which works to achieve a sustainable balance of people, resources and the environment, both in the United States and worldwide.

THE HUMAN GENOME PROJECT RAISES PROFOUND ISSUES

The objective of the human genome project, directed by the National Institutes of Health and the Department of Energy, is to uncover the complete sequence of all three billion base pairs in a representative human genome. Various research groups around the country will accomplish this task during the next fifteen years, using a variety of techniques from classical genetics to cutting-edge molecular biology. The ethical and policy issues surrounding this project are numerous and complex, ranging from the use of sequence data for genetic screening for monogenic and multifactorial disorders, to the proprietary nature of gene probes.

BSCS will address those issues and other important challenges in a new instructional module for the high school biology classroom titled "Mapping and Sequencing the Human Genome: Science, Ethics, and Public Policy." Under this sixteen-month grant funded by the Department of Energy, BSCS will provide background material for teachers on the human genome project, and at least five instructional activities for the classroom. In most cases, the high school biology classroom is the last formal opportunity for many students to explore the content and nature of science and to develop the skill needed to analyze the relationship between rapid scientific and technological progress and its societal implications.

BSCS will collaborate with the American Medical Association on the development of the materials. The American Society of Human Genetics, National Society of Genetic Counselors, and Council of Regional Networks for Genetics Services will provide independent reviews of content. Ward's Natural Science Establishment will serve as official supplier for laboratory equipment and materials for the classroom activities that comprise the instructional part of the module. Under the terms of the grant, BSCS will send one copy of the final program free of charge to each high school biology teacher in the United States.

BSCS, now in its thirty-third year, is dedicated to providing leadership for education in science, primarily through innovative materials. In addition, BSCS provides leadership through research by conducting research on the development and implementation of print and nonprint materials; teacher-education activities and field testing constitute important parts of the development process. It is primarily through its research-based materials that BSCS serves as an advocate for learners and for exemplary science teaching.

For more information contact: BSCS, Catherine M. Monson, [719] 578-1136.

THE UNIVERSE IN THE CLASSROOM:

A Free Classroom Resource for Grades 3 - 12: A Newsletter on Teaching Astronomy

A free newsletter on teaching astronomy in primary and secondary schools is being offered by the four leading professional astronomy societies in North America. Designed to help teachers, curriculum specialists, and librarians include more astronomy in their classroom work, the newsletter is produced by the nonprofit Astronomical Society of the Pacific and is co-sponsored by the American Astronomical Society, the Canadian Astronomical Society, and the International Planetarium Society.

Each quarterly issue features:

- clear nontechnical articles on new developments in the exploration of the universe
- practical classroom activities for teaching astronomy
- specific suggestions for the best written and audiovisual resources on astronomical topics.

Articles focus on a variety of astronomy topics, including exploration of the planets, exploding stars, the search for life elsewhere, the Big Bang, and the difference between astronomy and astrology.

No background in astronomy is assumed of the reader; in fact, the sponsoring societies particularly wish to encourage teachers with little science training to request the newsletter.

To be put on the mailing list for future issues, teachers or school librarians should write on school stationery *and identify the grade level they teach.*

Write to:
Astronomical Society of the Pacific
Teachers' Newsletter, Dept. N
390 Ashton Ave.
San Francisco, CA 94112

(The Teachers' Newsletter project is supported in part by grants from the sponsoring societies, the V.M. Slipher Fund of the National Academy of Sciences, AUI/Nat'l Radio Astronomy Observatory, Lockheed, and Apple Computers.)

BIOLOGY LABS FOR HIGH SCHOOL TEACHERS

From Huntington's disease to dichotomous keys, DNA fingerprinting to schooling behavior and fish, the new monograph, *Favorite Labs from Outstanding Teachers*, bridges a wide range of life sciences topics for high school classrooms. The 25 recipients of the Outstanding Biology Teacher Award (OBTA) offer teaching techniques, labs and topical ideas to enhance the classroom experience.

The monograph is available for $12 to members and $15 for nonmembers plus $2 for shipping and handling. Checks should be mailed to NABT, 11250 Roger Bacon Dr. #19, Reston, VA 22090. For bulk orders, call NABT at 703-471-1134.

INTERESTED IN CONTRIBUTING TO THE ISTA SPECTRUM?

SPECTRUM welcomes contributions from its readers. Won't YOU submit some of your GOOD IDEAS for one or more sections of the SPECTRUM?

ARTICLES
- 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.

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

MINI IDEAS
- Instructional pieces
- Demonstrations
- Lab activities
- "Grabbers"

OPPORTUNITIES
Activities for professional and/or student involvement

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

MEETINGS
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.

YES, I WOULD LIKE TO CONTRIBUTE TO THE ISTA SPECTRUM

I have a good idea that I'd like to share!

Name: _____

School or Business:
(name) _____
(address) _____
(city, state, ZIP) _____
(telephone) (____) _____

Home:
(address) _____
(city, state, ZIP) _____
(telephone) (____) _____

Title of Contribution: _____

I have a good idea or contribution for:

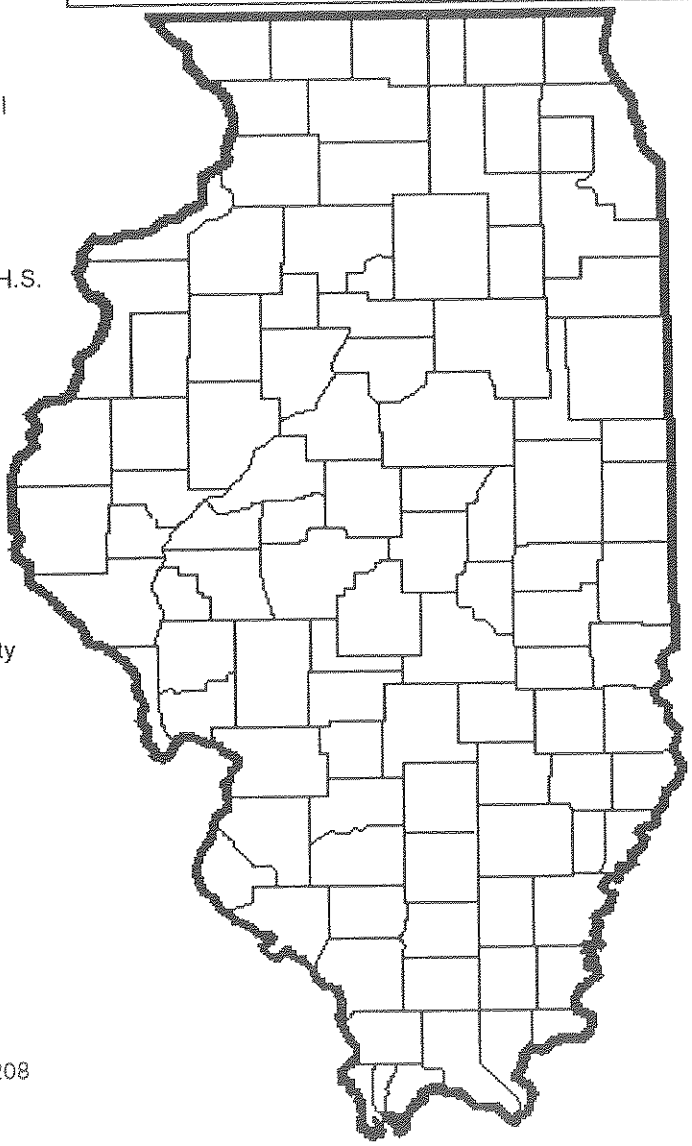
___ARTICLES
___IN FOCUS
___SPECIAL INTERESTS
___MINI IDEAS
___REVIEWS
___POTPOURRI
___OPPORTUNITIES
___MEETINGS
___AWARDS/RECOGNITION
___FIELDTRIPS/WORKSHOPS
___EDUCATIONAL MATERIALS

I would like my contribution to appear in the following issue(s):

___**Fall** (due June 1)
___**Winter** (due September 1)
___**Spring** (due December 1)
___**Summer** (due March 1)

SPECTRUM welcomes black and white glossy photographs. We can sometimes use color pictures but they must be sharp with high contrast.

ISTA REGIONS



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Maureen Jamrock
Coolidge Jr. High School
155th and 7th Avenue
Phoenix, IL 60426
(708) 339-5300

Barbara R. Sandall
Teachers Academy for
Math and Science
10W 35th Street
Chicago, IL 60616
(312) 808-0100

REGION II
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1307 West 4th Street
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(309) 793-5985

John Carleton
Hononegah Community H.S.
307 Salem Street
Rockton, IL 61072
(815) 624-8951 Ext 52

REGION III
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5617 N. Merrimac
Peoria, IL 61614
(309) 693-4422

John B. Beaver
Western Illinois University
47 Horrabin Hall
Macomb, IL 61455
(309) 298-2065

REGION IV
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Franklin M.S.
817 N. Harris
Champaign, IL 61820
(217) 351-3709

Gary Butler
Sangamon State University
Biology Program
Springfield, IL 62794
(217) 786-6630

REGION V
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26th and Bond Avenue
East St. Louis, IL 62205
(618) 583-8438

Paulette Burns
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Fairview Heights, IL 62208
(618) 233-6004

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Fairfield, IL 62837
(618) 842-2649

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Hutsonville, IL 62433
(618) 563-4913

Listing of Counties Comprising Each ISTA Region

Region I	McHenry, Lake, Kane, Cook, DuPage, Kendall, Will, Grundy, Kankakee
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Region III	Henderson, Warren, Knox, Stark, Peoria, Hancock, McDonough, Fulton, Tazewell, Schuyler, Mason, Adams, Brown, Cass, Menard, Pike, Scott, Morgan, Sangamon
Region IV	Woodford, Livingston, Ford, Iroquois, McLean, Logan, DeWitt, Piatt, Champaign, Vermillion, Macon, Shelby, Moultrie, Douglas, Edgar, Coles, Cumberland, Clark
Region V	Calhoun, Greene, Macoupin, Montgomery, Madison, Bond, St. Clair, Clinton, Monroe, Washington, Randolph, Perry
Region VI	Fayette, Effingham, Jasper, Crawford, Marion, Clay, Richland, Lawrence, Wayne, Edwards, Wabash, Jefferson, Franklin, Hamilton, White, Jackson, Williamson, Saline, Gallatin, Union, Johnston, Pope, Madison, Alexander, Pulaski, Massac

ILLINOIS SCIENCE TEACHERS ASSOCIATION

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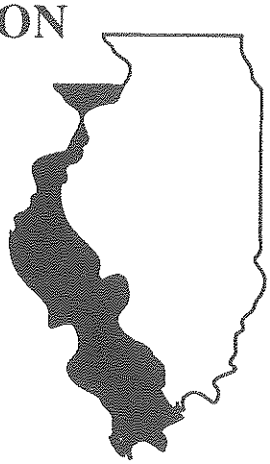

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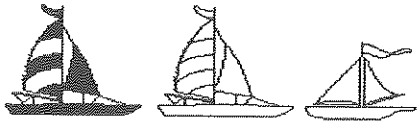

SUMMER 1992