SPECTRUM

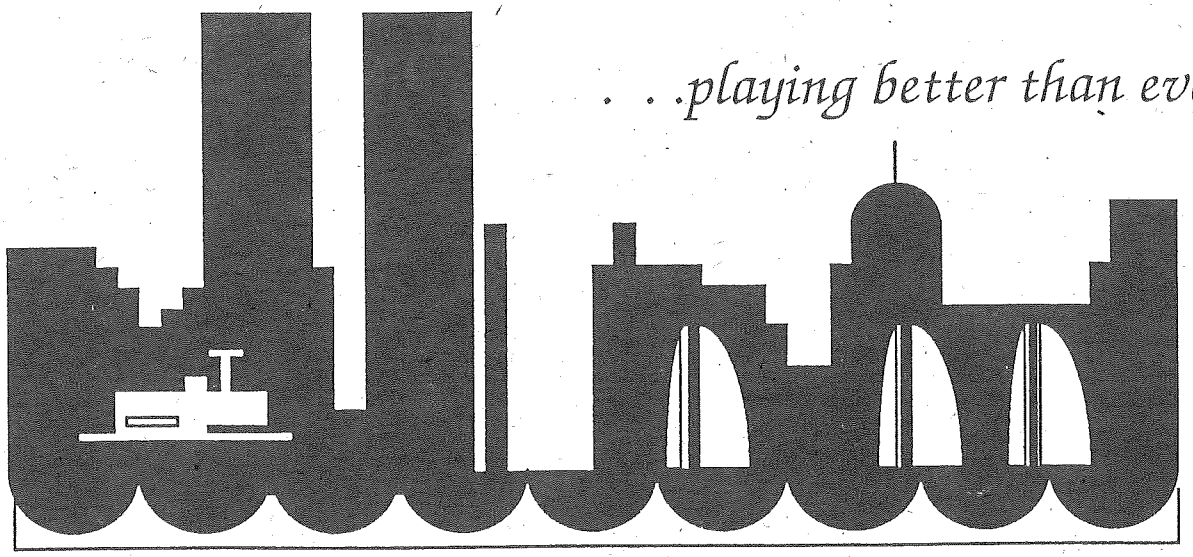
THE JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION FALL 1991

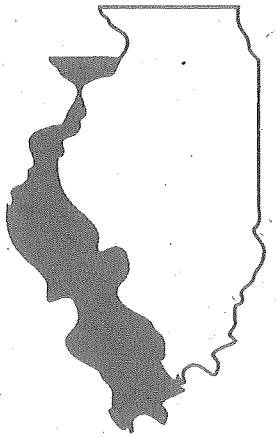
Interacting for Excellence in Science Education

ISTA 25th Annual Convention
Peoria Civic Center/Hotel Pere Marquette
Peoria, Illinois
4 -5 October 1991

Peoria

. . .playing better than ever!





ILLINOIS SCIENCE TEACHERS ASSOCIATION

ISTA SPECTRUM

JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION
Volume 17, Number 1, Fall 1991

SPECTRUM is mailed from the University of Illinois, Champaign. Correspondence regarding the SPECTRUM should be addressed to:

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The Illinois Science Teachers Association (ISTA) is a state chapter of the National Science Teachers Association, 1742 Connecticut Ave., NW, Washington, DC 20009.

ISTA NEWS 1
ARTICLES 5

- USING MAZON CREEK FOSSILS TO EXPLORE PENNSYLVANIAN ILLINOIS
- STATE OF ILLINOIS GOALS AND SAMPLE LEARNING OBJECTIVES
- BEGINNING SCIENCE TEACHERS IN ILLINOIS
- USING ASTRONOMY TO EDUCATE AND INSPIRE
- A STRATEGY FOR INTEGRATING THE ASSESSMENT OF SCIENCE AND WRITING

SPECIAL INTEREST 26
MINI IDEAS 36
AWARDS/RECOGNITION 40
OPPORTUNITIES 44
MEETINGS AND CONFERENCES 45

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ISTA NEWS

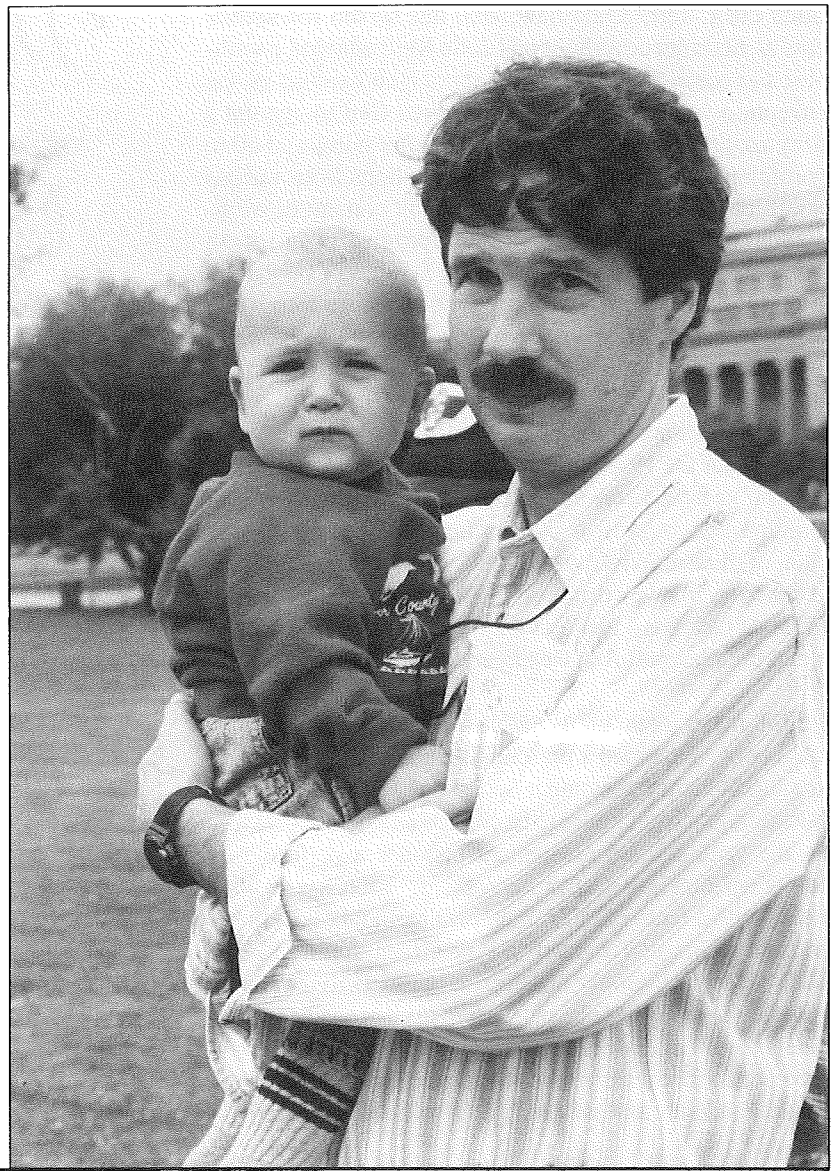
PRESIDENT'S MESSAGE

Dear Colleague:

I just returned from our summer ISTA Board meeting held on June 14 and 15 in Urbana-Champaign. As President of the Association it was my job to chair the meeting, a task that kept me busy for two action-packed days. It is not easy to lead, let alone keep up with a roomful of enthusiastic science educators who are all leaders in their own right. Nonetheless, the meeting was productive and I think we laid some important groundwork for the continued growth and success of our organization. I'd like to share with you some of the highlights of the meeting.

I'm pleased to report that ISTA is on solid financial ground. Over the last several years we have maintained a good balance between the income from membership dues and the expenses associated with running the organization and providing services to members. Among these services are **SPECTRUM** and various awards programs. The 1990 convention, aside from being highly successful from the standpoint of providing an outstanding program and ample interaction between science educators from across the state, also produced a healthy profit for the organization. A major portion of the profit was the income from the commercial exhibitors. I encourage you to thank them for their support when you visit the exhibits at our next convention.

Max and I are concerned about the future of Science Education . . .



IN FOCUS
SPRING 1992 TOPIC

"CHILDREN AND SCIENCE WRITING"
SEND IDEAS ON HOW YOU HAVE INCORPORATED WRITING INTO THE SCIENCE CURRICULUM

* RESEARCH IDEAS
* "HOOKS"
* TECHNIQUES
* INTERDISCIPLINARY PROJECTS

DEADLINE: DECEMBER 31, 1991

Income from the conventions goes into our reserve funds. These reserves allow us to conduct our conventions in locations that we know may be expensive to the organization or that may not draw as large a crowd as can be expected in the Chicagoland area conventions. Over the long term, our goal is that ISTA conventions will be self-supporting while no single convention will need to break even or to make a profit. To summarize our current financial standing, our dues adequately cover our expenses and our convention reserve is more than adequate to insure that we can run a quality convention at least for the next few years, barring some catastrophe.

At this meeting, the Board addressed the problems associated with assuring that high quality conventions continue to be the trademark of our Association. In line with the Board's concern, two major actions were taken. First, the Board activated a Standing Convention Committee and appointed Geri Blakley as Chair. Working with Geri will be Shelly Peretz who for several years has been our convention registration chair; Jerry Dillashaw, who has served for several years as site selection chair; and John Kent who has coordinated the commercial and non-commercial exhibits of the convention for several years. I've asked Geri to appoint a transportation coordinator who will charter buses and other appropriate transportation to our conventions from various regions of the state. Geri will also recruit committee members who will help the local convention program chair recruit presenters for the conventions. This Standing Convention Committee will insure continuity for our conventions while each annual convention will have a local committee and chair who will work out the details unique to each convention.

The Board also approved the Edwardsville-Collinsville area as the site for the 1993 convention. It has been several years since we've held a convention south of Springfield and I'm delighted that we will make the long overdue journey to southern Illinois. While we're on the subject of conventions, I'd like to remind you that the1991 convention will be held in Peoria on October 4 and 5 and the 1992 convention will be held at the Pheasant Run Resort area west of Chicago.

A third major area of discussion was the Illinois State assessment. We heard a presentation from Richard Walker from the Student Assessment Section of the State Board of Education. Rich continues to be our ally as we push to assure that the state science assessment includes a performance component that will test process skills. Rich has worked closely with a team of ISTA members including Past President Jenny Grogg; Treasurer Wayne Green, former SPECTRUM editor Orin Gould; and President-Elect David Winnett to produce sample performance test items that can be used as models for local districts to develop their own assessment instruments. The team's hard work has come to fruition and sample hands-on assessment kits have been produced for demonstration at workshops or for local districts to purchase from ISTA. While we do not want to be in the "kit business," we feel that producing an actual set of testing materials is an important step to furthering performance assessment in Illinois.

In closing I would like to speak to you not as the President of ISTA but as a new father. I'm concerned for my year old son Max's science education future. I look forward to helping him with his science projects and to setting up a home laboratory so that he can conduct experiments inspired by his classroom science experiences. I hope that when he becomes school age there will be science teachers like you to encourage his enthusiasm and to keep his hands and mind busy with meaningful experiences.

I thank you for your past efforts and encourage you to continue to keep our profession growing.

Sincerely,

Mark Wagner

ARE YOU INTO C.A.I.?

(COMPUTER AIDED INSTRUCTION)

IF YOU HAVE DEVELOPED:

***SCIENCE SIMULATIONS**
***MICROCOMPUTER-BASED LABS (MBLs)**
***TUTORIALS**
***DRILLS**
***USE OF TOOL SOFTWARE TO COMMUNICATE ABOUT SCIENCE**
***USE OF NETWORKS TO CONDUCT LEARNING ACTIVITIES IN SCIENCE**
***USE OF DATABASES TO CONDUCT SCIENCE RESEARCH PAPERS**

SPECTRUM

WANTS TO SHARE YOUR INSIGHTS WITH OUR READERS!

Send your ideas to:
MIKE WAUGH,
c/o SPECTRUM
COLLEGE OF EDUCATION
1310 S. SIXTH STREET
CHAMPAIGN, IL 61820

NEWS FROM NSTA

It's time to start planning for NSTA's 40th National Convention, to be held in Boston, Massachusetts, March 26-29, 1992. This convention promises to be one of our best ever, with tons of workshops, special presentations, tours, short courses, and exhibits.

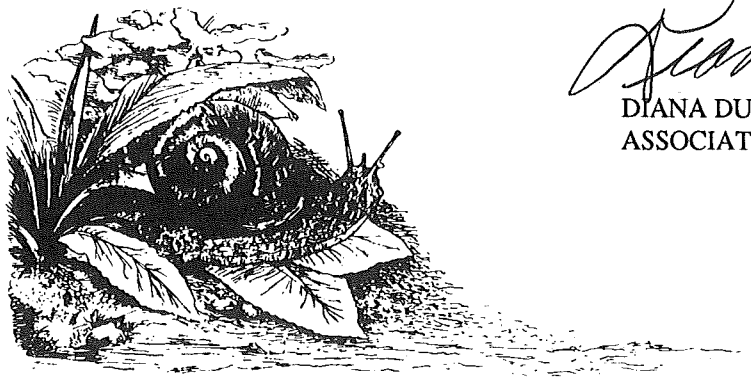
Advance registration rates for the Boston National Convention range from $15 for students, one day only, to $60 for members and $90 for nonmembers for the full convention. After the advance registration deadline, fees will be $70 for members and $100 for nonmembers. Special discounts, not yet determined, will also apply.

Housing costs will be in the $100-$115 range for a single. The co-headquarters hotels will be the Sheraton Boston Hotel and Towers and the Boston Marriott Hotel/Copley Place. Exhibits will be in the Hynes Convention Center.

As usual, NSTA and major airlines will join together to offer special discounted airfares to attendees of the Boston Convention. Discounts will range from 5 percent off supersaver fares to 40 percent off regular airfares. Special rates will also be available for car rentals.
Our convention program will include four general sessions, the speakers to be announced, as well as luncheons, special lectures, and the president's banquet. In addition, Carl Sagan has again been invited to present his popular Planetary Society Lecture.

On our tentative social agenda is a Thursday night reception at the Boston Museum of Science, and on Friday, a choice of a harbor cruise or a visit to the Kennedy Library or Boston Aquarium.

The annual SOAR conference, Special Opportunities in Aerospace Resources, will be held concurrently with the NSTA National Convention. Participants must register separately to attend the SOAR conference. On the program are hands-on workshops incorporating space science into the curriculum and special presentations by members of NASA, NOAA, and ESA (European Space Agency).



NSTA'S FALL CONVENTIONS

Vancouver, B.C., November 21-23
Reno, Nevada, December 5-7
New Orleans, Louisiana, December 14-16

SPECTRUM PUBLISHING UPDATE

THIS ISSUE OF **SPECTRUM** MARKS THE BEGINNING OF SEVERAL NEW FEATURES.
THE U OF I COLLEGE OF EDUCATION PRINT SHOP CLOSED SO WE NOW HAVE A NEW PRINTER, **ANDROMEDA PRINTING AND GRAPHIC ART COMPANY.**
NOTICE THE JOURNAL IS NOW SADDLE-STITCHED, A MUCH MORE DURABLE METHOD OF BINDING.
IN ADDITION, **SPECTRUM** IS NOW COMPLETELY PRINTED ON RECLYCLED/RECYCLABLE PAPER.
THE POSITION OF ASSOCIATE EDITOR IS NOW A MORE PERMANENT ONE, REFLECTING THE TREND TOWARD YEAR TO YEAR CONTINUITY IN OUR ORGANIZATION. WE HAVE PURCHASED AN UPDATED VERSION (4.01) OF PAGEMAKER AND AS I HAVE LEARNED TO USE IT, THE COST OF HIRING AN OUTSIDE PERSON TO LAYOUT THE PAGES HAS BEEN ELIMINATED. LOOK FOR FURTHER IMPROVEMENTS IN THE NEAR FUTURE AS WE CONTINUE TO MAKE **SPECTRUM** A PUBLICATION THAT REFLECTS THE PROFESSIONALISM AND GROWTH OF THE ISTA!
REMEMBER -- THIS IS *YOUR* JOURNAL AND *YOU* HAVE THE OPPORTUNITY AND RESPONSIBILITY TO ENHANCE SCIENCE EDUCATION THROUGH THE INNOVATIONS AND IDEAS YOU SHARE IN THESE PAGES. LET US HEAR FROM **YOU** SOON!

SINCERELY,

Diana

DIANA DUMMITT
ASSOCIATE EDITOR

ILLINOIS ASSOCIATION OF BIOLOGY TEACHERS
1991-1992 CALENDAR

A group of colleagues with which you can learn new ideas, exchange information or network.

SEPTEMBER 28	Biology Teachers' Tour of Brookfield Zoo
OCTOBER 4-5	ISTA CONFERENCE - IABT Speaker Dr. Ralph Nelson, University of Illinois Bear Behavior Peoria, IL
NOVEMBER 4 -7	National Association of Biology Teachers Conference Nashville, TN
JANUARY 31	Surgical Museum Dinner - Tour Chicago, IL
MARCH 6	Computers in Biology To Be Announced
MARCH 26-29	NSTA Conference Boston, MA
MAY 1-2	Fossiling in Illinois With Mike Parrish - NIU Lorado Taft Field Campus Oregon, IL

JOIN US! MAKE NEW FRIENDS! LEARN NEW IDEAS!

NAME _____ DATE _____

MAILING ADDRESS _____

_____

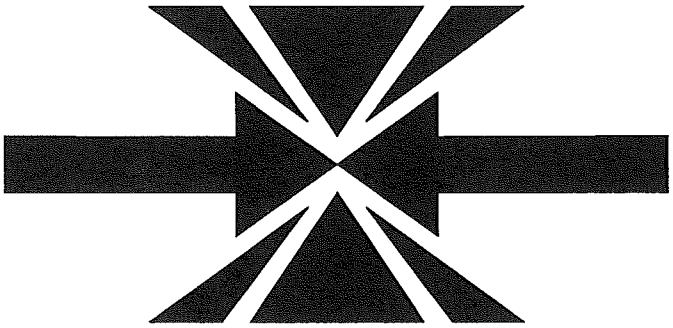
SCHOOL _____

IS THIS YOUR SCHOOL ADDRESS?
YES _____ NO _____ PHONE _____

IABT DUES $4.00
Check Payable to IABT, Inc.
Send to:
Phil McCrea
New Trier High School
385 Winnetka Ave.
Winnetka, IL 60093

Convention Information

ISTA 25th Annual Convention
Peoria Civic Center/Hotel Pere Marquette
Peoria, Illinois
4 - 5 October 1991



Interacting for Excellence in Science Education

The 25th annual convention of the Illinois Science Teachers Association will be held 4 -5 October 1991 at the Peoria Civic Center and the Hotel Pere Marquette in Peoria, Illinois. Convention sessions begin at 8:00 AM on Friday, 4 October 1991 and end on Saturday, 5 October 1991 at 2:00 pm. In addition to the workshop sessions and general sessions, there will be exhibits by commercial firms related to science education and non-profit organization with a science focus. All teachers, administrators, supervisors, and others with responsibility for and concerned with science education in Illinois are urged to attend.

Dozens of exciting workshops, tours, demonstrations, and others sessions are designed to help improve the status of science teaching. Classroom teachers, science educators, business people, and others have planned an exciting agenda for this, the 25th annual conference! Come, help celebrate the silver anniversary gathering of those who wish to provide the best in science education for the children of Illinois! Hear outstanding teachers from around the state tell about unique and exciting ideas for capturing g the imagination and attention of students! Visiting the Exhibit Area and get ideas about some of the latest in teaching materials through books, computer programs, science supplies, any many other teaching aids.

The theme of this year's conference, **Interacting for Excellence in Science Education**, emphasizes the complex task facing the schools in the 1990's. We must find ways to interact with the many constituencies of the schools - parents, business, colleges, etc - to help improve the nature of science education. The 25th Annual Convention will help to provide a forum for discussion among the many groups involved in educating the children of Illinois.

Of course, no ISTA convention would be complete without the opportunities to meet old friends and make new friends from around the state to converse, catch up on happenings, and share ideas for teaching. This sharing is one of the the most beneficial aspects of the annual conference.

This Advance Notice of the convention activities contains information, schedules, and registration forms for the Convention to be held in Peoria, Illinois on 4 - 5 October 1991. The sessions will be in both the Peoria Civic Center and next door in the Hotel Pere Marquette. Registration will be at the Civic Center and the exhibits will be housed in the Exhibit Hall of the Civic Center. The Hotel Pere Marquette is the Convention Hotel. All schedules at this time are tentative; changes may become necessary by convention time.

We suggest that you make your housing arrangements as soon as possible to help ensure your choice of room. Housing requests must be made directly to the Hotel Pere Marquette; ISTA is not making housing arrangements. Information regarding housing is found elsewhere in this convention notification.

For more complete information regarding the sessions, please contact Tim Halloran at the Mid-Illini Educational Service Center, 400 h Highland, Creve Coeur, IL 61611,(309) 698-7119. To preregister, use the form included in this notification. For questions regarding registration, contact Shelly Peretz, 7826 W. Arquilla Dr., Palos Heights, IL 60463, (708) 974-1812. If you preregister by 25 September 1991, you will receive a confirmation card confirming your registration. When you arrive at the Peoria Civic Center, you can present your confirmation card and pick up your registration packet. Your name badge, any tickets for tours or paid workshops, the final program booklet, and convention updates will be in the packet.

CONVENTION COMMITTEE

Jerry Dillashaw, Convention Chair
210 Westlake Hall
Bradley University
Peoria, IL 61625
(309) 677-3181

Tim Halloran, Program Chair
Mid-Illini ESC
400 N. Highland
Creve Coeur, IL 61611
(309) 698-7119

Karen Zuckerman, Publicity
Hollis Grade School
5613 W. Tuscarora Road
Peoria, IL 61607
(309) 697-1325

Gail Truho, Program
Rolling Acres Middle School
5617 N. Merrimac Drive
Peoria, IL 61614
(309) 693-4422

John Kent, Exhibits Coordinator
Chicago Board of Education
Chicago, IL
(708) 354-3289

Shelly Peretz, Registration
7826 W. Arquilla Dr.
Palos Heights, IL 60463
(708) 974-1812

Conference Location

Peoria, Illinois is located in central Illinois on I-74. The Civic Center and the Hotel Pere Marquette are easily accessed by taking the Glendale exit off I-74. Parking at the Pere Marquette is free to registered guests; parking at the Civic Center is $2.00 per day.

Peoria is served by several air lines. From Chicago - O'Hare service is provided by United Express and American Eagle. From Chicago - Midway service is provided by the Midway Connection. From the St. Louis area, TransWorld Express provides service from Lambert Field.

All sessions will be either in the Peoria Civic Center or the Hotel Pere Marquette. These two facilities are neighboring so participants can easily get from one to the other. The general sessions will be held in the Marquette Ballroom of the hotel; the exhibits and registration areas are in the Civic Center.

Hotel Reservations and Advance Registration

Hotel reservations. Reservations should be made directly with the Hotel Pere Marquette, 501 Main Street, Peoria, IL 61602, Tel. (309) 637-6500. ISTA is not handling the housing reservations. Should you wish to stay elsewhere in Peoria, there are several other options available.

Advance Convention registration. By action of the ISTA Board of Directors, registration is required of all participants, including all presenters and presiders. The lapel badge issued to each registrant is the "ticket of admission" to all sessions, exhibits, and other activities, except for those activities for which a separate registration and/or fee is required.

An **advance registration** form is included in the information packet. The deadline for advance registration is **25 September 1991**. Any advanced registrations received after that date will not be processed; it will be necessary to register on-site. Mail all individual advanced registrations to:

Shelly Peretz
1991 ISTA Convention
7826 W. Arquilla Dr.
Palos Heights, IL 60463

Registration Confirmation. If you register by the 25 September 1991 deadline, an advanced registration confirmation card will be mailed to you. This card will list your registration status and any special events for which an additional fee has been paid. This confirmation card will serve as your receipt. Please bring it with you to the Peoria Civic Center registration area. At this time you can pick up your registration materials, including your name badge and the final program.

Registration Hours

Convention materials will be available and on-site registration will be at the Peoria Civic center immediately outside the Exhibit Hall during the following hours:

Friday, 4 October	7:30 AM - 4:00 PM
Saturday, 5 October	7:30 AM - 11:00 PM

Reception

At the conclusion of the President's Address on Friday, there will be a wine and cheese reception. This reception is held in honor of the award recipients. Please join your colleagues in congratulating our outstanding science teachers in Illinois.

Hospitality

Enjoy coffee from 8:00 - 10:00 each morning. A Hospitality center will be located in the Exhibit Hall. Here you can relax with coffee and plan your days activities. The Registration area will have information on local sights, activities, restaurants, and other events in the Peoria area.

Meals

Lunch: Lunch service (sandwiches, etc.) is available in the Civic Center. There are several restaurants withing easy walking distance of the Civic Center and a cafe in the hotel.

Dinner: There are numerous fine restaurants in Peoria. A listing of restaurants and price guides will be available at the registration area.

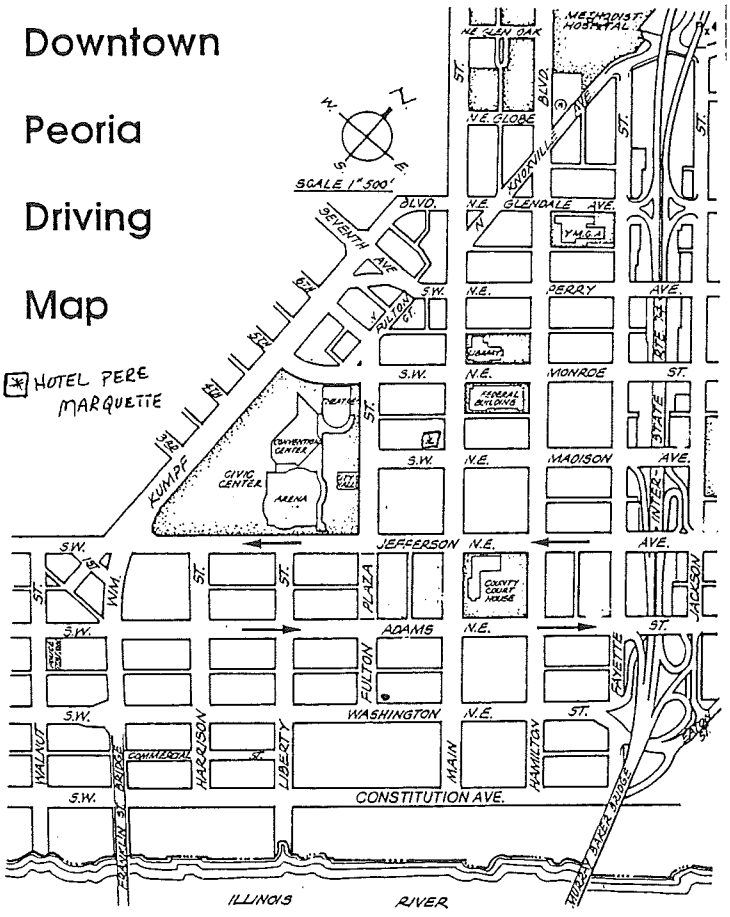
Special Needs

ISTA desires to make the convention accessible to all persons. If you need special services, check the appropriate box on the Advance Registration Form and explain the services you require. If you need special arrangements in your hotel room, you must contact the hotel directly. We will strive to make the convention barrier free, but we need your assistance to do so. Please give us advance notice of your needs by sending in your requests early.

Hometown Publicity Releases

Registrants are urged to help with publicity about science teaching by sending publicity releases to newspapers serving their home areas. News releases available for this purpose will be available at the convention.

Downtown Peoria Driving Map



PAID WORKSHOPS

PW-1 ROBOTICS
$35.00 8:30 - 10:45 AM, Saturday, 5 Oct 91

Learn about "robotics" by building your own sound-operated robot. By the end of this workshop, participants will be familiar with equipment that is required for construction of robots.

PW-2 FORENSICS: A Means to Process Evaluation
$5.00 11:15 AM - 1:30 PM, Friday, 4 Oct 91

The study of forensics is a means to process evaluation as dictated by Goal IV of the State of Illinois' Goals for Learning in Science Education. This presentation centers on a module in Princeton High School's Advanced Chemistry curriculum but can be adapted to all levels of science education from grades 7-12. The methods of teaching forensics and the process of setting up a criminal investigation in your school will be addressed. **Each participant will receive a forensic kit valued at $75.00 and a brochure describing how a single murder investigation can be set up.** Additionally, you will receive information on how to obtain a videotape of supporting evidence. Funded through an ISBE Literacy Grant.

** **Workshops PW-3 through PW-6 will be held at the Lakeview Museum and Planetarium. Participants are responsible for their own transportation.**

PW-3 Observing the Sky Through Toilet Paper Tubes
$10.00 9:00 - 10:45 AM, Friday, 4 Oct 1991 (Jr/Sr High)

Use the Museum's Planetarium to simulate two exercises in galactic astronomy:)1 statistical sampling of the stars in our galaxy and 2) creating a false color density map of the Milky Way Galaxy. These activities may be done under the real sky or in any planetarium to help explain how astronomers study the structure of our galaxy. We will also study how the Milky Way's appearance changes through the seasons of the year. Current star map and T. P. tubes will be supplied.

PW-4 Finding the Constellations Throughout the Year
$6.00 11:00 AM - 12:45 PM, Friday, 4 Oct 91 (K - 12)

Are you frustrated when teaching astronomy and can't find anything by Orion from your backyard Spend a year with out astronomers and learn how to find the principal seasonal constellations. Discover how the Big Dipper can be used as a calendar or a clock. Celestial events for the coming school year will also be summarized. Seasonal star maps will be supplied.

PW-5 Classroom Activities in Astronomy (Make It-Take It)
$12.00 1:15 PM - 3:00 PM, Friday, 4 Oct 91 (K - 8)

Forty page activity guide including current sky map is included. Twelve classroom activities which can be adapted for a wide range of grades, including making a simple planetarium projector, creating constellations, the scale of the solar system, astronomy activities for your school bus ride, your weight on other planets, the lunar olympics, an anywhere sundial, an astroscanner, folding a space shuttle, a big dipper clock, and a 3-D Big Dipper. The planetarium will be used to demonstrate the concepts where necessary. (All activities will be summarized; time will not allow complete construction of all materials.)

PW-6 Using the Starlab Portable Planetarium
$6.00 3:15 - 5:00 PM, Friday, 4 Oct 91 (K - 12)

Current star map will be supplied. The 110 page Starlab Teacher's Guide will be available for purchase at a special conference price of $7.00. (Do not send this $7.00 to ISTA; purchase at the session).

TOURS

T-1 Wildlife Prairie Park
$12.00 8:30 AM - 12 noon, Saturday, 5 Oct 91 (K - 12)

Wildlife Prairie Park is a preserve devoted to keeping animals native to the prairie in natural habitats. The Park naturalist will give a guided tour of the park as well as explain the variety of educational programs available to schools. Transportation is included in the cost. The bus will depart from and return to the Hotel Pere Marquette.

T-2 National Center for Agricultural Utilization Research
cost 9:00 AM - 12:00 noon, Friday, 4 Oct 91

The NCAUR is a research facility of the United States Department of Agriculture. The primary function of the lab is to study ways to get greater production efficiency for the products of farmers and ranchers. This lab is the lab where penicillin was first used for medicinal purposes in World War II. Most recently, a scientist at this lab developed the fat substitute, *Oatrim,* which was introduced in 1990.

1991 CONVENTION REGISTRATION
Interacting for Excellence in Science Education
Peoria Civic Center/Hotel Pere Marquette, Peoria, Illinois
4-5 October 1991

PLEASE FILL OUT FORM COMPLETELY (Each participant should use a separate form.)

Name_____ Spouse's Name (if attending)_____

Home Address_____ Home Phone (____)_____-_____

City_____ State_____ Zip_____

Affiliation (school, college, organization)_____

Business Address_____ Bus. Phone (____)_____-_____

City_____ State_____ Zip_____

_____ *CHECK HERE IF YOU NEED SPECIAL ASSISTANCE DUE TO HANDICAP.*

LEVEL (Circle): Elementary Middle School/Jr. High High School College Other

DISCIPLINE (biology, chemistry, physics, environmental, general, etc.):_____

MY SCHOOL IS (Circle): Public Private Parochial Museum Other

_____ ISTA Membership Dues (through 9/92)	$20.00	_____
_____ Member Registration	$20.00	_____
_____ Member Registration, One Day Only: (Circle one) Friday Saturday	$15.00	_____
_____ Non-Member Registration	$40.00	_____
_____ Non-Member Registration, One Day Only: (Circle) Friday Saturday	$30.00	_____
_____ Full Time Student (Includes Membership)	$10.00	_____
_____ Non-Teaching Spouse	$ 8.00	_____

PAID WORKSHOPS - *Fee covers cost of materials*

Workshop #	*Workshop Title*	*Fee*	
_____	_____	_____	$_____
_____	_____	_____	$_____

TOURS - *Fee includes transportation*

_____	_____	_____	$_____
_____	_____	_____	$_____

PRE-REGISTRATION DEADLINE; 25 SEPTEMBER 1991
Registrations must be received no later than this date to ensure processing before the convention.

TOTAL $_____

Make checks payable to: ***ISTA 1991 Convention***

SEND REGISTRATION FORM AND CHECK TO:

SHELLY PERETZ
7826 W. ARQUILLA DR.
PALOS HEIGHTS, IL 60463

BY ACTION OF THE ISTA BOARD OF DIRECTORS, REGISTRATION IS REQUIRED FOR PARTICIPATION IN ALL ACTIVITIES OF THE CONVENTION. THE BADGE ISSUED TO EACH REGISTRANT IS THE TICKET OF ADMISSION TO ALL SESSIONS, EXHIBITS, AND OTHER ACTIVITIES.

HOUSING REQUEST FORM

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone__( )_____-_____

GROUP: ILLINOIS SCIENCE TEACHERS ASSOCIATION

ACCOMMODATIONS REQUESTED

- ☐ SINGLE (1 PERSON) $63.00
- ☐ DOUBLE (2 PERSONS) $73.00
- ☐ Extra Person_____ ☐ Number @ $15.00

ARRIVAL TIME: ☐ 6 P.M. ☐ GUARANTEE LATE ARRIVAL

GUARANTEED BY:

- ☐ CONFIRMATION REQUESTED
- ☐ ENCLOSED ONE NIGHT ADVANCE DEPOSIT
- ☐ CREDIT CARD TYPE_____

NUMBER_____EXPIRES_____

NOTE: ALL ROOM REQUESTS MUST BE RECEIVED BY 9-19-91

Date_____ Signature_____

ROOM TYPE HONORED ON AVAILABILITY

MAIL HOUSING DIRECTLY TO THE HOTEL. MAIL TO:

Hotel Pere Marquette
501 Main Street
Peoria, IL 61602-9938

FRIDAY, October 4, 1991
8:30 A.M.
PRESENTATIONS

HOTEL PERE MARQUETTE

Harvesting Peter Rabbit's Garden, Discovering Mr. McGregor's Tools
Blackhawk Room
Marion Lardner, Hanson School, Rock Island, IL

Risk and Reason, A Classroom Challenge
Bradley Room
Robert W. Asplund, Highland Pk High, Highland Pk,IL

Can Mother Nature Fool You?
Cheminee Room
Sue Berg, Anne Rizzolo, Dave Brown, Hawthorn Junior High School, Vernon Hills, IL

Summer Science Project at Fermilab
Cotillion Ballroom
R. Dombeck, Fermilab & J. Cox, Hinsdale Dist. #181

New Biology Labs
Illinois Room
Al Kaskel, Glencoe-MacMillan/McGraw Hill, Glenview, IL

Get-A-Charge, Math and Science Hands-On (5-6)
LaSalle Room
Rebecca Keim, Debbie Tippett, Lalumier School, Centreville, IL

Nature Teaches Teachers
Lincoln Room
Dr. Marylin Lisowski, E.I.U. Dept. of Ed., Charleston,IL

BSCS Science for Life and Living
Marquette Ballroom
Gail Foster, Kendall/Hunt Pub. Co., Dubuque, IA

Problem Solving With Seeds &Other Flying Things
Peoria Room
Patricia Ross, Cooke Magnet School, Waukegan, IL

Achieving Knowledge Integration: Writing About Science
Sandburg Room
Raymond A. Davidson, Jr., I.S.U., Normal, IL

PEORIA CIVIC CENTER

Reduce, Reuse, Recycle
Room 134
Kathy Engelson, Ill. Dept. of Energy, Springfield, IL

In Days of Old When Things Were Bold
Room 135
Joan C. Preer

PEORIA CIVIC CENTER (Cont'd.)

Bloomington Jr. High School Outdoor Education: Taking the Classroom Outside
Room 136
Greg Freeman, Bloomington Jr. High, Bloomington, IL

Hands-On Fish Egg Development
Room 200
Dan Findley, Argo Community High, Summit, IL

Canines in the Classroom
Room 201
David M. Stone, University High School, Urbana,IL

Contemporary Science Teaching Korea/Thailand
Room 202
Manat Boonprakob & Hae-Ae Seo, I.S.U., Normal, IL

Snack Attack
Room 203
P. Doran, G. Fuller, M. Sams, Northpoint and Brigham Elementary Schools, Bloomington, IL

Physics Fact: Equipment Dollars Can Be Stretched
Room 204
Paul Lepard, Pasco Scientific, Roseville, CA

Energizing Your Curriculum with NEED
Room 209
Rich Ammentorp, ILEED, Schaumburg, IL

Clinical Laboratory Science: A Career That Gets Results
Room 210
Janice M. Kinsinger, I.C.C., East Peoria, IL

Paper Dragsters
Room 211
Barbara Detwiler, Gurrie Jr. High Sch., LaGrange, IL

NEWEST-NEWMAST, Networking and Recruitment
Room 212
Yvonne A. Johnson, West Elementary, Sycamore, IL

Fun With Fossils
Room 213
Peggy Ma, Edison Junior High School, Macomb, IL

Space Adventures from NASA-The Only Way to Fly
Room 218
Kathy Costello, St. John's Catholic School; Gail Letcher, Red Bud Elementary Sch.; Red Bud, IL

FRIDAY, October 4, 1991
11:15 a.m.
PRESENTATIONS

HOTEL PERE MARQUETTE

Mathematics in the Classroom
Blackhawk Room
Dennis Filliman, Niles West High School, Skokie, IL

Stars and Galaxies
Bradley Room
Charles A. Schweighauser, Sangamon State University, Springfield, IL

Forensics: A Means to Process Evaluation
Cotillion Ballroom
John R. Young, Princeton High Sch., Princeton, IL

Using Groundwater Models
Illinois Room
Harry Hendrickson, Ill. Dept. of Energy, Springfield, IL

Teacher Developed Science and Math Kit Sharing
LaSalle Room
Michael Schneider, ESC #16, Belleville, IL

Inducting Children Into Science (ICIS) - A Program for Middle School Children
Lincoln Room
Maria Verelas, Dr. Joseph Becker, U. of I. College of Education, Chicago, IL

Chemquest:Activities Related to Chemical Change
Marquette Ballroom
Carl Pfeiffer, NASCO, Fort Atkinson, WI

Primary Science Olympiad
Peoria Room
D. Andrews, S. Spivey, AlWood School, Alpha, IL

Integrating Science with Global Education
Sandburg Room
Ann Rubino, Custer Park High School, Custer Park, IL

PEORIA CIVIC CENTER

GEMS (Great Explorations in Math & Science) Workshop - Integrated Hands-On Math & Science
Room 134
John B. Beaver, Kevin D. Finson, Don Powers, Don Nelson, W.I.U., Macomb, IL

Simple Science
Room 135
Fredric Tarnow, North Cook ESC #3, Glenview, IL

Monkey Business is Everybody's Business
Room 136
Stephen L. Bartsch, DePaul University, Chicago, IL

PEORIA CIVIC CENTER (Cont'd.)

Helping Kids to See the Big Picture with Video-Enhanced Instruction
Room 200
Marion Stewart, Optical Data Corp., Chicago, IL

Butterfly Gardening
Room 201
Shari Morkin, Oakland School, Bloomington, IL

Which M & M Can Beat the Heat? Will Color Influence Melting?
Room 202
Judith K. Hall, 6th Street Elementary School, Mascoutah, IL

Science and Technology: Building Bridges to the Future
Room 203
Jenny Grogg, Lois Wisniewski, I.S.U., University High School, Normal IL

Preview of the 1992 IGAP Science Tests
Room 204
Dr. Richard Walker, Ill. State Bd. of Ed. Springfield, IL

Astronomy Basics: Easy Ways to Learn It and Teach It
Room 209
Elizabeth Stiles, Cernan Earth & Space Center, Triton College, River Grove, IL

A View of the New Science Education Center at Fermilab
Room 210
Kristin Ciesemier, Fermilab Education Office (Fermi National Accelerator Laboratory), Batavia, IL

Halloween Science - Elementary
Room 211
P. Diane Chambers, Brook Forest Sch., Oak Brook, IL

Yes, There Is Time for Science! Hands-On for K-3
Room 212
Sylvia Gilbert, Duke Ellington Branch, Chicago, IL

Food for *(Thought)* Chemistry
Room 213
Jane Russell, East Leyden High School, Franklin Park, Dalie Zygas, West Leyden High School, Northlake, IL.

Primarily Science
Room 218
Carol T. Young, Illinois State University, Normal, IL

FRIDAY, October 4, 1991
12:30 p.m.
PRESENTATIONS

HOTEL PERE MARQUETTE

Presentation of a Plan for the Review and Revision of Preservice Curriculum
Blackhawk Room
Lynne Haeffele, Illinois State Board of Education, Springfield, IL

Illinois Groundwater: Determining Parts Per Million (Billion)
Bradley Room
John B. Beaver, Don Nelson, Karen Zuckerman, W.I.U., Macomb, IL

Instant Science Take Away
Cheminee Room
Rose West

Forensics: A Means to Process Evaluation
Cotillion Ballroom
John R. Young, Princeton High School, Princeton, IL

Hands-On Problem Solving - Technic I
Illinois Room
Kathy Palker, MPI School & Inst. Supplies, Lansing, MI

Chemistry Activities for Elementary Science
LaSalle Room
Linda Hall, ESC #11, Macomb, IL
Bruce Hall, Roseville High School, Roseville, IL

In-School Suspensions (Solutions & Emulsions)
Lincoln Room
Karen Meyer, Thomas Jefferson School, Milan, IL

Teaching with Model Airplanes
Marquette Ballroom
Michael Garcher, Midwest Products Co., Hobart IN

Ill. Science Olympiad Interscholastic Competition
Peoria Room
Robert Griffy, Ill. Science Olympiad, Richmond, IL

Science, Similes and Misconceptions
Sandburg Room
H.B. Barrett, Northeastern Ill. University, Chicago, IL

PEORIA CIVIC CENTER

Water - A Drop in Your Life
Room 134
Yvonne A. Johnson, West Elementary School, Sycamore, IL

PEORIA CIVIC CENTER (Cont'd.)

Add Some Color (and Light) to Your Science Classroom
Room 135
Don Powers, W.I.U., Macomb, IL

Phases of the Moon: Selected Activities
Room 136
Harvey Hensley, Univ. of Wisc., Platteville, WI

FOSS - Full Option Science System
Room 200
Michael Dellefield, Encyclopaedia Britannica Education Corp., Chicago, IL

Non-Structural Hazard Mitigation for Schools
Room 201
Joseph V. Gasparich, Ill. Emergency Services & Disaster Agency, Springfield, IL

Professional Development Activities in Science, Mathematics & Technology Education
Room 203
Raymond J. Dagenais, Ann Hanson, Illinois Mathematics & Science Academy, Aurora, IL

Tips, Timesavers, and Techniques
Room 204
Shelley Schultz Castans, Judith K. Tamm, James B. Conant High School, Hoffman Estates, IL

The Adventures of Computer Kid
Room 209
Barbara Tidaback, Wilson Intermed. School. Pekin, IL

The Inquiry Approach to Science Teaching
Room 211
Frank W. Mattas, EMC/Univ. of Hawaii, Roseville, CA

ESC #13 Science Literacy Project: Getting Materials to Our Teachers
Room 212
Kevin Seymour, Julie Triplett, ESC #13, Rantoul, IL

Teaching Integrated Mathematics & Science: A Hands-On Program for Elementary Schools
Room 213
Marty Gartzman, U.I.C., Teaching Integrated Math & Science Project, Chicago, IL

Inside the Human Body
Room 218
Sheila M. Hogan, Kathie Moll, Mt. Zion High School, Mt. Zion,IL

FRIDAY, October 4, 1991
1:45 p.m.
PRESENTATIONS

HOTEL PERE MARQUETTE

Gravity Lessons for Little Kids
Blackhawk Room
Paul H. Zingg, School Dist. #108, Highland Park, IL

Productive Thinking Scale
Bradley Room
Richard Walker, John T. Chibnall, ISBE, Springfield, IL

Classroom Horticulture that Promotes Creative Science Thinking
Cheminee Room
Donald J. Schmidt, I.S.U., Normal, IL

Hands-On Problem Solving - Technic I
Illinois Room
Kathy Palker, MPI Sch. & Inst. Supplies, Lansing, MI

Exploring Solid Waste Issues Through Hands-On Classroom Activities
LaSalle Room
L. Hagen, ESC #16, Belleville; K. Kenna, Estelle Kampmeyer Sch.; D. Becherer, Shiloh Sch., O'Fallon, IL

Classroom Animals: Pill Bugs and More!
Lincoln Room
Gerry D. Haukoos, I.S.U., Normal, IL

Illinois Farm Day
Marquette Ballroom
Linda Lucas, Grundy Elemen. Sch., Morton, IL

Illinois Elementary Science Olympiad
Peoria Room
Robert Griffy, Ill. Science Olympiad, Richmond, IL

MASH (Math and Science Hands-On) Kit: Use It, Reuse It - Grades 5-6
Sandburg Room
Rebecca A. McLaughlin, Lalumier Sch., E. St. Louis, IL

PEORIA CIVIC CENTER

Agriculture and Science:A Match Made in Heaven!
Room 134
Jim Gullinger,, Rantoul, IL

Zen and the Art of State Science Assessments
Room 135
Michael Schneider, ESC #16, Belleville, IL

You Want to Step Outside and Say That?!
Room 136
Dale Goodner, Elroy Limmer, Forest Pk. Nature Center, Peoria Heights, IL

PEORIA CIVIC CENTER (Cont'd.)

Put on Your Own "Dr. Chemistry and Professor Physics" Show
Room 200
Ray Bruzan, Lanphier High School; Dave Sykes, Lincoln Land Community College, Springfield, IL

Overview: Illinois Scientific Literacy Program
Room 201
Lynne Haeffele, Don Full, Burles Bennett, Center on Scientific Literacy, I.S.B.E., Springfield, IL

Ponds and Prairies: Project C.A.R.E.
Room 202
Marylin Lisowski, E.I.U., Charleston, IL

Physics Lite: 22 Ready to Go Experiments in Introductory Optics
Room 203
Paul Lepard, Pasco Scientific, Roseville, CA

Operation Physics: A Program To Improve Science Literacy
Room 204
Tom Holbrook, University High School, Normal, IL

Eggspectations and Eggsplanations: Eggsperimenting on the Equinox
Room 209
Arlene D. Kanno, Julian Jr. High Sch., Oak Park, IL

Wading Into the Illinois River
Room 210
Jennifer Beal, Heartland Water Council, Peoria, IL

At-Risk Students + Microcomputers + Hands-On Science = Success
Room 211
William J. Sumrall, Gene Aronin, Northeastern Ill. University, Chicago, IL

Science Literacy on a District-Wide Scale
Room 212
Peter McFarlane, Jr., Alton School District, Alton, IL

Honors Science Teacher Project - Homecoming - Part I
Room 213
Tom Fitch, I.S.U., Normal, IL

Simple Machines - MASH (Math And Science Hands-On) Kit, Grades 2-3
Room 218
Barbara Reifschneider, Illini School, Fairview Hts., IL

SATURDAY, October 5, 1991
9:45 a.m.
PRESENTATIONS

HOTEL PERE MARQUETTE

Particle Theory for Little Kids
Blackhawk Room
Paul H. Zingg, School District #108, Highland Park, IL

PSInet: Computer Network for Science Teachers
Bradley Room
Don Roderick, Ill. State Board of Ed., Springfield, IL

I Can Do It!! Hands-On Science for the Early Years
Cheminee Room
A. Scates, S.I.U., Edwardsville, IL; D. Davis, McDonnell Douglas Corp., St. Louis, MO

Energizing Your Curriculum with NEED
Cotillion Ballroom
Rich Ammentorp, ILEED, Schaumburg, IL

Hands-On Physical Science
Illinois Room
Robin Dombeck, Coord., Fermilab, Batavia, IL

Teacher Developed Science and Math Kit Sharing
LaSalle Room
Michael Schneider, ESC #16, Belleville, IL

Science on the Go! Moving Mechanics
Lincoln Room
Meg Peterson, Chicago Acad. of Sciences, Chicago, IL

Retrograde Motion -- No Mystery Now
Marquette Ballroom
Jo Crow, Metamora Grade School, Metamora, IL

Constructing 3-Dimensional Models of Atoms
Peoria Room
Beverly Sussman, Twin Groves Sch., Buffalo Grove, IL

Teaching Students to Investigate Environmental Issues
Sandburg Room
Martha M. Kronholm, S.I.U., Carbondale, IL

PEORIA CIVIC CENTER

Artistotle, Computer Managed Instruction, and the Art of Integration
Room 134
Michael Fulton, Bloomington School Dist. #87, Bloomington, IL; Gerry D. Haukoos, I.S.U., Normal, IL

What You Can Learn From a Styrofoam Cup
Room 135
Katherine Johnson, Chicago Acad. of Sci., Chicago, IL

PEORIA CIVIC CENTER (Cont'd.)

Box Turtle at Long Pond - Sciencing with Stories
Room 136
V. Lopez, K. Zapal, Downers Grove, IL

Kids for Conservation, An Investment in the Natural Resources for Today and Tomorrow
Room 200
Phil Wilson, Ill. Dept. of Conservation, Springfield, IL

A Science Network on FrEdMail - Bringing Geology to the Classroom
Room 201
R. Jacobson, D. Berggren, Ill. State Geographical Survey; M. Waugh, J. Levin, U. of I.; Champaign, IL

Solar Solutions for Global Pollution
Room 202
Robert & Sonia Vogl, N.I.U., Oregon, IL

Robotics
Room 203
Jane Oberneufemann, Evans School, O'Fallon, IL

The Geometry of Crystals & Bubbles
Room 204
Danette B. Riehle, Monroe School, Hinsdale, IL

Computer-Based Research in the High School Physics and Astronomy Classrooms
Room 209
Jordis Asbell-Clarke, University High Sch., Urbana, IL

Oil Spill in the Classroom
Room 210
P. Losey, Downers Grove So. High; Downers Grove, IL

Classifying Students Phenotypically
Room 211
Donna Plier, W.I.U., Macomb, IL

Hands-On Activities that Turn Both Parents and Students Onto Science
Room 212
L. Perkins, Math & Science Academy, E. St. Louis, MO

Honors Science Teacher Project - Homecoming - Part II
Room 213
Tom Fitch, I.S.U., Normal, IL

Alternative Assessment
Room 218
Wayne Green, Orrin Gould, Dave Winnet, Jenny Grogg, ISTA

SATURDAY, October 5, 1991
12:30 p.m.
PRESENTATIONS

HOTEL PERE MARQUETTE

Street Geology: Doing Earth Science in Urban Environments
Blackhawk Room
D. Berggren, R. Jacobson, Illinois State Geological Survey, Champaign, IL

The Alleged Greenhouse Effect
Bradley Room
R. W. Asplund, Highland Park High School, Highland Park, IL

Trash to Treasures
Cheminee Room
L. Hagen, ESC #16, Belleville; A. Scates, S.I.U., Edwardsville, IL

Mac Media: Multimedia Applications Using the Macintosh
Cotillion Ballroom
Jim Zimmerman, HST Project, Urbana, IL

Low Tech/High Thought
Illinois Room
Ann Rubino, Carolyn Dunmore

CHEM: Chemicals, Health, the Environment & Me
LaSalle Room
Carol Van De Walle, AlWood Elementary School, Alpha, IL

An Atextual Approach to Research in the Science Classroom
Lincoln Room
Patricia Morris, University High School, Urbana, IL

Owls: Families, Feeding, and Ecology
Marquette Ballroom
Bonita Yocus, Lincolnwood School District #74

Heat and Temperature
Peoria Room
Ed Guzdziol and Ann Min

Construction Science Kit
Sandburg Room
Lisa Fisher & Billie Snell, S.I.U., Edwardsville, IL

PEORIA CIVIC CENTER

Science Across the Curriculum - An Interdisciplinary Approach to Science Projects
Room 134
Mary Lou Lipscomb, Gregory School, Naperville, IL

PEORIA CIVIC CENTER (Cont'd.)

Science Resource Kits: Hands-On Science to Go
Room 135
S. Widdows. G. Dearborn,Lakeview Museum,Peoria, Il

Beyond Bats
Room 136
Judy McKee

Exploring Variables
Room 200
William Myers, Discovery Center, Wheeling, IL

Science Activities in a School Prairie Garden
Room 201
Lynn Hyndman, Dawes School, Evanston, IL

Space - Our Future
Room 202
P. Thomas/Brown, Schnieder Dist. #129, Aurora, IL

An Organic Chemistry Experience for Gifted High School Students
Room 203
Dr. C. E. Cannon, Ill. Math and Sci. Acad., Aurora, IL

Classification is the Key
Room 204
Judith Ball, Mannheim District #83, Franklin Park, IL

Video Technology in Science: Promoting Thinking, Learning, and Communication Skills
Room 209
Marilyn Bazell, North Elementary School, Sycamore, IL

Enhancing Science Learning Through Hands-On Agriscience Kits
Room 210
Jim Guilinger. Rantoul, IL

Discovering Density - GEMS and Beyond
Room 211
Mary Lou Lipscomb, Gregory School, Naperville, IL

Shedding Some Light on Reflection & Diffraction
Room 212
Cheryl Eagles, Homer, IL

Kids & Chemistry
Room 213
Virginia R. Bryan, Ann Scates,S.I.U., Edwardsville, IL

The Trails and Tribulations of Environmental Ed.
Room 218
B. Conrad, B. Dzierzynski, School Dist. 15, Palatine, IL

SATURDAY, October 5, 1991
8:30 a.m.
PRESENTATIONS

HOTEL PERE MARQUETTE

Agriculture - Concepts & Applications
Blackhawk Room
Karl Radnitzer, U. of Chicago Lab School, Chicago, IL

Stones and Bones
Bradley Room
Pam Helfers Riss

Air Air Everywhere!
Cheminee Room
Mitch Silverman, Cuisenaire Co., New Rochelle, NY

Inventions: Integrate Your Curriculum
Cotillion Ballroom
Linda Duncan, Pecatonica Elemen. Sch., Pecatonica, IL

Using Groundwater Models
Illinois Room
Harry Hendrickson, Ill. Dept. of Energy, Springfield, IL

Unique Method for Teaching Physics of Light and Color
Lincoln Room
Gerald Saxon, Thornton Community High, Harvey, IL

Science Expo...Beyond the Science Fair
Marquette Ballroom
Paul Roberts, Judith Kozveik, Dosher Elementary School, Justice, IL

A "GNEISS" Group of Earth Science Activities & Resources
Peoria Room
Ann F. Holda, IESTA, Arlington Heights, IL

A New Look at the Advanced Science Curriculum
Sandburg Room
John R. Young, Princeton High School, Princeton, IL

PEORIA CIVIC CENTER

Tully Monsters, Dinosaurs and Fish - Using Fossils to Explore the Past
Room 134
Brian Poelker, Midwest Cen. Jr. High Sch., Manito, IL

Demonstrations - Integrating Science and Math with Inquiry Activities
Room 135
Evan McFee & David Hayes, Bowling Green State University, Bowling Green, OH

PEORIA CIVIC CENTER (Cont'd.)

Field Experiences in Science Education
Room 136
David A. Winnett, S.I.U., Edwardsville, IL

Helping Kids to See the Big Picture with Video Enhanced Instruction
Room 200
Marion Stewart, Optical Data Corp., Chicago, IL

Conquering Hidden Circuitry
Room 201
Gail L. Truho, Rolling Acres Middle School, Peoria, IL

Illinois & New Madrid Earthquake Project
Room 202
Lloyd H. Barrow (and others), NSTA, Columbia, MO

Robotics
Room 203
Jane Obernuefmann, Evans School, O'Fallon, IL

Teaching Science Through Discrepant Events
Room 204
H.B. Barrett, Northeastern Ill. University, Chicago, IL

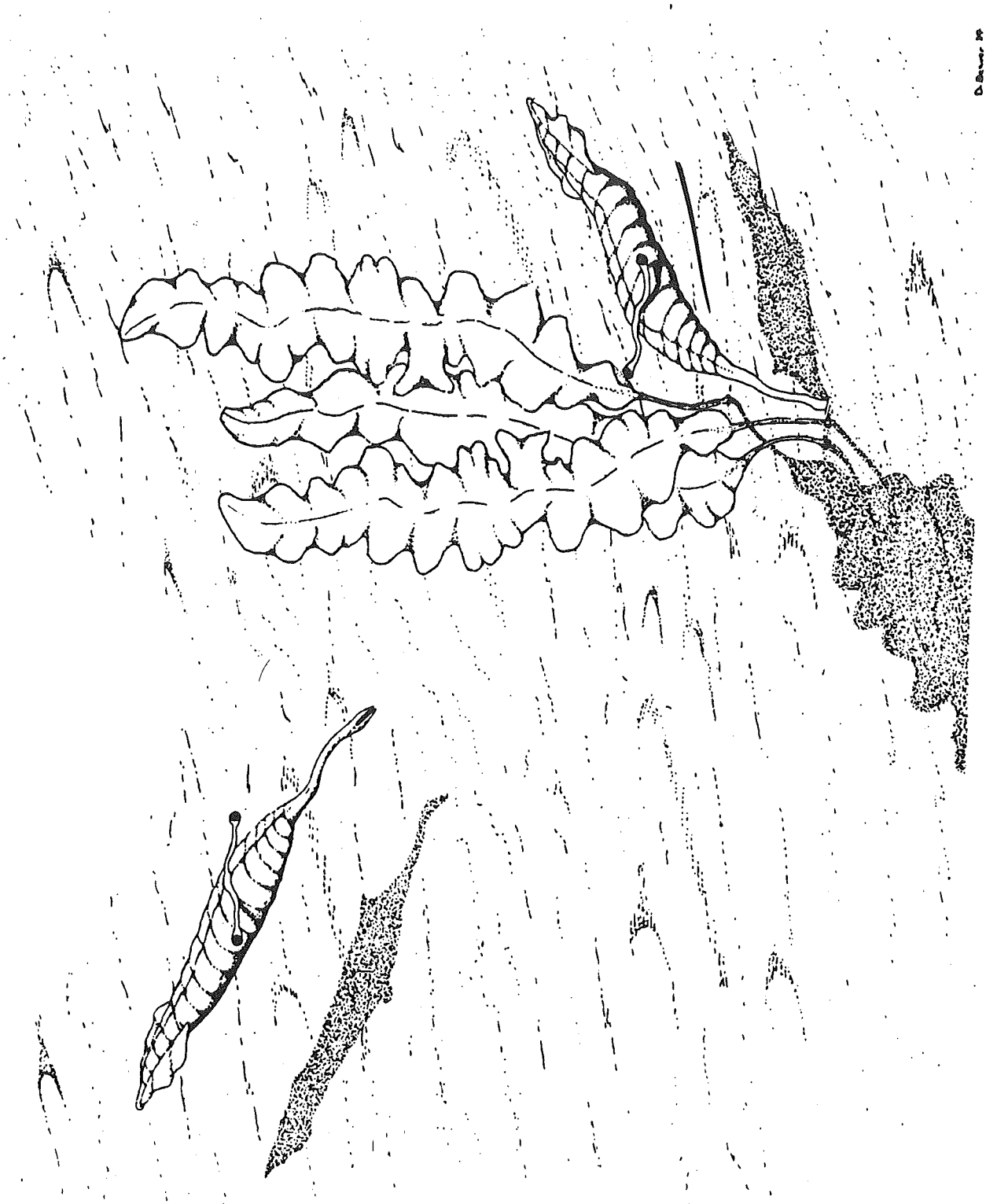
People and the Planet: Activities for Population and Environmental Education from ZPG
Room 209
Yvonne Johnson, West Elementary, Sycamore, IL

Stream Team: Biomonitoring of Local Water Resources
Room 210
Don Nelson, W.I.U., Macomb, IL

The STS Approach to Waste Management
Room 211
William J. Sumrall , Northeastern Ill. Univ., Chicago, IL

Wisconsin Fastplants
Room 212
Peggy Ma, Edison Jr. High, Macomb, IL; Carol Van De Walle, Alwood Sch, Alpha, IL; Ann Min

FUNtastic Ways with Insects
Room 213
Robert and Mo Sowinski, Nature's Nook Environmental Education Service, Carpentersville, IL



ARTICLES

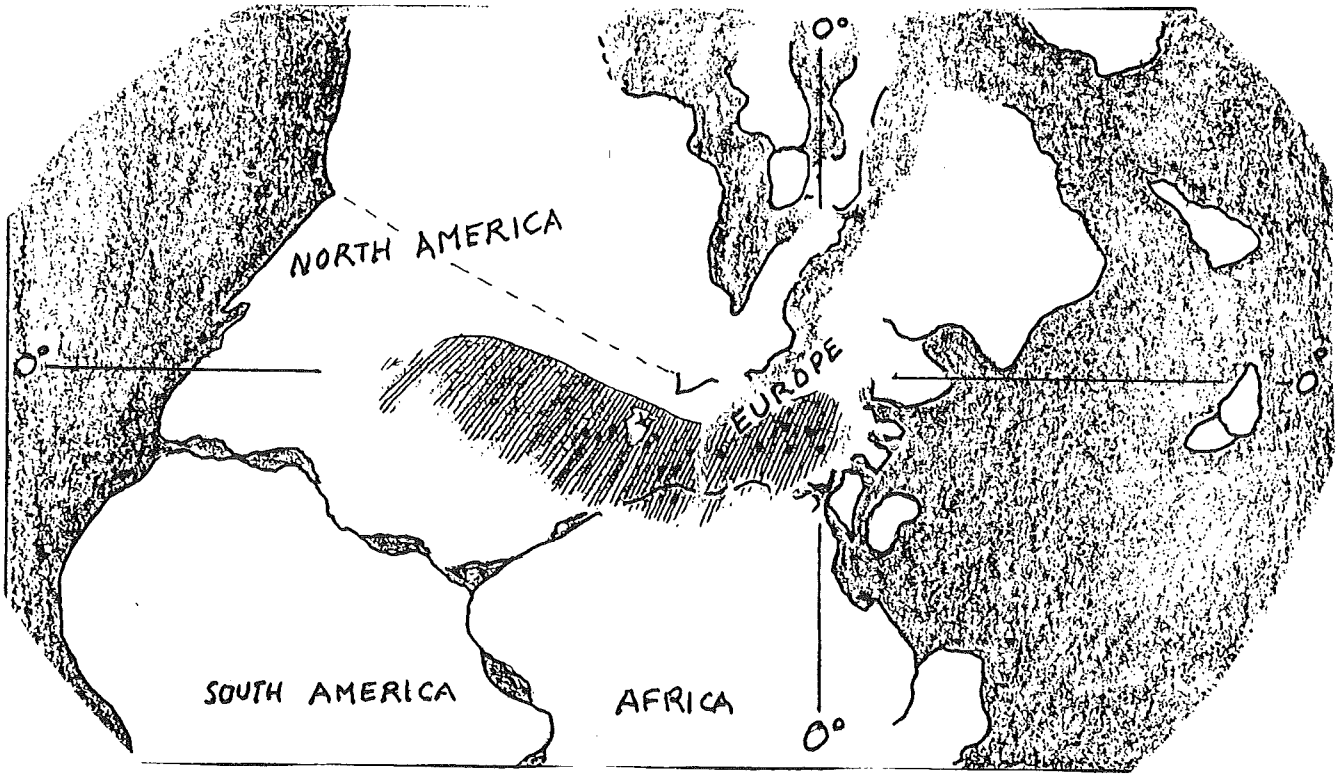
Brian Poelker
Midwest Central Junior High School
Manito, Illinois

Using Mazon Creek Fossils to Explore Pennsylvanian Illinois

Fossils of soft-bodied animals are rare and treasured by paleontologists. They tell us much more about the structure and anatomy of the organism than just the shell. Some of the most important discoveries in piecing together the earth's history have come from the great fossil lagerstattens of the world. A lagerstatten is literally a "mother lode." The fossils of the Burgess Shale of Canada show intimate details of life after the Cambrian explosion about 530 million years ago. The fossils of Germany's Solnhofen limestone quarry include all of the fossils of Archeopteryx. Illinois is blessed to be the home of one of the richest fossil deposits in the world, the Mazon Creek Lagerstatten.

Notes for the Teacher

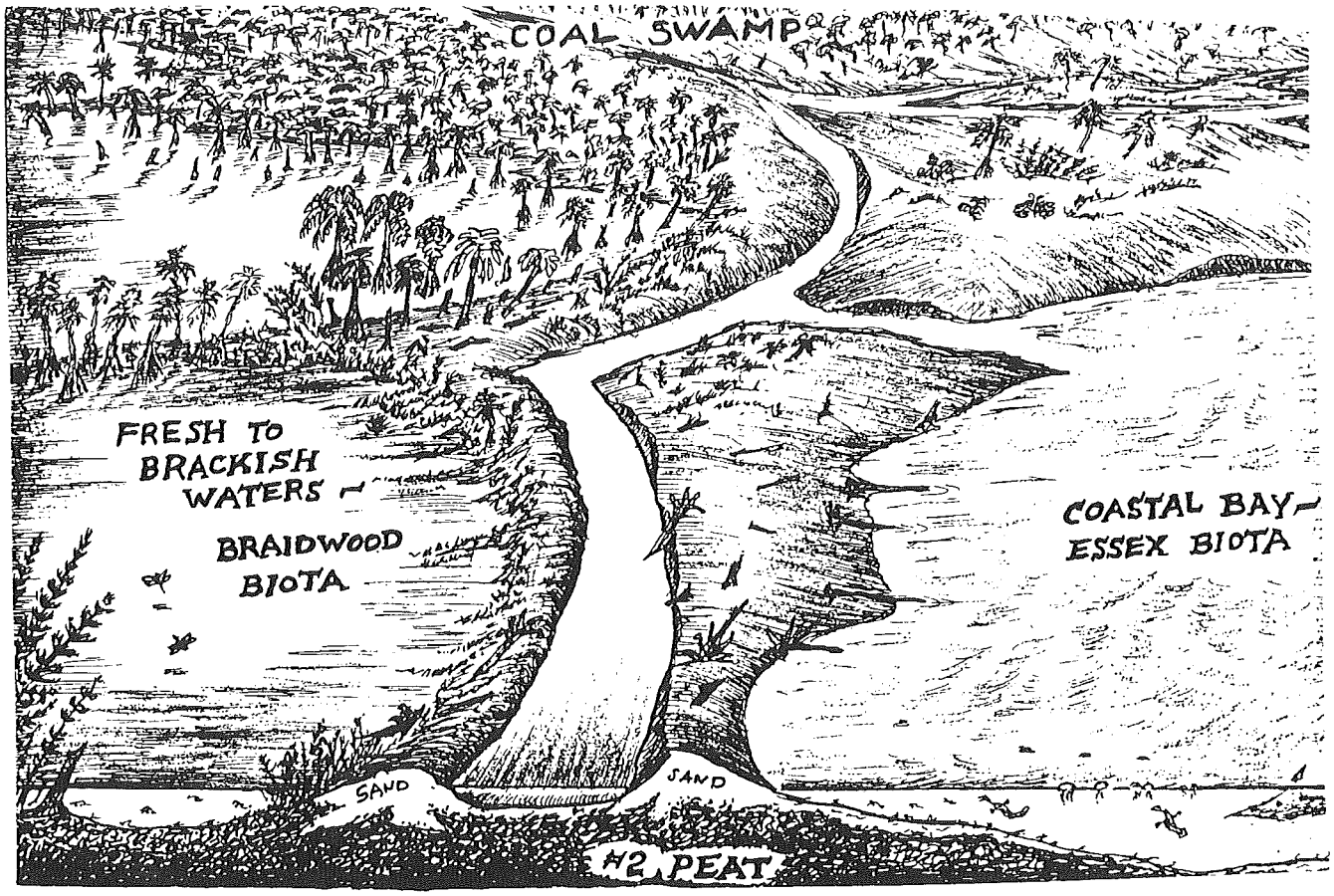
The Mazon Creek area of Illinois is located near Braidwood, about 60 miles south of Chicago. Mazon Creek fossils are best known because of the world famous Tully Monster, but the variety and uniqueness of fossils from the locality can offer students a rare glimpse into the past. Illinois was not always in its present location. About three-hundred million years ago, during the Pennsylvanian period Illinois lay just south of the equator. A warm sea covered most of the state and a large river flowed down from the north. This was the time of Pangea. The Mazon Creek area was a huge delta. The organisms that lived in the area are divided into two groups: the Braidwood biota and the Essex biota. The coal swamps contained giant fern trees and the invertebrates that lived in its humid confines. The Braidwood biota division contains these organisms and those that lived in freshwater or brackish conditions. The Essex biota division contains organisms that lived in a marine environment. The fossils of the area therefore represent all the major constituents of the ecosystem.



North American and European Carboniferous Swamps

Examples of Braidwood and Essex Organisms

BRAIDWOOD FLORA AND FAUNA	ESSEX FAUNA
FERNS	
Pecopteris	
Neuropteris	Tully Monster
Annularia	jellyfish
Stigmaria	some shrimp
Cordaites	polychaete worms
Sigillaria	sea cucumber
	shark egg cases
snails	fish
insects	brachiopods
insect wings	scallops
spiders	clams
centipedes	shark egg cases
some shrimp	
amphibians	



The fossils of Mazon Creek are a rarity because of the preservation of the soft-bodied animals. Usually organisms that need an abundant oxygen supply will decompose after they die. A mechanism to preserve these organisms probably occurred during large storms that produced periodic flooding of the delta region. The rapid burial of the organisms in the mud blocked out the oxygen and made fossilization possible. The fossils are preserved in siderite concretions. Iron carbonate (siderite) was deposited around the fossil over the millennia. The concretion is harder than the shale which encases it and the entombed fossil is preserved.

Most of the Mazon Creek area is now under power plant cooling lakes or has been reclaimed by bulldozers. However millions of the fossils have been collected over the decades and many are available at low cost to teachers at rock and fossil shows throughout the state. One of the largest is held each year at Western Illinois University in Macomb. The show is sponsored by MAPS and is held in late April. Next year's show is April 24-26. Teachers can purchase a variety of plant material, clams, shrimp, worms, jellyfish, scallops for only a couple of dollars each. Less than perfect specimens are sold in volume, a cardboard tray with as many as twenty

fossils can be purchased for about ten dollars. Pieces of the state fossil, *Tullimonstrum gregarium*, are also relatively inexpensive. The sections can be jointed to make a "whole" fossil.

The Tully Monster is the State Fossil of Illinois. It was first found by Francis Tully in the spoil piles of Pit 11 near Essex. Mr. Tully took the fossil to the Chicago Museum of Natural History for identification. No one had ever seen a fossil like it before! The Tully Monster is truly a "weird wonder." The organism is so unusual that it does not fit easily into any existing phylum. The Tully Monster joins several of the Burgess Shale organisms to share this distinction. The Tully Monster is also unique to Illinois. It is found no where else in the world.

The Lab

Sudents can use fossils to investigate the history of Illinois. Guidebooks published by ESCONI and the Illinois State Geological Survey are especially helpful in identification of fossils. A question to ask the students is "Can you describe the climate in which these organisms lived?" Students must examine and identify a set of fossils. Students use the fossils to describe what the environment was like in the past when the organisms were alive. The students are detectives and use the clues provided by the fossils to deduce the history of the earth.

If you have enough fossils each lab group can have its own set. If no,t place all of the fossils on a table in the front of the classroom. Students take the fossils back to their table, one at a time, and identify each. Students draw the fossils at their lab table and identify them, then draw the organisms as if they were alive in a suitable habitat. Often they must reconstruct missing parts of the fossil. After the fossil is identified it is returned to the table for another group to use. In a paragraph students postulate what the climate of the area must have been like during the time the organisms were alive. Caution: Fossils are often delicate and must be handled carefully so that they can be studied by others in the future.

Students gather evidence as they identify the organisms. They know that ferns grow in warm, swampy, humid conditions. Jellyfish, clams, scallops and shrimp are saltwater organisms. The only place where these environments meet is at a river delta. This activity can lead students to explore how Illinois was once it a different location with a vastly different climate than it now has. The study of Mazon Creek fossils is evidence of the theory of plate tectonics.

Further exploration

Students can make a Fossil Book identifying the fossils found in your area. They should include the name, drawing, and incidental information about each. Middle level and intermediate students can share the book with the primary grades and keep it the school library as a reference. Excellent resources about fossils include ESCONI (the Earth Science Club of Northern Illinois), MAPS (Mid-America Paleontology Society), and the Illinois State Museum in Springfield. Cost for a family membership to the Mid-America Paleontology Society is only fifteen dollars. Membership includes the MAPS Digest newsletter which is published nine times per year October through June. Contact the membership chairman Sonn Leitner, 4800 Sunset Dr. S.W., Cedar Rapids, IA 52404. Students can also become members of ESCONI by writing the club at P.O. Box 321 Downers Grove, Illinois 60516. Many National Monuments have pamphlets available for students who write to them. Excellent resources for fossil information include:

Dinosaur National Monument
P.O. Box 210
Dinosaur, CO 81610

Agate Fossil Beds National Monument
c/o Scotts Bluff National Monument
P.O. Box 427
Gering, NE 69341

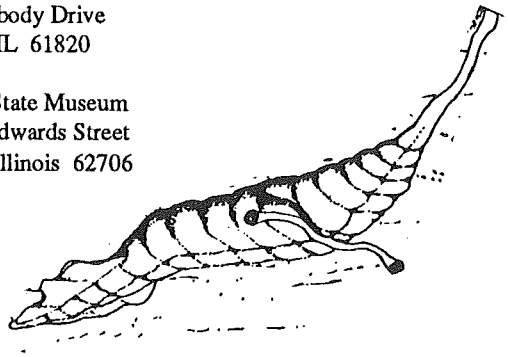
John Day Fossil Beds National Monument
420 W. Main Street
John Day, OR 97845

Fossil Butte National Monument
P.O. Box 527
Kemmerer, Wyoming 83101

Florissant Fossil Beds National Monument
P.O. Box 185
Florissant, CO 80816

The Illinois State Geological Survey
Education Extension Unit
615 East Peabody Drive
Champaign, IL 61820

The Illinois State Museum
Spring and Edwards Street
Springfield, Illinois 62706

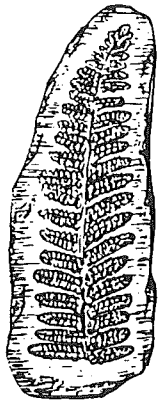


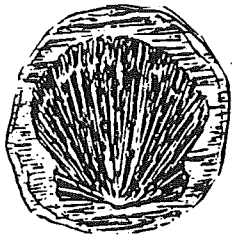
Special Acknowledgments: Drawings courtesy ESCONI; Illinois State Geological Survey; Dale Beaver, Instructor Illinois Central College

MAZON CREEK FOSSIL WORKSHEET

Directions: Complete this worksheet after you have drawn and named your fossils. All of the Mazon Creek Fossils are Pennsylvanian in age but they lived in different environments. List the fossils you have identified and the environment in which you think the organisms lived. You must identify at least six different organisms, the more the better.

NAME OF FOSSIL ENVIRONMENT OR HABITAT

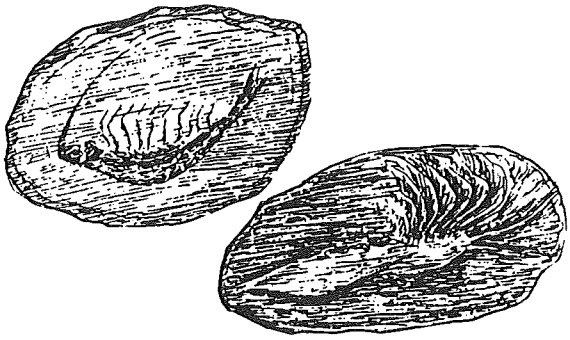


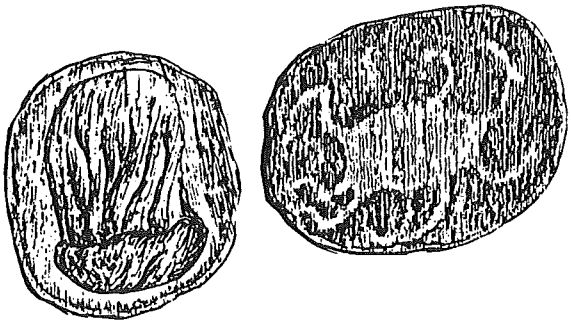


In what kind of climate do you think these organisms lived?

Now that you have identified the organisms, the environments, and the climate make a drawing on the back showing what you think the area of Illinois looked like at the time when these organisms were alive. These fossils were all found within 20km of each other! Your drawing should be like a map and you are looking down at the earth. Label the habitats on your map.

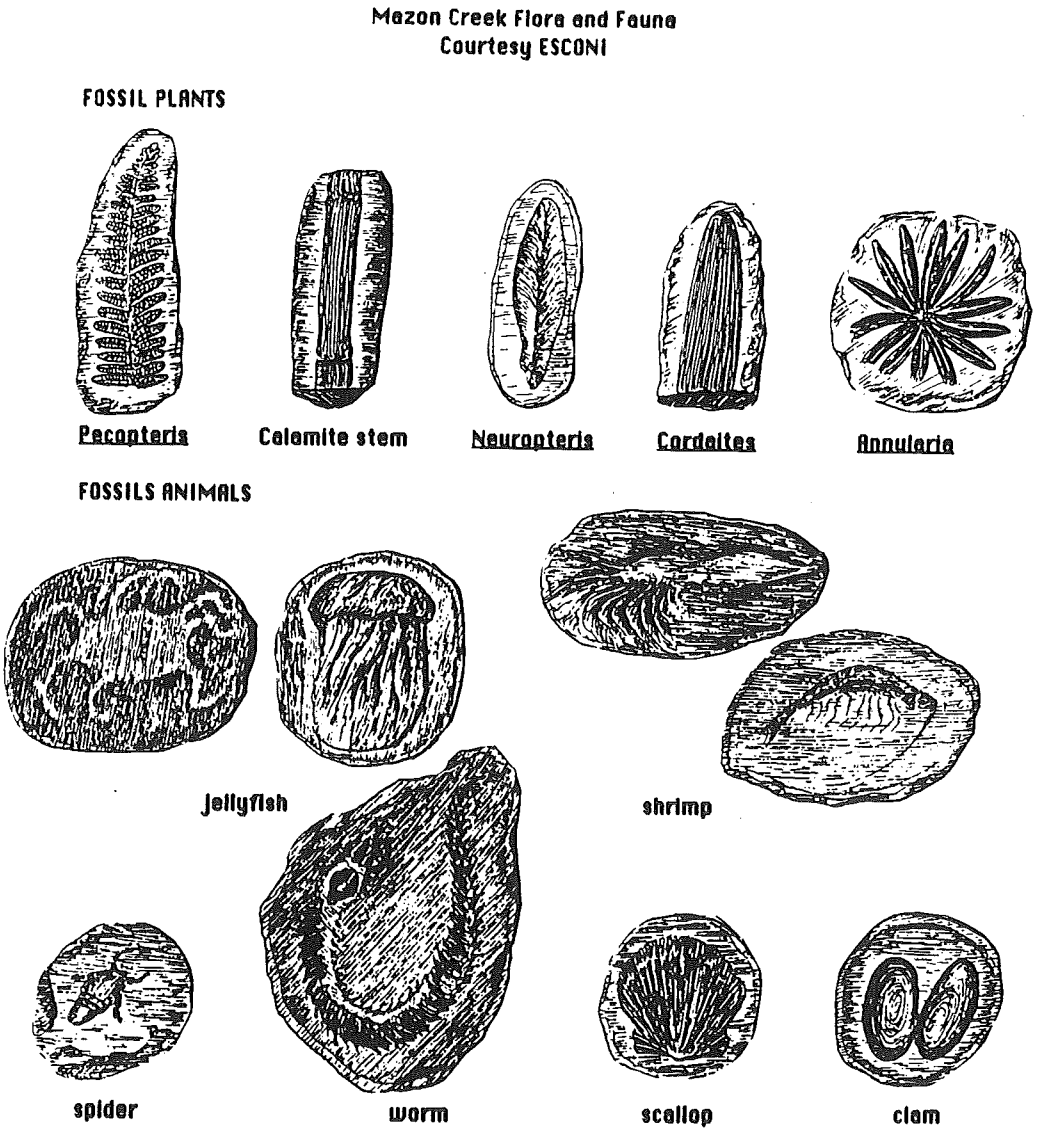
After you have made your drawing check with the teacher.





Bibliography

1. Auler, Don. 1989. Keys to Identifying Pennsylvanian Fossil Animals of the Mazon Creek Area. Earth Science Club of Northern Illinois. P.O. Box 321 Downers Grove, IL 60516 pp125
2. Brazea, Don. 1986. Keys to Identifying Pennsylvanian Fossil Plants of the Mazon Creek Area. Earth Science Club of Northern Illinois. P.O. Box 321 Downers Grove, IL 60516 pp60
3. Gould, Stephen Jay. 1989. Wonderful Life. W. W. Norton & Co. New York. pp347 ISBN 0-393-02705-8
4. Hay, Andrew. 1987. Tullimonstrum gregarium MAPS Digest 10(7). Mid-America Paleontology Society. p3.
5. Jennings, James. 1990 Guide to Pennsylvania Plant Fossils of Illinois Educational Series 13. Illinois State Geological Survey. pp85 ($2.75 plus postage)
6. Leary, Richard. 1987. The Tully Monster: Mystery Animal of Illinois. The Living Museum 49(2/3). Illinois State Museum. pp26-27
7. Mikulic, Don and Joanne Kluessendorft. 1991. Illinois State Fossil, Tullimonstrum gregarium Illinois State Geological Survey. Geogram 10.
8. Redfern, Ron. 1983. The Making of a Continent Times Books, New York. pp242 ISBN 0-8129-1617-4
9. Scheuberth, Christopher. 1986. A View of the Past: An Introduction to Illinois Geology Illinois State Museum. pp181. ISBN 0-89792-104-6



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The State of Illinois Goals and Sample Learning Objectives for Scientific Thinking and Methods: Strengths, Weaknesses, and Suggestions

In 1985 the legislature of the State of Illinois required the State Board of Education to establish goals in six areas, one of which is the biological and physical sciences. In compliance the Board in the following year established four broad goals for biological and physical science (Naumer & Sanders, 1986, p. 3):

As a result of their schooling, students will have a working knowledge of:

I. **the concepts and basic vocabulary of biological, physical, and environmental sciences and their application to life and work in contemporary technological society;**
II. **the social and environmental implications and limitations of technological development;**
III. **the principles of scientific research and their application in simple research projects;**
IV. **the processes, techniques, methods, equipment, and available technology of science.**

In this essay I shall comment on Goals Three and Four and their proposed associated sample learning objectives, make some suggestions for their revision, and, based upon my essay about scientific thinking in the previous issue of Spectrum, offer an elaboration of Goal Three, the scientific thinking goal

To focus on Goals Three and Four is not to suggest that Goals One and Two are unimportant. They are not only important in their own right, but the need to be well informed when doing scientific thinking requires the satisfaction of Goal One, when doing the scientific thinking involving scientific content. However, I shall limit my discussion of the goals to those concerned with scientific thinking, processes, methods, and techniques.

GOALS THREE AND FOUR

Strengths

On the whole Goals Three and Four seem valid. One strong feature is that they call for science courses to teach students to think scientifically. Another is that they implicitly allow for taking into account the social responsibilities and social consequences of science, an area picked up by the State Board's elaboration of Goal Three (p. 7). A third strong feature is that they emphasize the activities and materials involved in doing science, so that science is not just a paper and pencil activity.

A Weakness: Overlap between Goals Three and Four

A weakness in the general statements of Goal Three and Goal Four is the excessive overlap between them. The "application of the principles of scientific research" (half of Goal Three) to a considerable extent consists of "the processes [and]...methods...of science" (two fifths of Goal Four). This overlap is probably also responsible for the duplication found in the following three pairs of sample "general knowledge/skills," which were suggested by the State Board of Education for all the grades (henceforth "across-grade items"). The suggested sample across-grade items within each pair are quite similar, yet supposedly they elaborate different goals (underlining added):

First Pair (dealing with communication):

Under Goal Three: "Effectiveness in communicating laboratory procedures and results" (p. 7).

Under Goal Four: "Communication" (p. 8).

Second Pair (dealing with organization of data):

Under Goal Three: "Systematization of data to maintain an orderly manner of review" (p. 7).

Under Goal Four: "Data collection, organization and interpretation" (p. 8).

Third Pair (dealing with operational definition):

Under Goal Three: "Application of operational definition using terms to physically describe the activity or result of a procedure" (p. 7).

Under Goal Four: "Operational definition development" (p. 8).

The overlap is probably also responsible for the inappropriate placement of the following three items, which the State Board has placed under Goal Three, but part or all of each most logically belongs under Goal Four (underlining added):

1) Accuracy, skill and safe practices in laboratory activities (p. 7).
2) Good experimental techniques which will be evident by the precision practiced during the investigation (p. 7).
3) Apply scientific knowledge, through the proper use of techniques, laboratory instruments, and the unbiased reporting of results (p. 39).

The first two of these items are across-grade "general knowledge/skills" suggested for Goal Three, but which are somewhat more central to Goal Four. The third item is the one and only supposedly culminating (end of grade 12) objective under Goal Three. The emphasis here on techniques and laboratory instruments should come under Goal Four. It might have been more appropriate for a culminating objective under Goal Three to have said, "Apply the principles of scientific research in scientific and everyday situations." Lastly the culminating learning objective given by the State Board for Goal Four seems to belong at least as well under Goal Three. This objective runs as follows:

> Apply observation, hypothesis, theory, model, law, and assumption to everyday situations (p. 45).

This overlap problem would not be serious in some contexts, but since schools are asked to produce their own learning objectives for each of the four goals, they will have trouble deciding where to put many things that are important (as is evidenced by even the State board's questionable placement of the last four quoted learning objectives).

Furthermore the overlap leads to confusion about what is involved in the application of principles of scientific research, paradoxically suggesting that the methods and processes of science are not involved in this application (since the methods and processes of science are part of Goal Four, but the application of scientific principles is part of Goal Three). As a result, the State Board, in its overall interpretation of Goal Four, incorporates a good deal of what is involved in the application of the principles of scientific research (Goal Three).

For the record, this presumably-fairly-complete proposed elaboration of Goal Four consists of the following items:

> observation; classification; inference; prediction; measurement; communication; data collection, organization and interpretation; operational definition development; question and hypothesis formulation; experimentation; model formulation; results verification; and scientific equipment use. (p. 8)

It is confusing to imply that these things are not the application of the principles of scientific research. Many of them are constitutive of this application.

Although there will unavoidably be some overlap in broad goals, the problem could be considerably reduced by moving the concepts, processes and methods, from Goal Four to Goal Three. Accordingly Goal Three could then read:

> As a result of their schooling, students will have a working knowledge of the principles of scientific research and their application in the methods and processes of simple research projects.

And Goal Four could then read:

> As a result of their schooling, students will have a working knowledge of the techniques, equipment, and available technology of science.

"SAMPLE LEARNING OBJECTIVES"

In its pamphlet, State Goals for Learning and Sample Learning Objectives the State Board lists an elaboration of each of the four goals in the form of "general knowledge and skills" related to each goal (Naumer & Sanders, 1986, pp. 4-8), and also a further elaboration for each of grade levels 3, 6, 8, 10, and 12 (pp. 9-45), called "sample learning objectives." There are too many items to be reproduced here, but some strengths, weaknesses, and suggestions can still be noted.

Strengths

Tentativeness. An important strength of these sample learning objectives is that they are put forward tentatively. The word "sample" in the title makes this clear. School districts are able to make adjustments to local conditions, and to changing times, as students and teachers become more sophisticated in scientific thinking.

Concrete Clarification. Another strength is that the elaborations make the broad goals more concrete, and thus provide teachers pursuing them with guidance not provided by the broad goals.

Assessment Guidelines. A third correlative strength is that they provide guidelines for the state-mandated assessment that is to occur at some of these grade levels, so that schools will not be caught by surprise by the assessment. (However, this last strength also signals a danger: that the goals and their elaboration, together with the accompanying assessment, if not done well, will drive the curriculum in the wrong direction.)

Weaknesses

One significant general weakness is the neglect of important things that should be included. Another is the inclusions of some puzzling anomalies.

Omissions. Although there are a number of omissions, I shall mention only four crucial ones, the most important being the neglect of the tentativeness of scientific findings. It is understandably tempting to present scientific content and the results of scientific investigations as a complete and settled set of facts and laws. But things are not that way. Scientific content and the results of investigations are continually changing, and particular conclusions should be held with varying degrees of certainty. This is so whether they be the conclusions of scientists, or our own conclusions

about matters of everyday life, even though they be drawn while employing the activities, principles, and dispositions characteristic of scientific thinking. The objectives should somewhere have stated that students should have a disposition to regard scientific conclusions as at least to some degree tentative.

A second omission is the lack of the objective, having the ability to plan an experiment or investigation from start to finish. A student could do all the things in the various lists without learning to plan an experiment or investigation from start to finish. This is so, even though there is an admirable emphasis on the control of variables.

A third omission is the absence of an objective calling for the ability to identify assumptions. Assumptions play a very important role in our thinking. Their identification is crucial. A fourth general omission is the absence of an explicit statement of many principles of scientific research in the elaboration of Goal Three, even though such principles are the focus of Goal Three. For example nowhere do we find the statement that one must be justifiably confident that all plausible alternative hypotheses are eliminated before one can be justified in regarding an hypothesis as established.

Anomalies. There are some anomalies which are likely to puzzle people rather than enlighten them. One is the inclusion of the objective, "Identity prominent scientists from several cultures" (p. 38) under Goal Three. This objective, worthy as it may be, does not fit under this goal, which is for "a working knowledge of the principles of scientific research and their application in simple research projects."

Another anomaly is the wording of the one-and-only culminating (again end of grade 12 objective under Goal Four: "Apply observation, hypothesis, theory, model, law, and assumption to everyday situations" (p. 45). The language, "apply...assumption to everyday situations," is incoherent. This is especially unfortunate, since the concept, assumption, has not been previously mentioned.

A third anomaly appears in the already-quoted one-and-only culminating (twelfth grade) sample learning objective for Goal Three:

> Apply scientific knowledge, through the proper use of techniques, laboratory instruments, and the unbiased reporting of results
> (p. 39)

This culminating learning objective for Goal Three emphasizes Goals One and Four, while neglecting to even mention the central feature of Goal Three, the principles of scientific research (though it does imply one such principle: avoid bias). Of course scientific knowledge is needed in the application of the principles of scientific research but emphasis on these principles should appear in a culminating learning objective for goal Three, since Goal Three is focused on principles of scientific research.

Based upon my elaboration of scientific thinking in an earlier issue of Spectrum (Ennis, 1991) I next list characteristic activities, principles, and dispositions that appear to constitute scientific thinking as a goal for education. The format of the original State Board recommendations is used (so that this listing is substitutable for the material on p. 7 of Naumer & Sanders, 1986).

[Proposed New Illinois] STATE GOAL FOR LEARNING NUMBER THREE IN THE BIOLOGICAL AND PHYSICAL SCIENCES

As a result of their schooling, students will have a working knowledge of the principles of scientific research and their application in the methods and processes of simple research projects.

GENERAL KNOWLEDGE OBJECTIVES RELATED TO GOAL THREE

I.Activities and Principles

Whether dealing with scientific content or everyday situations students should be able to engage competently in such characteristic scientific activities as the following, and to do this in accord with the following principles.

The ordering of these activities does not imply that any given investigation must proceed in this order, nor does the total listing imply that every investigation must include all the activities listed. (Activities are labeled "A," principles, "P".):

A1. Formulating a researchable question.

P1. Every investigation should have a clear focus in the form of a question. The question might be of the form, "Is the hypothesis correct?" But it need not be of this form.

P2. If a question is researchable, then its formulator should have some idea about what would count as observable evidence bearing on it.

A2. Learning about the situation, including the results of investigations by others and their reasons for holding their positions.

P3. It is important to be familiar with the relevant conclusions of others, their reasons, their evidence, and the issues; that is, it is important to be well informed.

A3. Judging the credibility of the sources of information.

P4. Human sources of information tend to be credible to the extent that they

1) are experienced in the area,
2) lack conflict of interest,
3) agree with others equally qualified on the other criteria,
4) have a good reputation for veracity,
5) followed established procedures, if there are any,
6) realized that their reputations could be hurt by being proved wrong,
7) are able to give reasons to support their claim, and
8) have careful habits in similar areas.

A4. Formulating an explanatory hypothesis and/or a generalization.

P5. An explanatory hypothesis is a statement or proposition that can explain (that is, account for) some data, and is a candidate for testing in the situation. A generalization is a summation of data. Many, but not all, generalizations are also hypotheses; and many hypotheses, but not all, are generalizations.

A5. Seeking clarity in one's own as well as others' thought.

P6. The language in which one expresses one's thoughts must be clear enough for the situation.

P7. Definitions are often a good way to express the meaning of one's terms.

1) Equivalence between the defined term and the other part of a full definition is generally desirable, and is often provided by a set of necessary conditions that are jointly sufficient for the use of the term.
2) Operational definitions specify an investigator-performable operation under which the desired equivalence (or some less-complete relationship) holds.
3) The degree of precision appropriate for a definition depends on the context and the concept.

A6. Planning an experiment or non-experimental investigation, controlling the variables as fully as possible.

P8. An experiment is an attempt to find out something by making a deliberate alteration in the way things are.

P9. Not all investigations are amenable to experiment, but experimenting is valuable, because it generally enables us to control the variables more effectively, and thus—by eliminating many other possible explanations—is more likely to enable us to identify probable causes of the observations.

P10. Investigations should be planned in order to minimize the number of different possible causal explanations of the results. Control of the variables has this as its purpose. Controlling a variable generally eliminates the variable as a possible cause of the result.

1) Provide for a separate control and experimental group.
2) Minimize the other things that are different when introducing and/or removing the experimental variable, and observe the situation when the experimental variable is present as well as when it is not: vary one thing at a time.
3) Arrange one's non-experimental observations so that, except for the hypothesized cause and effect, as much as possible is alike from observation to observation.
4) Or make comprehensive thorough observations so that some alternate hypotheses will be ruled out by what is observed.

A7. Careful and repeated collecting and methodical recording of data.

P11. Repeated observations should be part of the plan, the number of observations and variations in conditions being dependent on the situation, including the materials and the consistency of the observations.

P12. Plans should generally be made in advance for the careful recording of data. But even if such advance planning is not possible, careful records should be kept.

P13. Observation by more than one person is generally desirable.

P14. The observational technology should be adequate to the task, and the observers should be competent in the use of that technology.

P15. Bias (that is, reporting or seeing things in an unfair way) is to be avoided in observation, even though observation is done within a framework (often one of which the observer is not explicitly aware). The framework is often justified, but not always.

A8. Monitoring the operation or use of the apparatus or investigative materials, and adjusting one's actions accordingly.

P16. The investigation should include attention to the proper working of the investigative materials (the apparatus, tests, meters, etc.) and there should be continual checks of their proper operation.

P17. Assuming the previously specified planning, the plan should be followed with close attention to what is happening in the investigation as well as what is happening in the surroundings, but with flexibility for reacting to the findings and observations.

A9. Weighing the evidence cautiously, identifying and judging crucial assumptions.

P18. Criteria for judging the acceptability of an explanatory hypothesis are the following (the first three being necessary conditions for the full justification of a hypothesis, the fourth being desirable):

1) Hypothesis must explain facts, the more numerous and varied the better.
2) Hypothesis must be consistent with known facts.
3) Competitive alternative hypotheses must be ruled out. (If there is a plausible competitive alternative hypothesis that also explains the crucial facts, then we have no right to regard a hypothesis as fully justified.)
4) Hypothesis should be plausible. Plausibility is aided by (a) the hypothesis' fitting in with other knowledge and acceptable theories; (b) the hypothesis' being more simple than its competitors; and (c) the hypothesis' yielding surprising predictions that turn out to be correct. However, none of these three is a necessary condition for the hypothesis' being fully justified.

P19. A hypothesis should be rejected if a prediction it yields is shown to be false, and if the background assumptions used in deriving the prediction are true. This means that the falsity of a prediction does not by itself imply that the hypothesis is false. The truth of the background assumptions together with the falsity of the prediction implies the falsity of the hypothesis.

P20. A generalization is warranted to the extent that there are varied and numerous instances. The extent to which variety and frequency are needed depends on the materials about which we generalize.

P21. Weighing evidence is not a mechanical process. Intelligent judgment is required.

P22. Possibly false assumptions should be identified

1) An assumption in this sense is a proposition upon which some reasoning or belief depends.
2) One frequent characteristic of an assumption is that an argument from the stated reasons to the conclusion would be made deductively valid by the addition of the possible assumption to the set of stated reasons.

A10. Making a tentative decision about the original question.

P23. In making a decision,which may simply be that there is not enough evidence, avoid bias and take into account all the evidence, which includes the situation. Do not go further than the evidence warrants, or refuse to draw a conclusion when one is warranted.

A11. Replicating and investigating further under the same and different conditions.

P24. Replicating, when possible, as well as repeating the basic investigation under different conditions, and doing other investigations to check the hypothesis or generalization, are essential.

A12. Communicating one's procedures and results to others.

P25. So that others can understand and check one's work, one should communicate in detail one's questions, hypotheses, methods, findings, definitions of key terms, and conclusions. Qualitative description, especially in uncharted territory, is often very helpful, although quantitative information is more precise and, if valid and comprehensive, usually better able to generate predictions.

P26. Give adequate citations when needed. Citations are needed for the purposes of giving credit, enabling others to identify and check the authority on which one leans, and enabling others to check one's claim that the person really made the statement.

A13. Facing ethical issues.

P27. In making ethical decisions one should pay heed to acceptable ethical principles and to the possible consequences for human and other life.

II. Dispositions

Students should possess the following dispositions:

D1. Treat conclusions and results as tentative to some extent, though many are so firmly established that the tentativeness is justifiably minimal;

D2. Respect evidence;

D3. Be cautious in drawing conclusions;

D4. Look at things from the point of view of others;

D5. Be aware of your own basic assumptions;

D6. Conduct investigations with care;

D7. Pay attention to what is going on;

D8. Depend on records more than memory;

D9. Engage in approximate thinking, where appropriate;

D10. Seek and be open to alternatives;

D11. Try to be as clear and precise as is needed in the situation.

D12. Face issues and questions with honesty, integrity, openness, and a respect for life, the rights of subjects, and the dignity of every human being.

I hope that this elaboration of scientific thinking and its formulation in terms of a suggested set of goals are "as clear and precise as is needed in the situation."

SUMMARY

Strengths of Goals Three and Four and associated learning objectives include the emphasis on thinking and doing conjoined with significant science content, the concreteness of many of the suggested learning objectives, and the flexibility allowed by the use of the word "sample" in referring to the proposed learning objectives. Furthermore these learning objectives provide some assessment guidelines usable by makers of assessment procedures as well as teachers and students.

Difficulties include the excessive overlap between Goal Three and Goal Four, and omissions and anomalies in the elaboration of these goals. Things that were omitted included an awareness of the tentativeness of scientific findings, the ability to plan an investigation from start to finish, the ability to identify assumptions, and explicit statements of many important principles of scientific research in the attempted elaboration of the goal that emphasizes such principles (Goal Three). The difficulties mentioned are serious enough to warrant a significant revision of the State Board's elaborations of Goals Three and Four.

The statement of goals would profit from having the ideas concerning process and methods transferred from Goal Four to Goal Three, leaving Goal Four to include a concern with techniques, equipment, and available technology of science. If this is done, then the activities, principles, and dispositions listed earlier could serve as across-grade objectives under Goal Three, by and large avoiding the cited problems with the State-Board suggested sample objectives.

Goal Four should then be elaborated across grades with a listing of specific techniques, equipment, and technology that are appropriate for our students to acquire, such as, interpolating, reading meters and gauges, mixing a solution, solving equations, etc. I have not dealt with this task.

Even if these recommendations are followed, there would still need to be additional elaboration by grade level for Goals Three and Four. I have not addressed grade level appropriateness in this essay, but am confident that objectives developed for today's level of scientific sophistication will need to be adjusted as students and teachers develop greater sophistication in scientific thinking, processes, and methods.

NOTES

1. The advice given by Ray Boehmer, Lee Brown, Nicholas Burbules, Michelle Commeyras, Lindley Darden, Jeffrey Davis, Michelle B. Fisher, Orrin Gould, Jana Lamboy, Linda Litteral, Christine A. Newell, Pamela W. Salela, Alan Soffin, Gregory Stillman, and Richard Walker is much appreciated.

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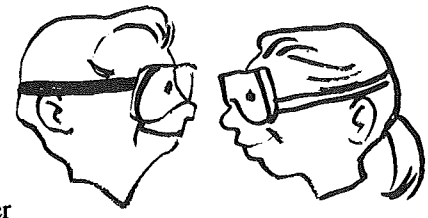
REFERENCES

Ennis, Robert H. (1991). An elaboration of scientific thinking as an educational goal. SPECTRUM (Summer 1991).

Naumer, Walter W. & Sanders, Ted (1986). State goals for learning and sample learning objectives. Springfield, IL: Illinois State Board of Education.



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Beginning Science Teachers in Illinois

Each year, the Illinois State Board of Education collects information on the teaching force in Illinois public schools. Each district provides information such as new degrees earned, new teaching assignments, and new teachers hired that year. This information is compiled as the Teacher Service Record (TSR) of Illinois.

Information on newly employed science teachers was obtained from that record for the 1990-91 academic year. For the purpose of this study, teachers in their first year in the district were identified and the following variables were examined: total years of experience; primary teaching assignment; second teaching assignment; grade level of assignment; and degree earned.

The TSR lists 450 teachers who were new to the school in which he or she was employed and taught science as the primary assignment. The previous experience of these teachers breaks down as follows:

254 (56.4%) had no other experience in an Illinois or out-of-state public school.

26 (5.7%) had all of his or her previous experiences outside of Illinois.

152 (33.8%) had experience in other Illinois schools.

18 (4.0%) had experience in both Illinois and out-of-state.

The TSR lists only regularly employed public school teaching experienc; it does not include private school experience, substitute teaching experience, or other school related employment.

The teaching assignments are categorized in the TSR as general science, biology, chemistry, physics, earth science, physical science, and other science. Of the 450 teachers with a primary assignment of teaching science, 247 (54.9%) taught only one area of 7 categories of science listed in the TSR. The remaining teachers taught in more than one of the seven areas and/or in some other curricular area.

The primary teaching assignment for the 450 beginning science teachers was listed as follows:

General Science	20 (46.4%)
Biology	96 (21.3%)
Chemistry	65 (14.4%)
Physics	19 (4.2%)
Earth Science	12 (2.7%)
Physical Science	24 (5.3%)
Other Science	25 (5.6%)

Not all beginning teachers of science taught science as the primary assignment. In addition to the 450 beginning teachers with a primary assignment in science, 78 teachers taught some science but had a primary teaching assignment in a non-science area. The largest number of these, 53, taught general science as that second teaching assignment. The most frequent first assignments for the 53 general science teachers were basic mathematics, physical education, and language arts.

The location of the 450 beginning teachers with a primary assignment in a science area followed a pattern which resembles the general employment pattern. Employment of new teachers in Cook county who have a primary teaching assignment in science accounts for 26.8% of the total first year science teachers. When the counties of Cook, DuPage, Kane and Lake are combined, the new hires in these counties account for 49.8% of the total new hires. Route 136, which bisects the state between Springfield and Peoria, almost evenly splits the remaining new hires. This hiring pattern can be summarized as follows: for every four new teachers hired for a primary assignment in science, one is in Cook County, one is in the DuPage, Kane, or Lake counties, one is somewhere in the remaining counties north of Route 136, and one is in one of the counties south of Route 136. In 31 of the 102 counties, there were no new teachers hired with a primary assignment in science.

Of the new teachers hired with a primary teaching assignment in science, 105 (23.3%) held a Master's degree. Of the 105 teachers with a Master's degree, 67 had prior teaching experience and 38 had no other identified teaching experience. Of the 105 new teachers with a master's degree, 52 earned the masters at an Illinois institution and 53 at an institution outside of Illinois. Of the 52 Illinois institution graduates, 35 earned the degrees at Northern Illinois University and the two University of Illinois campuses. Only 44 (9.7%) earned bachelor's degrees out-of-state. Both degrees were earned out of state for 26 (5.8%) of the 450 teachers.

Examination of the grade level of the teaching experience yeilded the following results :

278 (61.8%) had teaching assignments between the 9th and 12th grades.

172 (38.2%) had teaching assignments below the 9th grade.

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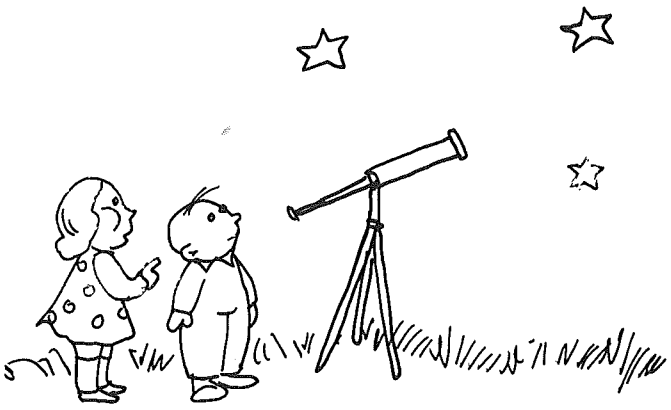
Using Astronomy to Educate and Inspire

Abstract

Astronomy is science at its best. It's an inherently fascinating subject, children love to learn about it, everyone has relatively easy access to the night sky, and its related to lots of other science and even non-science topics. In this article my aim is to show why astronomy can be used to spark children into learning science in general and how it can be incorporated into other academic subjects such as history, literature, and social studies. In addition, I hope to encourage educators of primary and secondary grades to use the resources presented here to learn and teach this exciting subject. I promise that you will have just as much fun as your students do!

The moon, planets, stars and galaxies. There's a whole universe out there very night filled with wonder and mystery. Young minds envision foreign landscapes, alien beings, and epic battles between celestial warlords fighting for supremacy of the universe. You can bring the real universe to life in your classroom. Incorporating astronomy into your science curriculum can help catch the attention of students who claim to dislike science, and feed the curiosity of those students hooked on learning how the world works.



Just by merit of its scope, astronomy encompasses virtually all other pure sciences, from biology to physics. In the context of astronomy, biology is seen in a new light. Bigger questions are posed. What conditions are needed for life to develop and survive in the first place? Why are there so many different kinds of flora and fauna on our planet? And physics can be demonstrated with real life examples. Nuclear fusion is the source of our sun's energy. We all feel that energy on a warm, sunny day. Gravity, a fundamental force of the universe effects everything from holding pupils in their seats (well most of the time!) to the motion of the moon around the earth.

Science is a way to view the world. Its rules, or laws, are used to explain, describe and predict events in nature. It's the cornerstone of our technological culture and its roots are in astronomy. Astronomy is the oldest science and the most fundamental. It addresses basic questions like: What types of things make up the universe? Why do things move the way they do? Can the universe last forever? How can we explore places like black holes where the known laws of nature break down and no longer apply? These may sound like lofty questions for young children, which they may very well be, but just as they stir something in you when you read them,t hey do the same for children. The point isn't so much teaching the answers to questions like these, but rather teaching children to think about such questions in the first place. We must aim to feed their natural curiosity and keep those questions coming well into adulthood. Throughout their lives they will have a better understanding of science, our world, how we perceive and explore it, and they will be good thinkers. Science, and astronomy in particular, is as much about thinking, being creative, perceiving the world, and asking the right questions, as it is about answers.

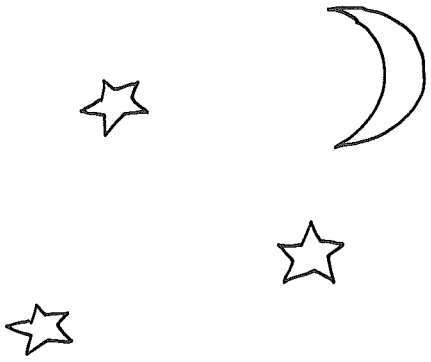
So, with that out of the way let's get down to how you as a dedicated, hard working educator can expose your students to the wonders of astronomy. Of course the first thing you need is to be knowledgeable enough about the field to teach it. This can be accomplished much more easily than you realize.

Learning the Basics

Nothing beats a good college textbook for learning the basics of astronomy. Two that I highly recommend are Exploration of the Universe by George Abell, et al., and Universe by William J. Kaufman. Despite being textbooks, they really read well. They also become a valuable, concise, and easy to use reference later on. If you find the prospect of reading a textbook to be a bit too much to ask, an excellent alternative is a book like COSMOS, the classic astronomy book by Carl Sagan. It's a superbly written, encompassing account of the many aspects of astronomy. Also, COSMOS is available in video format. check your local video store or public library.

A number of other astronomy video resources exist. The newest one is the PBS series, "The Astronomers." This six-part exploration of the lives and work of some of today's working astronomers first aired in the spring of 1991. It is widely available in video and has a companion book as well. One caveat about the series is that, as the title implies, its focus is the astronomers, not the astronomy. For more science and detailed explanations of black holes, dark matter, etc., you'll need other resources. And the creators of "The Astronomers" offer educators plenty of astronomy teaching resources in their Resource and Referral Guide. The Guide is part of their National Science Outreach Packet, which contains a number of other educational materials, including a curriculum guide. The Resource and Referral Guide lists sources that offer educators everything from books of astronomy teaching resources, class activities, astronomy laboratory manuals, to resource organizations for educators, interdisciplinary approaches to teaching astronomy, and audio visual resources, etc. The Guide is invaluable to anyone needing information on astronomy and ways to teach it. Write to the address below on school letterhead for your Outreach Packet.

Director
KCET Community Outreach-The Astronomers
4401 Sunset Boulevard
Los Angeles, CA 90027



Two other excellent, easily attainable resources include the educator newsletters you can subscribe to that are published by NASA and the Astronomical Society of the Pacific (ASP). Their addresses are listed below. Once again, request your free subscription on school letterhead.

NASA Report to Educators
Public Affairs, Elementary and Secondary Programs Branch
NASA Headquarters
Washington, D.C. 20546

Astronomical Society of the Pacific
Teachers' Newsletter, Department N
390 Ashton Avenue
San Francisco, CA 94112
(The name of the newsletter is "The Universe in the Classroom")

Using Planetariums and Science Museums

Another important resource for you to explore and utilize is your local planetarium and/or science museum. The names, addresses and phone numbers of all the planetariums in Illinois are listed at the end of this article. Planetariums are not only a place to take classes on field trips, but many are also a place where educators can get the information and tools they need to help them with their astronomy curricula. Some offer special teacher workshops on astronomy and astronomy education. The larger planetariums have education departments and can help you tap into needed resources. April Whitt, Associate Astronomer at The Adler Planetarium in Chicago, has compiled a list of Astronomy Teaching Resources, listing children astronomy books (good to recommend to your school librarian), teacher reference books, and additional resources. Request your free copy of the list by writing to:

April Whitt
Astronomy Department
The Adler Planetarium
1300 South Lake Shore Drive
Chicago, IL 60605
(Include a self-addressed stamped envelope with 52 cents postage.)

Planetariums also serve as ideal field trip destinations. Seeing a planetarium show or two can be a great way either to introduce a science or astronomy unit, or wrap one up. Many planetariums provide teacher's guides to help educators supplement their visit and incorporate it into what's being done in the classroom. In the planetarium, students can see the stars, planets, constellations, moon and much more. It's much easier to actually see the moon orbiting the earth than it is to visualize it, or see a diagram in a book.

No matter what the topic of the planetarium show your class happens to see, it still serves as a source of new questions and idea. Planetarium shows can help educators teach astronomy, but because of the limited time spent there, the shows usually better serve this broader purpose of just getting the audience to think about what's up there, and to perhaps think about the universe andour place in it in a different way.

Science museums are another great local resource. They too usually have education departments and a variety of offerings for educators. Even if they do not have astronomy exhibits per se, they will certainly have some that deal with motion, force, size, radiation, life, etc., which all have a connection with astronomy.

Interdisciplinary Astronomy

With a little thought, it's easy to see how to incorporate astronomy into the teaching of other sciences like chemistry and geology, but what about going a step further and working it into non-science subjects? Sometimes I think it's unfortunate that there exists such a sharp delineation between the sciences and the humanities in our educational system. After all, just how different are they? Science, art, math, history, literature—they are all human endeavors. All require creativity, insight, their own type of language, and a certain way to view the world. There are more similarities than differences between the two academic categories.

It's true science is about the "real" world. It reveals answers to questions about how nature works her magic. It seems apparent that a work of art or a novel paint a fictionalized view of the world. But do they? Is a painting of a beautiful landscape a less realistic representation of that landscape than a photograph of it? I think not. Paintings, and art in general, humanize our view and the genius of the artist is in his or her ability to reveal things in our world that a photograph or a scientific formula cannot. The landscape painting reveals nuances in movement, mood and beauty, that the snapshot cannot. The photo just shows us what the camera sees, the painting shows us what the human sees.

Thus, it is not only easy, but important, to blur the line between science and non-science subjects. In literature or history for example, it can be shown how the science of the times influenced man's development in other areas like religion, politics and technology. Scientists have played important roles shaping society and its views. That role is not just left to world leaders, heroes, and celebrities.

Art is a wonderful topic to incorporate with astronomy. Children use just as much creativity envisioning the Martian landscape or a trip through Saturn's rings, as they do actually putting it on paper. They can either be asked to create an accurate representation of such places and do the research needed, or they can invent their own science fiction of these other worlds with no constraints. Both are creative acts. It takes just as much creativity to do science as it does to do art.

Conclusion

Everyone has access to the night sky. Feeling a sense of wonder and awe about what we see up there is a universally human experience. One does not have to be an astronomer or peer through a powerful telescope to appreciate the universe. The science of astronomy is a view of the universe through human eyes, human experience and human thought. And the subject is just as accessible to all of us as the sky is. The sense of wonder is very contagious and once sparked by celestial pursuits, it can't help but spill over into other subjects, rapture your students, and inspire you!

List of Illinois Planetariums

Aurora
Waubonsie Planetarium
Waubonsie Valley High School
2590 Route 34
Aurora, IL 60504
(708) 851-7900

Barrington
Barrington Middle School
Barrington, IL 60010
(708) 381-0464

Champaign
William M. Staerkel Planetarium
Parkland College
2400 West Bradley Avenue
Champaign, IL 61821
(217) 351-2568

Chicago
The Adler Planetarium
1300 S. Lake Shore Drive
Chicago, IL 60605
(312) 322-0304

Crown Space Center/Omnimax Theatre
Museum of Science and Industry
57th Street & Lake Shore Drive
Chicago, IL 60637
(312) 684-1414

Cicero
Morton College
3801 S. Central
Cicero, IL 60650
(708) 656-8000

Elgin
Elgin Observatory/Planetarium
School District U-46
355 E. Chicago Street
Elgin, IL 60120
(708) 888-5324

Evanston
Planetarium
Evanston Township High School
1600 Dodge Avenue
Evanston, IL 60204
(708) 492-5844

Galesburg
Planetarium
Knox College
Galesburg, IL 61404
(309) 343-0112

Jacksonville
Planetarium
Jonathan Turner Jr. High School
664 S. Lincoln
Jacksonville, IL 62650
(217) 243-3383

Joliet
Planetarium
Joliet Township High School
Joliet, IL 60431
(815)

Herbert Trackman Planetarium
Joliet Junior College
1216 Houbolt Avenue
Joliet, IL 60431
(815) 729-9020 x363

Kankakee
Strickler Planetarium
Olivet Nazarene University
P.O. Box 592
Kankakee, IL 60901
(815) 939-5267

Normal
Illinois State University Planetarium
Physics Department
Normal, IL 61761
(309) 438-8758

Ottawa
Shepherd Planetarium
Shepherd Jr. High School
701 E. McKinley Road
Ottawa, IL 61350
(815) 434-3531

Peoria
Planetarium
Lakeview Museum of Arts & Sciences
1125 W. Lake Avenue
Peoria, IL 61614
(309) 686-7000

River Grove
Cernan Earth and Space Center
Triton College
2000 Fifth Avenue
River Grove, IL 60171
(708) 456-5886

Rock Island
John Deere Planetarium
Augustana College
Rock Island, IL 61201
(309) 794-7327

Rockford
Rockford Planetarium
401 S. Main Street
Rockford, IL 61101
(815) 226-9205

Tinley Park
Planetarium
Central Junior High School
17248 67th Avenue
Tinley Park, IL 60477
(708) 532-1771

Lela M. DeToye, Ed.D.
Southern Illinois University-Edwardsville

David A. Winnett, Ed.D.
Southern Illinois University-Edwardsville

A Strategy for Integrating the Assessment of Science and Writing

April is assessment time for Illinois's schools, and some educators are sick about it. Teachers are complaining that the majority of their class time in April, seventeen class days according to one elementary school teacher, is taken over by an assortment of mandated state and local tests as well as traditional standardized achievement testing. This is not just an Illinois phenomenon. classrooms across the nation are becoming inundated with various types of state and local assessments. The threat of national assessment tests only adds to the burden that many educators already feel. Teachers and students alike are crying out for relief.

An easy form of relief would be to simply eliminate some of these levels of testing. But in many states, as in Illinois, the question of how much assessment is too much is no longer a point for debate. In 1985, Illinois legislators passed Public Act 84-126, effective August 1, 1985. This comprehensive piece of school reform legislation addresses nearly every aspect of public school education. As a result of this legislation, the following amendments were added to The School Code of Illinois:

1. The state Board of Education must establish goals consistent with the primary purpose of schooling;

2. Local school districts must establish student learning objectives which are consistent with the primary purpose of schooling and which meet or exceed goals established by the State Board;

3. School districts must also establish local goals for excellence in education;

4. The State Board must establish assessment procedures for local school districts;

5. School districts must assess student learning to determine the degree to which local goals and objectives are being met;

6. School districts must develop local plans for improvement in those areas where local goals and objectives are not being met;

7. School districts must disseminate the local goals and objectives to the public, along with information on the degree to which they are being achieved and, if they are not being achieved, what appropriate corrective actions are being taken by the district;

8. The State Board must approve the local school district objectives, assessment systems, plans for improvement, and public reporting procedures.

State assessment in Illinois divides "the primary purpose of schooling" into six broad areas, math, language arts, science, social studies, fine arts, and health and physical education. Eventually, state assessment in these areas will involve students, grades three, six, eight, and eleven, in five hours of testing. Separate assessments will be given each year in reading, math, and language arts; science and social studies will be assessed in alternating years, as will fine arts and health and physical education. In addition to state provided tests, local school districts are mandated to develop their own assessments in these same areas. Add to state and local assessments the district's standardized achievement tests and the number of separate evaluations becomes overwhelming.

Overwhelming or not, state and local assessment is a fact of school life in Illinois. Any relief from this assessment burden is going to have to come from changes in the way assessment is approached, not from the reduction of required assessments.

In an effort to provide some relief for teachers and administrators who feel they are drowning in these repeated waves of assessment, we have devised a way for districts to combine some assessments, at least at the local level. The example we provide in this article combines science and language arts assessment. By using an integrated approach at the local level two good things happen:

* the number of individual assessments is reduced,

and

* assessment remains tied to instruction in meaningful ways.

Educators know that the best way to assess student writing abilities is to have them write. A program entitled Write-On Illinois, specifically designed to help prepare students for the writing portion of the Language Arts assessment provides sample prompts for three types of writing (narrative, persuasive, and expository), and a rubric for evaluating student writing. Teachers are encouraged to have students write throughout the year using the Write-On Illinois guidelines. Writing is time consuming, however, and does not seem purposeful when done in isolation, thus, teachers often seek ways to integrate writing with the content areas. This creates a real purpose for the writing and helps to justify the time spent on writing.

Similarly, the best way to assess student abilities in science is through observation—by watching students apply the scientific method to actual problem solving situations. But when faced with large scale assessment this personal observation becomes impractical. At the same time, traditional forms of science assessment are not sufficient either. Multiple choice and other one right answer type tests do not allow the evaluator to "see" whether or not students have acquired the scientific inquiry methods deemed so essential in science education today. Writing to a science prompt provides a window through which evaluators can actually assess the student's competence in the content and processes of science.

In the prompts provided inAssignment 1., we have combined science and writing assessment. Because the prompts follow the format established in Write-On Illinois student responses can be evaluated for writing competence according to the state criteria. At the same time, the content for these prompts is directly related to the Illinois State Goals for Science. In fact, these sample prompts address three goals that the state science advisory committee have identified as being particularly difficult to evaluate using the more traditional assessment methods.

For example, the student written response to Assignment 2. could be used to assess the depth of that student's awareness of environmental issues, Illinois science goal #2. Simultaneously, that same student written response could be scored using the state criteria for expository writing. The local district could assess both science and language arts skills and processes in one assessment, a time and energy saver many Illinois school districts desperately need.

Integrating science and writing assessments at the local level is justified for several reasons:

1. It accomplishes the goals and objectives set out in both Write-On Illinois and in the Illinois State Goals for Science.

2. The integration of assessments helps keep testing in its proper place—a part of the overall instructional plan, thus eliminating the notion that testing is a once a year intrusion into the classroom.

3. By using a combined assessment procedure throughout the year, testing can be used to develop thinking, writing, and processing skills in several areas while providing practice for the April assessment time in Illinois.

Writing Assignment 1
Persuasive: Science Reporting

In the1940's, scientists learned how to split the atom and create nuclear energy. This discovery resulted in many improvements in the treatments of cancer and the production of low-cost, dependable energy. However, this discovery also resulted in the development of the atomic bomb and the fear of nuclear war.

In your opinion should the scientists have shared this important breakthrough?

Writing Assignment

Write a paper using the following guidelines:

- Decide whether you agree or disagree that scientists should have shared this important breakthrough.
- In the beginning of your paper state your opinion (position) and give reasons for why you feel this way.
- Fully explain your reasons and give examples.

Check points to remember:

- ✓ Take some time to plan your paper on scratch paper.
- ✓ Organize your ideas carefully. Remember what you know about paragraphs.
- ✓ Use language and information appropriate for the teachers who will read the paper.
- ✓ Check that you have correct sentences, punctuation and spelling.

Adaptations of this integrated assessment concept are being explored in Illinois at several levels.

* The Illinois Science Teacher's Association is currently piloting writing prompts for science assessment in Illinois classrooms. The concept of integrated assessment and sample prompts will be a part of the ISTA Handbook to be published in 1991.
* Members of the Illinois Science Assessment Advisory Committee are proposing that science/writing prompts and supporting science assessment equipment be made available to Illinois schools through the state's eighteen educational service centers.
* During the 1990-91 school year Illinois school administrators will be introduced to the concept of integrated science and writing assessment as they participate in the Science Literacy Project, a component of the Illinois Administrator's Academy.
* The Excellence in Science Education Project at Southern Illinois University at Edwardsville currently provides area schools with writing-to-learn and writing-to-assess science staff development inservice programs.

The possibilities of integrating student assessment go far beyond the proposed match up of science and writing. School districts could develop writing prompts using the Write-On Illinois approach for their social studies assessment or literally for any area of the curriculum.

Yes, spring has become the time for assessment headaches in Illinois. School districts are looking for relief from testing overload. One way to spell relief from the misey of too much assessment is I-N-T-E-G-R-A-T-I-O-N. All educators would feel better if more school time could be devoted to meaningful learning experiences.

Writing Assignment 2
Expository: Important Environmental Concerns

A topic of national concern is the health of our environment. A student conference is being held to discuss issues related to the problems in our environment. Conference organizers want to hear from students across the nation discussing important environmental issues.

Writing Assignment

Write a paper using the following guidelines:

- Think about an important environmental problem.
- In the beginning of your paper, identify and describe this environmental problem.
- Give examples of its causes.
- Describe in detail what will happen if we do not correct this problem.

Check points to remember:

- ✓ Take some time to plan your paper on scratch paper.
- ✓ Organize your ideas carefully. Remember what you know about paragraphs.
- ✓ Use language and information appropriate for the teachers who will read the paper.
- ✓ Check that you have correct sentences, punctuation and spelling.

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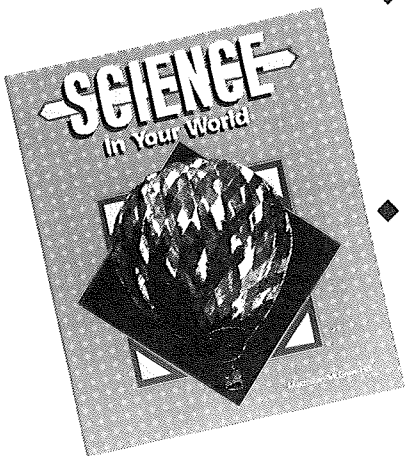

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For additional information contact:

Steve Bancroft
2305 Grinnell Drive
Springfield, IL 62704
217 793 8798

John Hanzalik
205 Arcadia Court
Vernon Hills, IL 60061
708 367 8337

John Kent
10625 Laramie Avenue
Oak Lawn, IL 60453
708 425 5116

Janet McCormick
1220 Sayles Drive
Palatine, IL 60067
708 359 4619

Macmillan/McGraw-Hill
SCHOOL DIVISION

Leola Williams
1919 Brookdale #207
Naperville, IL 60563
708 357 6438

SPECIAL INTEREST

John G. Shedd Aquarium
1200 South Lake Shore Drive
Chicago, IL 60605

Great Lakes Beach Sweep Set for September 21

Shedd Aquarium is coordinating the Great Lakes Beach Sweep, a region-wide beach cleanup on Saturday, September 21. The event is part of the Center for Marine Conservation's four-year-old International Beach Cleanup, which involves not only all of the U.S. coastal states, but Canada, Guatemala, Japan, and Mexico. Last year, 105,000 volunteers on beaches around the world collected more than 2,657,500 pounds of trash.

What did they do with it all? Where possible, glass and metal were sorted out for recycling, and the rest disposed of more carefully than they had been the first time. But more importantly, every piece of debris was tallied by category on detailed data cards provided by CMC, a nonprofit environmental group based in Washington, DC.

Analyzing the data returns, CMC has found that most of the debris cluttering U.S. beaches is from packaging and disposable plastic products. Certain debris items are traceable to offshore sources: galley wastes from vessels, fishing and boating gear, operational wastes from vessels and sewage from inadequate treatment practices. Of course, much of it also can be tracked to fast-food and packaged-goods consumers on the shore.

Identifying the origin of beach trash is the first step in stopping it, whether through education or legislation, at its source. The long-term goal of the one-day cleanup is to clear the beaches, and the waters that wash them, of wastes that jeopardize the health and safety of humans and wildlife alike.

Last year, a modest but enthusiastic cleanup was organized as part of International Beach Cleanup by the Aquasphere Project and Friends of Lincoln Park at Montrose Beach in Chicago. Seventy-one volunteers removed 771 pounds of broken glass, crushed cans, styrofoam bits, fishing line and less savory items from the sand in a little more than two hours.

At the time, participating Shedd employees raised the possibility of Aquarium cosponsorship of the Chicago event in 1991. The Center for Marine Conservation suggested a more ambitious role for the Aquarium: establish and coordinate International Beach Cleanup activities in the eight states and two provinces of the Great Lakes region. Science editor Karen Furnweger is the regional coordinator. To date, Great Lakes Beach Sweeps are planned along the Illinois, Indiana, Michigan, New York, Pennsylvania, and Wisconsin shorelines. Assisting the Aquarium with local and regional organization are cosponsors Aquasphere Project, Chicago Academy of Sciences, Chicago Park District, Friends of Lincoln Park, and Lake Michigan Federation.

Closest to home, members are invited to join Shedd Aquarium staff and volunteers at 12th Street Beach, just south of Adler Planetarium. Cleanups are also slated for all of the Lincoln Park beaches from North Avenue to Foster, the Edgewater neighborhood, Evanston, South Side, and the Indiana dunes. At each site, beginning at 9:00 a.m, teams of volunteers, armed with plenty of garbage bags, data cards and work gloves, will work assigned sections of beach. While three or four "baggers" collect the sundry items deposited on the beach by waves and the public, another team member will record them on a data card. The cleanup should last about four hours. Participants at 12th Street are invited to bring a picnic lunch for afterwards. Meanwhile, the Chicago Park District will collect the day's haul along the lake front for sorting and recycling or appropriate disposal.

Aquarium members who would like to participate in the Great Lakes Sweep can mail a postcard to BEACH SWEEP, c/o Karen Furnweger, John G. Shedd Aquarium, 1200 S. Lake Shore Drive, Chicago, IL 60605. Include your name, address and day and evening phone numbers. (Please do not call the Aquarium.) More details on the 12th Street cleanup appeared in the August public programs brochure.

GET INVOLVED!

You can't save the ocean by yourself, but you can do your part. If you live near a beach, adopt it. Next time you go there, take a trash bag and spend a few minutes picking up any litter you find. Enlist other concerned persons in your effort; contact the CMC for information on how to organize a clean-up group. Write the Center for Marine Conservation, 1725 DeSales St., NW, Washington, DC 20036.

Closing the Loop on Six-Pack Rings

You see them everywhere: discarded plastic rings that once bound six-packs of cola, beer or other canned beverages. They litter beaches and parks, sidewalks and alleys. Poignant photographs show them encircling the necks of seabirds and baby seals, foretelling death by starvation or through further entanglement and drowning. Last year, 34,722 of these plastic nooses were collected in one day on U.S. beaches during the Center for Marine Conservation's International Beach Cleanup. The ubiquitous castoff six-pack carriers seem to be a problem of late 20th century consumerism that won't go away.

In reality, they do go away, to the extent that all of the carriers manufactured in the United States and Canada in the last few years are photodegradable. A new version, currently available on the East Coast and scheduled for use in Chicago, requires the consumer to tear a tab on the individual ring to release a can from the pack. The design greatly reduces the potential for wildlife entanglement and frees the environmentally conscientious from snipping the "empties" apart with scissors. Best of all, six-pack rings now are recyclable.

Jim Cathcart, director of environmental affairs for ITW Hi-Cone, one of two U.S. manufacturers of plastic six-pack holders, explained that since its development in the early '60s, his company's product has evolved to address environmental concerns. ITW Hi-Cone began marketing photodegradable carriers in the 1970s, although not all soft-drink bottlers were interested in using them. Since 1978, however, 24 states have passed legislation requiring six-pack holders to be "degradable" (Illinois is not one), making it prudent, economically and ecologically, for manufacturer and bottler alike to go entirely with the photodegradable product.

Photodegradable plastics should not be confused with the controversial "biodegradable" plastics, which are made with sugar or starch that eventually is consumed by microorganisms, leaving the residual matter to pollute in perpetuity. The photodegradable holders are made of a modified low-density polyethylene that becomes brittle when exposed to the ultraviolet rays in sunlight. The speed at which the plastic deteriorates varies with the time of year, temperature, latitude and any other factors that can limit the amount of UV exposure, but the plastic loses 75% of its stretch, or strength, in a few days to a few weeks. At that stage, Cathcart said, an animal entangled in a ring could exert enough effort to break free. During the peak summer picnic/littering season, it takes six to 10 weeks for a holder to degrade to the point where it crumbles into pieces. With exposure, it continues to break down into smaller and smaller bits.

While the plastic is inert and nontoxic, as litter it still represents foreign matter that can be ingested by fishes, turtles, birds, and other wildlife, and its effects, either immediate or cumulative, are unknown. Kathy O'Hara of the Center for Marine Conservation's Pollution Prevention Program noted that there is no quantitative information on ingestion of this particular kind of plastic by wildlife, "but anything that has the potential to break into pieces poses problems." Cathcart countered that, at least in birds, the brittle plastic would probably be ground up in the crop, minimizing the likelihood of intestinal blockage, the main danger from ingestion of most plastics.

The six-pack carriers degrade in direct and indirect light as well as in the water, where they float and are exposed to sunlight. They cannot break down under leaves or snow, or in a landfill. "[The six-pack carriers are] photodegradable to help reduce the eyesore of litter," Cathcart said. "But the proper disposal has to be recycling."

Recently, the manufacturer initiated a "closed-loop" recycling program—turning old holders into new ones—in Chicago and several suburbs. A partner in the effort is the Chicago Park District, which runs the two-year-old Plastics on Parks recycling program. Six-pack holders, 12-pack bands and the carriers for 16-oz. plastic beverage bottles (as well as the bottles themselves) can be dropped off in specially marked bins in part district fieldhouses throughout the city.

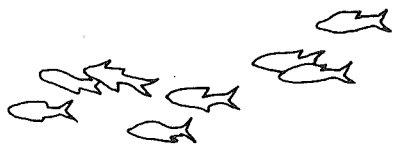
Six-pack holders are also accepted in curbside programs in Arlington Heights, Bloomingdale, DeKalb County, Glendale Heights, and Naperville. In each instance, a recycling service sorts the rings from other plastic and returns them to ITW Hi-Cone.

Not everyone views this new generation of six-pack holders as environmentally acceptable. Kevin Greene, research director for Citizens for a Better Environment, said "If there's a way to avoid the material, that's the best approach." He recommended filling a reusable container, such as a Thermos bottle, with beverages for picnics in the park or at the beach. "When you have something that photodegrades, it encourages the throwaway mentality.... We need to shift to reusable, repairable and recyclable materials." He acknowledged that

the closed-loop recycling program for the holders "is preferable to taking plastic and turning it into lower-grade secondary materials, but frankly, I'm not sure how great participation is going to be unless you have a recycling bin at every picnic table."

Fred White, director of the Chicago Park District's recycling project, said that, realistically, the lightweight refuse was too apt to blow or be dumped out of outdoor receptacles. "We'd be accused of littering, not cleaning up the parks." He noted that every city park fieldhouse accepts recyclable plastic. The park district recently mounted a publicity campaign t promote recycling six-pack rings.

"Just because they're photodegradable, six-pack carriers won't go 'poof' and disappear," admits ITW's Cathcart. But they can be plucked from the waste stream—and from beaches and parks—and returned to the manufacturer for reprocessing in a continuous recycling loop. Looking at six-pack holders as a given packaging phenomenon, perhaps the biggest problem is not with the product, but with careless consumer behavior, which the manufacturer is trying to circumvent and the Chicago Park District is trying to modify. For the time being, plastic six-pack holders shouldn't go away; they should go around and around, again and again.



International Space Year: 1992

1992 is International Space Year. In 1985 the late Senator Matsunaga from Hawaii proposed an International Space Year (ISY) to call attention to the convergence in 1992 of two commemorative events—the 500th anniversary of Columbus' voyage to the New World and the 35th anniversary of the International Geophysical Year (IGY) with its themes of scientific inquiry and global cooperation.

ISY has received endorsement from Congress and the United Nations. International studies include ocean/climate interaction, productivity of the ocean, global sea surface temperature, land cover change, polar ozone holes, polar ice extent, and greenhouse effect detection.

Special educational programs include "Educational Earthwatch," "Mission to Planet Earth," and precollegiate school projects. Highlight activities of 1992 are the "Mission to Planet Earth Day," April 25, 1992 and the 1992 Planetary Congress. Educators are encouraged to begin planning now for student involvement during this year of science.

To be placed on a mailing list to receive a newsletter, an activities list, and other related information for ISY, contact: The U.S. International Space Year Association, 600 Maryland Ave., SW, Suite 600, Washington, DC 20024 or phone (202) 863-1734.

Outdoor Highlights
June 17, 1991

Part of Mississippi is "Endangered" River

The part of the Mississippi River between the "saints" is considered one of America's most endangered rivers, according to American Rivers Inc., and the Izaak Walton League of America.

The Upper Mississippi River between St. Louis and St. Paul was given this rating not for the ecological damage done to the river, but for the threats to the unique environmental values within its corridor.

"This 800-mile stretch of the Mississippi is prime nesting and migratory habitat for waterfowl, eagles and hundreds of species of birds, fish and other wildlife," said Paul Hansen, Director of IWLA's Midwest Office. "It encompasses over 500 river miles of national wildlife refuge land in five refuges, as well as scores of state and private wildlife areas."

Threats to the river include:

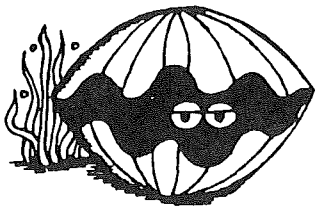
- The potential for a catastrophic spill of some of the approximately 200 million gallons of ecologically hazardous material that is transported in single-hulled barges.
- The proliferation of hydropower projects to be built with few, if any, environmental safeguards.
- A dramatic increase in barge traffic projected by the Corps of Engineers, and new multi-billion dollar public works projects being considered by the COE.
- Continued destruction of aquatic habitat by contaminated sediments from fields and polluted runoff from cities.
- A 500-megawatt pumped-storage power plant that will pump water out of Lake Pepin (a natural lake between Wisconsin and Minnesota) at a rate greater than the average flow of the river.
- Water quality standards that regularly are exceeded at many points along the river, and consumption advisories or consumption bans in effect for most species of bottom-dwelling fish.
- Development pressure that includes new barge terminals and marinas and rapid development of riverboat gambling.

Remember --

1991 National Beach Cleanup Day
September 21.

Mother Earth will thank you.

The HELM



Spring Workshop Focuses on Mussel Monitoring:Keep Your Eyes Peeled for Zebra Mussels

One March 13th over 80 attendees from power plants, water treatment facilities, and consulting firms gathered in Des Plaines, Illinois to learn abut zebra mussels. The workshop was sponsored by the Illinois-Indiana Sea Grant Program in cooperation with the Illinois Natural History Survey.

The workshop provided water users with information about the zebra mussel problem, specifically how to identify zebra mussel veligers (free-swimming larvae), and discussed monitoring efforts along the Illinois and Indiana shorelines of southern Lake Michigan.

Valuable Outcomes
Two important outcomes originated from this workshop. First, information concerning zebra mussel sightings in Illinois and Indiana will be coordinated through Chris Pennisi, Illinois-Indiana Sea Grant's Marine Extension advisor.

Second, the Lake Michigan Biological Station staff will supply information on monitoring techniques and assistance (sample collection, sample analysis, and identification confirmation) on a contractual basis to Illinois and Indiana water users. For more information : (708) 872-8677.

Workshop Highlights
Rich Hess from the Illinois Department of Conservation kicked off the agenda by discussing IDOC's role in public education and curbing the spread of zebra mussels. In addition, he announced that IDOC has published a pamphlet, Zebra Mussel Alert and Guide to Boaters, which can be obtained from Chris Pennisi's office.

Ellen Marsden provided an overview of zebra mussel biology and a progress report on the mollusk invasion. She also presented standard monitoring and sampling protocols.

Al Miller from Wisconsin Sea Grant Advisory Services described the mussel monitoring program underway in Wisconsin.

Chris Pennisi of Illinois-Indiana Sea Grant updated attendees on the distribution of zebra mussels in the two states. The following provides a brief summary of her presentation. The Illinois sightings were reported to *The Helm* just prior to pres time, May 9th.

Southern Lake Michigan Sightings
According to the Sea Grant's Chris Pennisi, 15 major industries, power plants, and municipal water departments along the Indiana shoreline of Lake Michigan have discovered zebra mussels in water intake pipes and other areas.

Because the two states have not yet established a formal monitoring program, Pennisi notes that these numbers may not be all inclusive. "Most of the sightings are not considered to be 'crisis' populations," says Pennisi. However, populations at Bethlehem Steel and Northern Indiana Public Service Company (NIPSCO Power Plant) are experiencing major problems, she says.

Bethlehem Steel and NIPSCO are located close to the Lake Michigan mouth of the Little Calumet River near the Port of Indiana, Portage, Indiana. Clusters of 50 to 100 mussels per square foot have been found in NIPSCO's intake cribs. Bethlehem Steel is similarly infested, according to a company spokesperson.

These large sightings are more than likely due to the location of the facilities. "Both are located in unusually good zebra mussel habitats," explains Pennisi. "The Little Calumet River brings warm, nutrient-rich water to the intake facilities. In addition, these plants are close to the Port of Indiana where zebra mussels are probably 'seeded' by national and international shipping traffic." Pennisi was unaware of any inland sightings in Indiana as of May 9th.

In Illinois, however, recent inland sightings have occurred. In the Lake County waters of Lake Michigan, zebra mussels have been found at the Commonwealth Edison Nuclear Power Plant in both Zion and Waukegan and at Abbott Laboratories in North Chicago. None of these facilities are at a crisis stage, according to Pennisi. Measures, however, are underway to combat the problem.

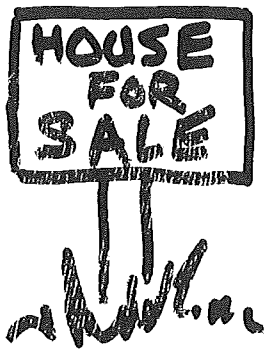
In the Cook County waters of Lake Michigan, individual zebra mussels were discovered on a number of items in Monroe Harbor near Chicago's Shedd Aquarium during April's Eco-Dive event. Mussels were also found off the shores of Loyola University. Two more sightings occurred in the Calumet Harbor area which serves as the entrance to the Illinois International Port.

Although most of the sightings have occurred on various bottom substrates, 50 to 100 mussels were found on the hull of a commercial fishing vessel which was docked for over a year in the Calumet Harbor. The Calumet River flows away from Lake Michigan and eventually feeds into the Illinois River system and the Mississippi River. These sightings could mean that zebra mussels are on their way inland.

Zebra Mussel Alert and Call for Action

As a result of these sightings, all Lake Michigan anglers, boaters, marina operators, scuba divers, and beach users are asked to be on the lookout for juvenile and adult zebra mussels. In the adult stage, these clam-like organisms are about two inches in length with zebra-like stripes. Unlike other freshwater mollusks, zebra mussels will attach to most hard surfaces. They also grow on top of each other, forming clusters.

If you think you have found a zebra mussel, note the location, and estimate the number of zebra mussels nearby. If you are unsure if it is a zebra mussel, scrape it off, and store it in rubbing alcohol. Whatever you do, do not trow it back into the water. In either case, contact Pennisi with your findings. Until a formal monitoring program is established, public sightings and observations will provide critical information on the spread of zebra mussels.



Bat Conservation International (BCI), founded in 1982 by Dr. Merlin Tuttle, is a nonprofit organization dedicated to reversing the severe declines in bat populations. Through research, education, and protection of bats and their habitats, BCI hopes to help one of nature's most relentlessly persecuted animals. Because one of the group's goals is to provide safe haven for displaced bats, BCI encourages people to put up bat houses.

Relatively inexpensive and fascinating to young naturalists, the structures have open bottoms and precut grooves inside so that bats can fly in, grip on, and hang easily. Depending on size, each house can usually accommodate from 20 to 50 bats. Houses should hang 12 to 15 feet above the ground in a location sheltered from the wind. Bats also prefer to roost within close proximity of a body of water such as a lake, marsh, or pond. BCI's bat houses come in two sizes ($42.95 and $29.95) and include a booklet that answers frequently asked bat-related questions.

Why not order a bat house? All you've got to lose is a few thousand insects. Write BCI, P.O. Box 162603, Austin, TX 78716. Donations to help cover postage are appreciated.

May I See Some ID Please? New Cards Help Spot and Report Zebra Mussels

With the help of a new zebra mussel identification card, anglers, beach users, boaters, marina operators, and scuba divers throughout Illinois, Indiana, and the Great Lakes region can help spot, report, and hopefully prevent the spread of zebra mussels inland to our lakes and rivers. The cards are now available from the Illinois-Indiana Sea Grant Program.

The front and back covers of the wallet-sized card feature color photos of zebra mussels. On the inside, the card describes characteristic traits to help identify the mussel and what to do if you find one. A contact person is also listed for more details.

The card was produced by the Wisconsin Sea Grant Institute in cooperation with the other Great Lakes Sea Grant Programs. Single zebra mussel cards and quantities under 20 are free. Bulk quantities of 20 or more will cost 5¢ each, with 20-card ($1) increments suggested. Prices include postage and handling.

Individuals or organizations interested in obtaining cards should send requests to: Robin Goettel, Illinois-Indiana Sea Grant Program, University of Illinois, 65 Mumford Hall, 1301 W. Gregory Dr., Urbana, IL 61801. Please make checks payable to "The University of Illinois."

For further mollusk information, readers can obtain a free copy of *Zebra Mussels: A 1991 Great Lakes Overview*. This 8-page booklet, produced by the Great Lakes Sea Grant Network, provides background information on what zebra mussels are and where they come from, current methods of zebra mussel control, what steps can be taken to slow the spread of zebra mussels, and who to contact for help. Requests can be sent to Robin Goettel at the address listed earlier.

Where Have All the Barn Owls Gone?

In the dark of the night, when the countryside is hushed, a small rustling sound breaks the quiet. The sound is so faint most humans would not even notice it, but it does not go completely undetected. With a flutter of wings, a barn owl sweeps out of the sky. Creatures of the night scurry for safety, but for one it is too late. The barn owl reaches out with sharp talons to pluck a mouse from a field.

The barn owl is a very distinctive looking raptor. Its buff-colored feathers are set off around the white face with a heart-shaped darker layer of feathers. Its dark brown eyes and unblinking stare have given it the nickname "monkey-face."

When most of us think bout owls we think of birds with big ears, or ear tufts on top of their heads. Barn owls don't have ear tufts. Instead, they have concave facial disks that pick up sounds much like satellite dishes pick up television signals. As the owl moves its head, it can use the precise sound waves to find its prey. Even in total darkness, a tiny mouse can be detected in a large field.

Barn owls have been welcome on most farms for hundreds of years because they eat mice and rats. Most barn owls prefer voles or meadow mice. Some voles only live in uncultivated grasslands. Over the past year farmers have stopped letting pastures and meadows grow wild. Now there are fewer and fewer places for voles to live, therefore, the population of these mammals has decreased. Since there are fewer voles, there are also fewer barn owls. A family of two adult and six young owls needs about 1,000 voles during its three-month nesting period. When the owls cannot find enough food to eat, they move on to other areas, or die.

Barn owls do not make the kind of nests many other birds build. They raise their young in places like hollow trees, barn rafters or tops of silos. Sometimes these are not really safe places for young owls. They often fall out of the nest or are exposed to wet weather. Other owls, like the great horned owl, attack and kill barn owls. Raccoons and snakes eat owl eggs and young owls.

Although it sounds like it might be impossible to save the barn owl fromextinction, it's not too late to do something to help. Farmers and landowners can keep existing grasslands and work to create more. You can help by watching for barn owls. If you are sure you have seen a barn owl, write down how many there were, where you saw them and the date. Add your name, address and phone number and mail the information to: The Department of Conservation, Natural Heritage Division, 5424 S. Second St., Springfield, IL 62701-1787.

Outdoor Highlights
April 15, 1991

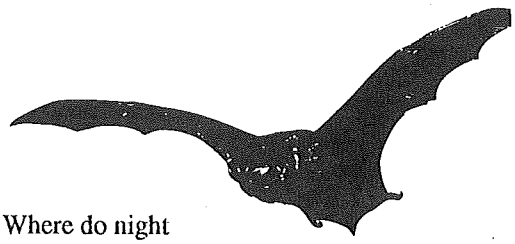
Springfield Oak Tree is National Champion

A dream oak located in West Cottonhill Park, near Springfield, has been certified as the champion tree for that species by the American Forestry Association.

The tree was nominated by Department of Conservation employee Guy Sternberg, who lives in Petersburg. The tree was featured in a story about Illinois' record trees in the February 19, 1990 issue of *Outdoor Highlights.*

The new national champion tree scored 278 points in the AFA's scoring system. The tree is 77 feet tall, has a circumference of 14 feet, 8 inches and an average crown spread of 101 feet.

Focus on Night Fall Creatures



Observe the wonder of the night and its creatures in Joanne Ryder's book, *STEP INTO THE NIGHT.*

SCIENCE CONCEPT #1: Experiencing the changes night brings requires special observation skills.

Before reading the book, ask the children how they feel about the night. Have they ever gone outdoors just as it is getting dark? What did they see , hear, touch, smell, taste? As you read the story, ask them to listen for the changes the night brings. Which of the five senses does the little girl use? (NOTE: The author uses both the child's point of view and the animals. Periodically, ask the children who is talking.) Stop at spots in the story to let the children guess what the little girl observes before you turn the page. Examples include sight (someone small: mouse), smell (strong and musky: skunk), hearing (thin chirps heard by a dog or bat), and touch (grounds shift for a moment: mole). After reading the story, discuss the changes that took place. When does night begin? (When the sun hides behind the rooftops.) What changes occur as night begins? (Things look darker, shadows come, different sounds and animals appear.) Why did she stand quietly as night began? (Night animals will not appear if there is noise or movement.) Now make a chart with the five senses as headings, and re-read the book listening to all the things she saw, heard, smelled, touched, and tasted. Which skill did she use least? (Taste.)

Integrating the Science Concept into the Curriculum

ART: Have the children observe how darkness changes color, line and visual texture by making a collage of materials. Cut into small pieces various kinds of paper, colored, lined and unlined, graph, sandpaper, flocked wallpaper in colorful cotton, silk, felt, wool, suede, leather, and fake fur. Have students choose varied materials to paste on their posterboard collage. After the collage is dry, place them on the bulletin board. Darken the room, what changes do the children observe? (Include changes they notice in color, line and texture.) As time passes, can they see better? (It takes human eyes 15 minutes to fully adjust to darkness.)

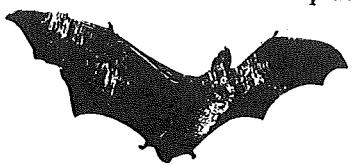
MATH: Measure and compare shadows from differing distances. Darken the room or a corner. Shine a flashlight on some object from a distance of one foot, then two feet and so on. (The shadow will grow smaller as the distance increases.) Determine at what distance, if ever, the shadow and object are the same size, animals hiding, and let other children try to find the hidden animals.

READING ART: Where do night animals go during the day? What keeps them safe? (Things such as protective coloring, burrows or nests.) Have children choose any night animal to research. Let them look in books and nature magazines. Using shoeboxes for dioramas, children can draw and cut out their night animal, or make a model out of clay and plan the habitat where it will hide during the day. Use a variety of materials in the diorama: paper cutouts as well as real objects such as twigs and leaves. A 3x5 card attached to the diorama could give important facts about the animal.

HEALTH: Why can some animals see better at night than humans? The structure of their eyes is different. The inside of their eyes have more light receptors (rods or cells), allowing them to see better at night. Their eye shine a yellow, red or green glow because of these additional receptors. Even human eyes can look red in a picture. Why? (Because of the bright flash.) Get a diagram or eye model and let children examine the structure of the eye. Invite an optometrist in to your classroom to talk to the children. Discuss ways they can be kind to their eyes.

SCIENCE CONCEPT #2: As grayness overtakes the day, night creatures search for food and mates.

Ask the children what kinds of food they have seen animals eat. Was it provided by a human, or did the animals have to find it themselves? What problems might an animal have when searching for food? (Scarcity of food supply, sharing food with others, protecting itself from predators.) What is a predator/prey relationship? (One animal, the predator, searches for a smaller animal, the prey, as it's food source.) What food did the night creatures find in the story? (The mouse - berries; skunk - insects and grubs; spider - insects; bat - moth; and the mole - worms.) How did some of the animals protect themselves from other predators? (The mouse hid in the leaves; the skunk sprays it's scent; bats, moles, and spiders have protective coloring.)



Animals often use calls or signals to send messages and to attract

mates. What did the firefly do to send messages? (It used it's tiny light.) What about the frog? (It calls in the night.) How did the little girl get a message? (Someone called her name.)

Integrating the Science Concept into the Curriculum

MATH: When does the night begin? Have the children notice at home how the light begins to change as night approaches. Teacher the time frame vocabulary: dusk, twilight, evening, dark, night, and midnight. Do these time frames start at specific times? Why or why not?

MUSIC: Sounds of the night send messages. Find a record of night sounds or songs about the night. What sounds do you hear? (If a record is unavailable, make your own recording of night on a cassette recorder/player.) What sounds do you hear besides the sounds of the night creatures? (Cars, planes, and people.) How might these sounds bother the night creatures? (They may make it harder to search for food, and more fearful of being found.) Can you create your own night sounds?

CREATIVE MOVEMENT: Choose a night creature to imitate. The entire class should do it together, or act out individual animals as in a game of charades. How do they move? How would a mouse move differently than a skunk? What about a firefly or a bat? How do you show the difference in size?

LANGUAGE ARTS: Have the children pretend that they are a night creature. How would they send messages to a friend in a darkened room? Children can work in pairs to determine what their animal is, and how they might communicate, such as with lights or calls. Younger children could tell each other what they are saying, while older children could devise a type of morse code or other sound code to actually send the message to their friends.

Reading Up

Bibliography of Books for Children

Experience the spellbinding quality of the outdoors at night in the books listed below:

Creatures of the Night by Judith Rinard, Books for Young Explorers, National Geographic Society, 1977. Through rare, closeup photography we feel one with nature as we peer at feeding raccoons, snoozing leopards, a howling coyote, and much more. Pre-Adult (nonfiction).

Harry's Night Out by Abigail Pizer, Dial Books for Young Readers, New York, NY, 1985. Harry, the cat, goes out into the night and is not alone, as other night creatures are hunting for their food. Pre-1.

Large as Life Nighttime Animals by Joanna Cole, Alfred A. Knopf, New York, NY, 1985. Children will be filled with awe when you open this large, quality picture book and begin to read about hare, bat, giant toad, wood mouse, elf owl, etc. Pre-3 (nonfiction).

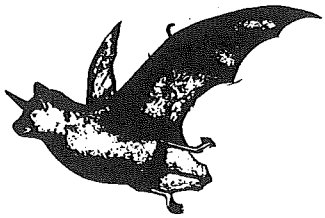
Moon Song by Baylor Byrd, Charles Scribner's Sons, New York, NY, 1982. This brief story brings you nearer the coyote than you may ever be again. K-Adult.

Night in the Country by Cynthia Rylant, Bradbury Press, New York, NY. We learn of sounds that happen in the night while we sleep. There are animal sounds and other sounds as well. Pre-2.

Raccoons and Ripe Corn by Jim Arnosky, Lothrop, Lee and Shepard Books, New York, NY, 1987. In his simple but special style, Jim Arnosky let's us experience the soft approach of an autumn night with a raccoon family; then we spend the night with them in a corn field. Pre-2 (nonfiction).

The Summer Night by Charlotte Zolotwo, Harper and Row Junior Books, New York, NY, re-issued in 1987. A tender story of a father and his daughter as he takes her into the spellbinding summer night to hear and see wonders near the pond. K-3.

When I'm Sleepy by Jane Howard, E. P. Dutton, New York, NY, 1985. A small child fantasizes about different places and ways she could sleep: in a bird's nest, in a hollow log, even standing like a giraffe. Young children will want to add their comments to this whimsical story. Pre-2.



Resources

Background Materials on Subject of the Month for Adults

Several magazines for children will be helpful in your study of night creatures. *ZOOBOOKS* are available from Wildlife Education, Ltd., 930 W. Washington St., San Diego, CA 92103 at $33.60 for a full year subscription. Individual issues are also available, such as the August 1984 Vol. 1, No. 22

issue entitled "*Night Animals.*" The pictures and factual information will have the children pouring over them. Also for children are *RANGER RICK* (ages 6-12), 12 issues for $14.00, and *YOUR BIG BACK YARD* (ages 3-5), 12 issues for $10.00 available from National Wildlife Federation, 1400 - 16th St., Washington, DC 20036-2266. By utilizing these publications, a teacher's picture file can be greatly increased as well.

NATURESCOPE from National Wildlife Federation (see address above) does it again in "*Amazing Mammals, Part I and Part II.*" These publications are available at $6.00 each, and contain a wealth of stories, demonstrations, experiments, play poems, craft ideas and more.

Bulletin Board

Have students sketch or draw a scene in mural style on large size paper. Include outlines of large trees, a lake or pond, a large farm house, a barn, driveway, lawn or meadow. With 1 or 2 inch squares of sponge dipped in dishes of black, gray, brown, and dark green tempera paint, apply the sponge gently to the drawn objects. Do not apply the paint heavily (leave some white spaces). Wait until the paint dries, then fill in the white spaces with the sides of crayons. Have the children make nighttime animals. They can be drawn or made from construction paper. Add a fence from construction paper. Bushes may be added. How can stars and the moon be added? To effect nighttime, shade over animals with the wide of a black or gray crayon.

NewScope

Hands-on Activities for Children

To help children understand the predator/prey relationship, put examples of predators and their prey on the chalkboard. Examples could include insects who are eaten by spiders, bats, frogs, and skunks, and even by other insects. You could also include the example of mice eaten by owls, rabbits eaten by foxes or grubs eaten by skunks. Often, the winner is the one who hears the other one coming first. Go to a large activity room or large carpeted area in your library. Two children are chosen, and must decide who will be the predator and who will be the prey. The prey is asked to hold a dry leaf or small twig which he must rustle or break during the hunt. (Crumpled up paper makes a good substitute for dry leaves.) The predator is blindfolded, and must try to locate the prey by the sounds it makes. As soon as the prey is caught, two new players are chosen. Set a time limit, and if the prey is not caught within the established time frame, the predator goes hungry! Observers of the hunt must remain extremely quiet.

Bats use *echolocation* to catch insects. When hunting insects, bats send out 20-30 calls per second. When they locate an insect, they increase the number of calls greatly to aid in the exact location of the insect. The echoes which come back let the bat know how close the insect is, how it moves, it's size, shape and even it's texture. Children can try this echolocation game indoors, if a large circle can be formed. (The technique may be used outdoors if it is very quiet.) Inside the circle, blindfold a student who will be the "bat." Three other students enter the circle as "moths." Two students are "trees." When the bat says, "Bat!" the moths immediately say, "Moth!" and the trees say, "Tree!" The bat and moths may move about in the circle. If the bat touches a moth, the moth must leave the circle. If the bat bumps into a tree, the bat is out. (Naturescope: "*Amazing Mammals, Part II.*")

Demonstrate how night animals might hunt by using their sense of smell. Select four students. Rub each students' hands with one of the following: sliced onion, crushed garlic, crushed evergreen needles, pepper, peppermint, oregano, sage, or any other pungent scent. Select four more students and rub each of those students' hands with one of the same scents as the first four students. Now these eight students must try to find the other person whose hands bear the same scent as their own. Repeat, until the entire class has participated. Might a keen sense of smell help a night creature find a meal or a mate?

Some animals use their sense of touch to hunt at night. In water, at night, raccoons feel for fish and grab them quickly. Close your eyes, and hold out both of your hands. Have someone place a ball, a peach or an apple in each of your hands. Now you must guess what object is in each hand. How did you know what each was? Try the experiment again using pieces of crackers, cookies, sticks or vegetables. How will you determine which items are food? How did you figure it out? Do the experiment again using a marble, a grape, a cherry tomato, or a mushroom. What senses did the students use to identify food? (Touch and smell.)

Predator Practice

Have the children run a 25 yard dash. Time their speed. Explain to the children that a cheetah can run that far (25 yards) in 1 second! Some predators run fast!

Have children flap their outstretched arms as fast as they can for 10 seconds. Explain that a little brown bat can flap it's wings over 100 times in 10 seconds! Some predators can fly fast.

The Great White shark is a large sea predator. Using a calculator, add the weight of each student. Total the weights and compare the total with 1,500 pounds—the weight of a Great White shark! Some predators are huge!

Have the children do a standing long jump. Compare the length of their jump to that of a cougar, who can jump 30 feet! Some predators can really jump!

Use this sheet to record observations for the night hike (see CHALLENGES). Have children visit the site during the day and record their observations on the chart. (Caution the children about taste.) Then record observations during the night hike. How are they different? How are they the same?

CREATIVE WRITING

Writing bat poetry may be a way for you to find out if students value bats. Small children may just make a simple statement. (Mister bat, I think you are nice to eat mosquitoes.) Older students may write Haiku. The top line has 5 syllables, the second has 7, and the third line again has 5 syllables.

Bats in the forests
Bats above the moonlit pond
Swooping for insects

Haiku is easy for children because expression of feelings is more important than the structural correctness. Haiku must be nature centered. Children may wish to illustrate their poetry.

Challenges

What actual night creatures can we observe on a night-time hike?

For a perfect ending to a study of night animals, take a nighttime hike and walk, sit and wait. Recruit parents to join you for the evening event. Where can you observe night creatures? (In a park, forest, arboretum, prairie, or desert.) What time of the year is best? (Anytime will be rewarding, but bats are best observed May through September, from approximately ten minutes prior to sunset until dark.)

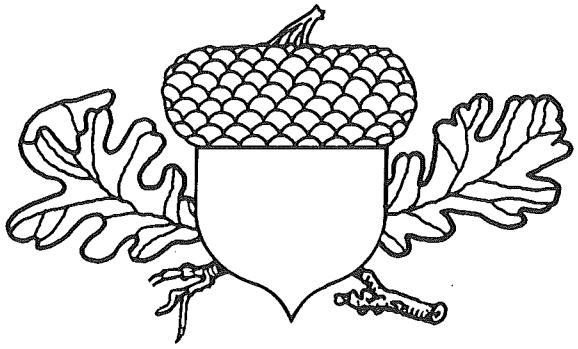
After choosing a site, visit it during the day to establish a point of interest, a trail, an owl evergreen, or open spaces for viewing the night sky. You may even be able to get a local naturalist to assist with your group's planning.

Review the four senses you'll be using during the hike. Refer back to what the little girl observed. Could you see the same things? (This will depend upon your local.) Go over plans with the children for the night hike. They will need to wear dark clothing. Remind them that their flashlight lenses will need to be covered with red plastic or red tissue paper. (Most animals cannot see red light.) Will they need to be quiet? Why? (So the animals will not become frightened.) Is it easier to be quiet in the dark? Why?

On the evening of the hike, rub yourselves with evergreen needles to help mask your scent. What outdoor smells might you notice?

After the trip, allow the children to share their observations, preferably together, in a large circle under the stars. How were their observations like the little girl's in the story? How were they different?

If a night hike as a class is not feasible, suggest a parent/child hike. Send a note home to parents explaining how and why to do a night hike. Allow the children who go on the hike to share their experiences later in class.



MINI IDEAS

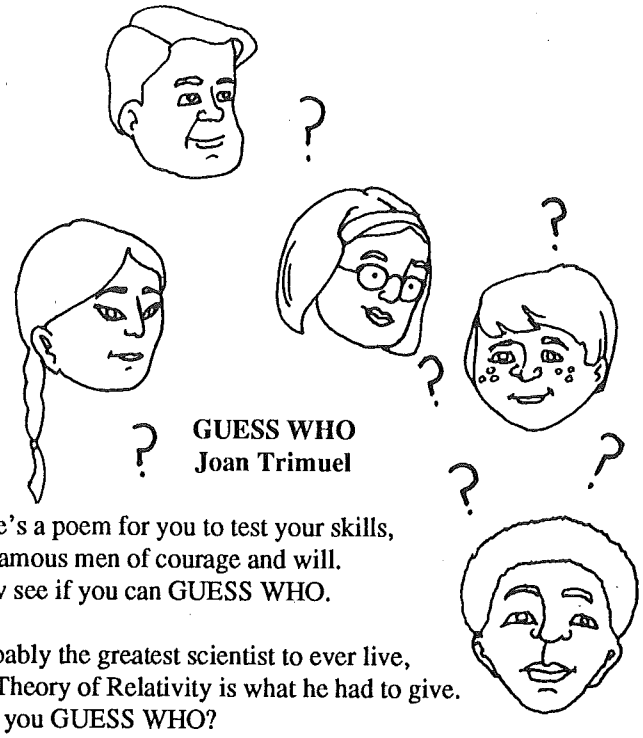
Vince Maccagnano
Bogan High School
3939 W. 79th Street
Chicago, IL 60652

Physics and the Humanities

During the third marking period of every school year, I have been assigning a written report. Until 1987, the students would be required to research a topic in the library. During the summer of 1987, I read an article in the Journal of Chemical Education. The author stated he assigned novels to his students. They were required to read the book and extract the chemistry from the story.

I decided to give this a try with a new twist. Instead of assigning specific novels for the students to read, I have my students write their own Physics poems or fairy tales depending on the level of the subject. The assignment allows the students to use their imagination and creativity. Within the poem or story, the student must correctly include physics concepts, theories, facts, etc. The assignment must be typewritten or on the word processor with a title. The poem must be a minimum of one page. The required length of the fairy tale is 2.5-3.5 pages in length. Illustrations may be included.

The success rate has been fantastic. Students seem to enjoy the assignment. The feedback I receive from them is, it is different and something they would not expect from a Physics class. The students are combining writing skills from English class with their scientific knowledge. The English Department enjoys reading the children's work. Last year, our Journalism instructor published one of my student's fairy tales in the school newspaper. One of this year's poems follows.



GUESS WHO
Joan Trimuel

Here's a poem for you to test your skills,
on famous men of courage and will.
Now see if you can GUESS WHO.

Probably the greatest scientist to ever live,
the Theory of Relativity is what he had to give.
Can you GUESS WHO?

He developed many electrical devices we use.
The light bulb and lamp are two we can't refuse to lose.
Can you GUESS WHO?

You might not know him from off the top of your head,
but think of the telephone instead.
He invented this dynamic creation,
so we all can receive important information.
Can you GUESS WHO?

Strain is directly proportional to stress is what he stated.
Now with this information sturdy beams can be created.
Can you GUESS WHO?

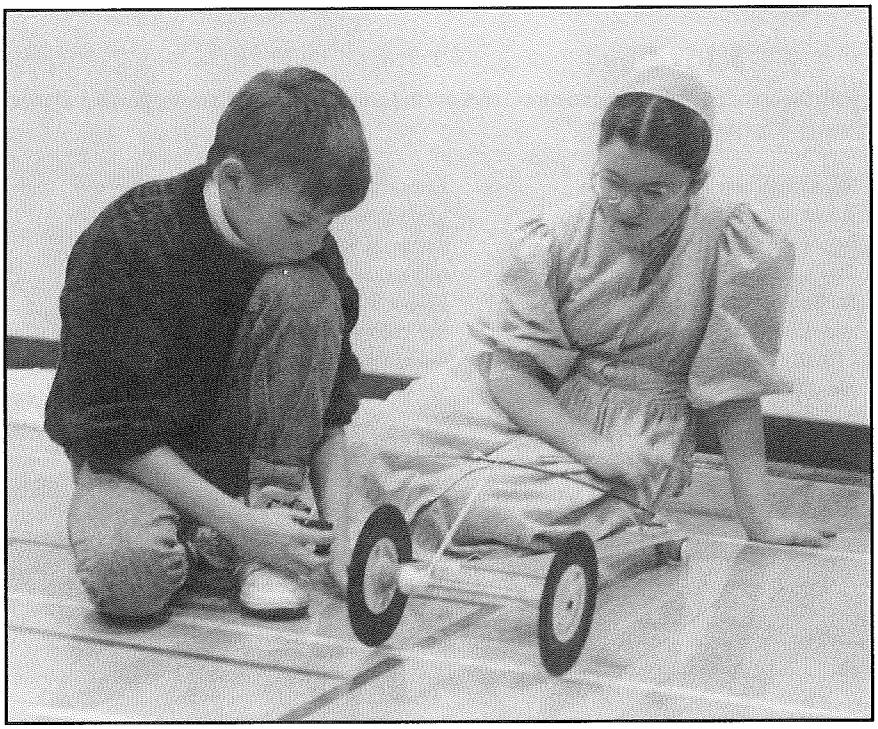
Isaac is his first name.
Laws of Motion were his claim to fame.
Can you GUESS WHO?

Conservation of Energy is what he demonstrated with Rumford.
But you may not know him with this clue,
so what you have to do is think of the unit work is measured in too.
Can you GUESS WHO?

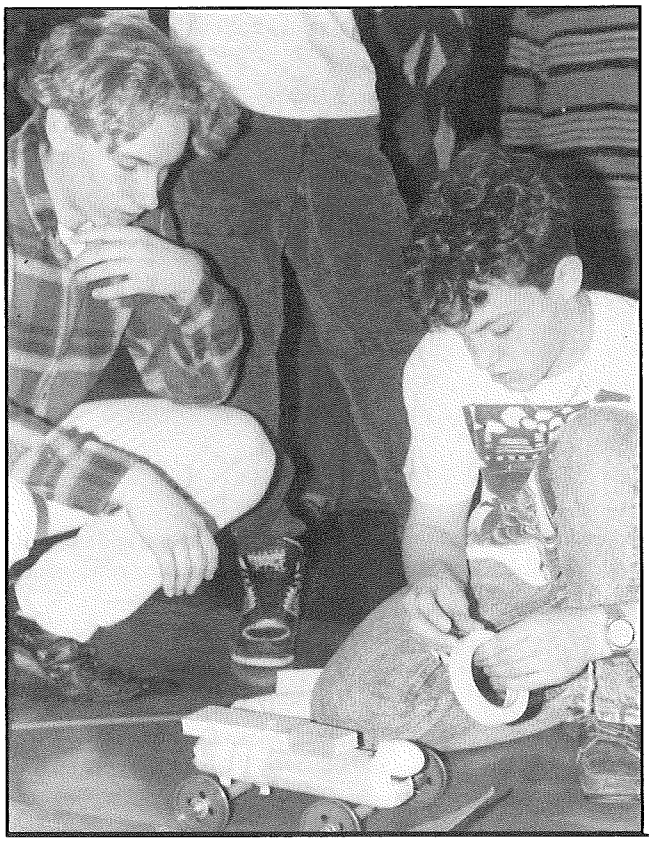
Steam engines are his game and because of this
a unit of measurement has his name.
Can you GUESS WHO?

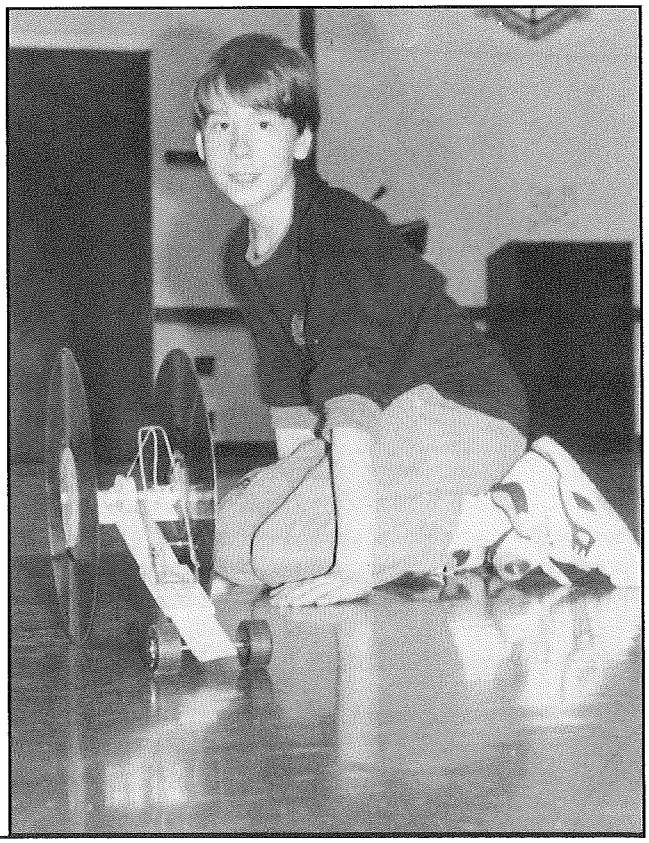
ANSWER KEY

ALBERT EINSTEIN
THOMAS A. EDISON
ALEXANDER G. BELL
ROBERT HOOKE
SIR ISAAC NEWTON
JAMES P. JOULE
JAMES WATT



1991 REGIONAL SCIENCE OLYMPIAD PARKLAND COLLEGE PHOTOS BY DAN POWERS





Kids Page

The treetops of tropical rain forests are crawling with thousands of different creatures. Identify the animals pictured here by placing a letter from the list below into the boxes inside the drawing. Then color it in!

A. My great big round eyes help me see in dim light as I search for my prey in the dark of the night.

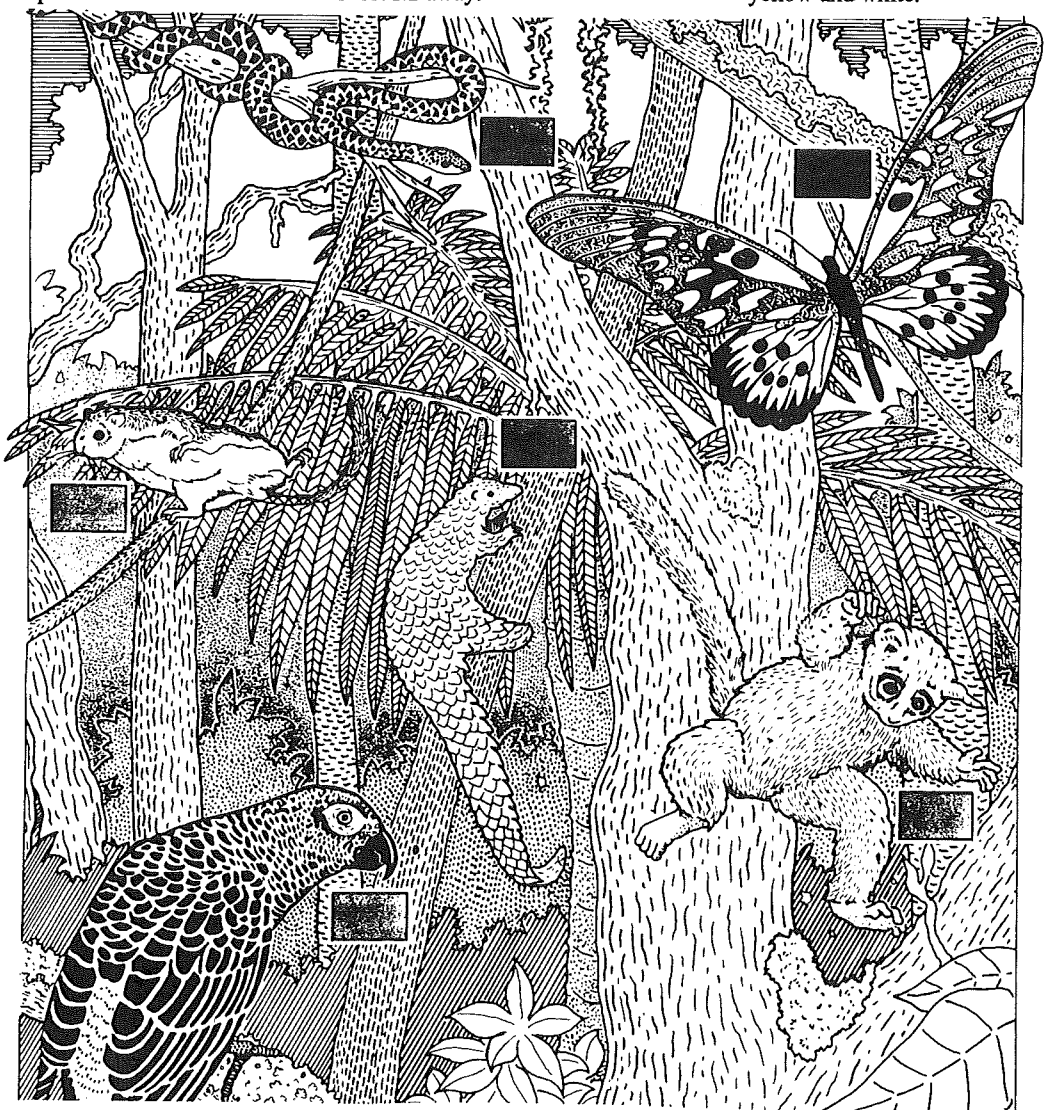
B. My long, scaly tail helps me grab hold of trees as I move here and there, wherever I please.

C. My shiny, black body can be 7 feet long. And my fangs inject prey with a poison that's strong.

D. I climb through the treetops and nibble all day, then I finally fly back to my roost far away.

E. Loose skin on my sides helps me glide through the air. I am active at night and I'm also quite rare.

F. I have 9-inch-wide wings and my colors are bright. I'm orange and black with some yellow and white.



The Chicago Academy of Sciences, founded in 1857, is dedicated to promoting scientific literacy through the exploration and study of the natural world. Nearly one million people are served by the Academy's exhibits, workshops, lectures, field trips, and educational outreach and teacher-training programs each year.

KEY

A. Dwarf Bush Baby
B. Long-tailed Pangolin
C. Gold's Tree Cobra
D. African Gray Parrot
E. Scaly Tailed Flying Squirrel
F. African Giant Swallowtail

For more information contact:

The Chicago Academy of Sciences
Carolyn Bresler
2001 North Clark Street
Chicago, Illinois 60614
312-943-7058

The Earth as a Peppercorn

Adapted from "The Thousand-Yard Model" by Dr. Guy Ottewell, Furman University, Greenville, South Carolina

While the planets appear to be starlike points of light, they actually range in size from tiny Pluto to giant Jupiter. To help your students compare the sizes and distances of the planets, prepare a scale model of the solar system:
Collect the following objects to represent the planets:

Sun	a ball, 8" diameter
Mercury	a pinhead, .03" diameter
Venus	a peppercorn, ".08" diameter
Earth	another peppercorn
Mars	another pinhead
Jupiter	a chestnut or pecan, .9" diameter
Saturn	a hazelnut, .7" diameter
Uranus	a coffee bean, .3" diameter
Neptune	another coffee bean
Pluto	another pinhead, smaller if possible

Now, lay the planets out on a table and compare the sizes. The Earth may look impressive next to Mercury, but it's certainly puny next to Jupiter and looks pretty unimpressive next to the Sun. To prevent the planets from getting lost, affix each to a piece of cardboard.

Since the Sun's diameter is 800,000 miles, our scale is 1 inch/100,000 miles. Since the distance from the Sun to the Earth is 93,000,000 miles, a scale model of our solar system places the Earth 26 yards away from the Sun. To lay out the entire solar system (Sun-Pluto distance is over 3,600,000,000 miles) you'll need a distance of 1,019 yards, over 1/2 mile. (Note: we're using Pluto's mean distance. Until 1999, Pluto is actually closer to the Sun than Neptune.)

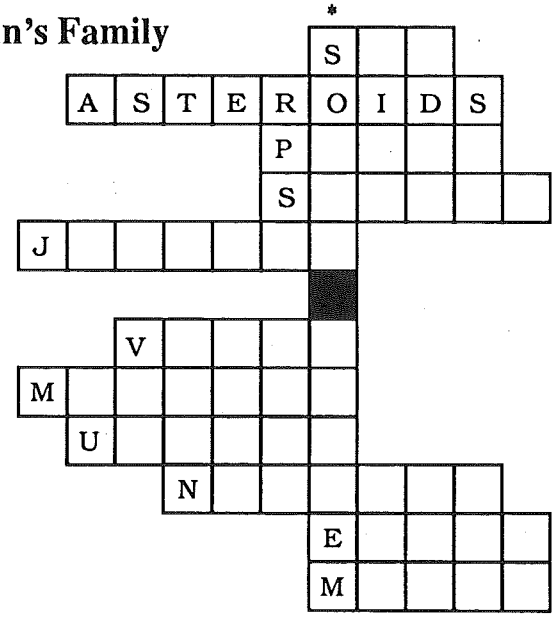
To lay out the solar system, assign a student to each planet. With the class, pace off the distances at one pace per yard:

Sun to Mercury	10
Mercury to Venus	9
Venus to Earth	7
Earth to Mars	14
Mars to Jupiter	9
Jupiter to Saturn	112
Saturn to Uranus	249
Uranus to Neptune	281
Neptune to Pluto	242
	1019 paces

Want to learn more? We highly recommend "The Thousand-Year Model" by Guy Ottewell, a 15-page booklet expanding "The Earth as a Peppercorn" activity. Includes photos, follow-up activities, plus lots of interesting tips for presenting planetary scale, spacing and orbits. Send $5.00 payable to the Astronomical Workshop, Furman University, Greenville, SC 29613; 803/294-2208

ELEMENTARY SCIENCE NEWSLETTER
Southern Illinois University at Edwardsville
Box 1122, Dep't of Curriculum & Instruction
Edwardsville, IL 62026-1122
c/o Dr. Robert Williams

The Sun's Family



WORD BOX

Asteroids	Earth
Jupiter	Mars
Mercury	Neptune
Pluto	Saturn
Sun	Uranus
Venus	

Fill in the boxes above with the names of our Sun's family. Read down from the * to discover another name for the Sun and the nine planets. Write in on the lineat right.

AWARDS AND RECOGNITION

Gwen Pollack, State Chairperson
401 S. Cass
Virginia, IL 62691

1991 Presidential Awards for Excellence in Secondary Science Teaching

The Presidential Awards for Excellence in Science and Mathematics Teaching is a program which seeks to recognize and award outstanding public and private teachers of elementary, junior/middle school and secondary science and mathematics. It is administered for the White House by the NSF. Professional organizations cooperating in the program are the NSTA, NCTM, AAPT, ACE, AGI, CSSS, FASEB, MAA, NABT, NAGT and NESTA. The program is also supported by the National Academy of Sciences.

The award, which is made to four teachers from each state, the District of Columbia, and Puerto Rico, includes a $7,500 NSF grant to the awardees' schools to be spent under the awardees' direction over a two-year period to improve school mathematics and science programs, an all expense-paid trip for the awardees and guests to Washington, D.C., and many generous gifts to the awardees and their schools from donors in the private sector. There were three nominees chosen to represent Illinois from each of the four fields: elementary science, elementary math, secondary science, secondary math.

During late January and early February nomination forms were circulated throughout the state. To be considered for the science award, nominees had to meet the following criteria for secondary science application:

1. **Five or more years of teaching science**
2. **Teach science at least halftime during the current year assignment at the middle/junior or senior high school level. (Teachers currently on sabbatical were eligible if they fit the criteria last year.)**

About 150 secondary nominations were received by the Illinois Secondary Selection committee chairperson and were mailed nomination packets. In addition to providing educational and professional background information and letters of recommendation, candidates were asked to write essays on what is personally considered the most important things students should learn in their school science experiences and what changes should be made in science education, personally and professionally. They were also asked to describe one of their most successful original or adapted units, including evidence of student work, photographs, etc.

About 50 nominees completed and returned the application packet. The secondary selection committee which was composed of science educators and scientists with a variety of backgrounds who rated the candidates in five areas: 1) background and experience, 2) understanding of how students learn science, 3) evidence of classroom success, 4) current thinking in the field, 5) letters of support addressing the teacher's effectiveness. The quality of the nomination packets was overwhelming and the selection of awardees was unbelievably difficult and exciting.

Three National Finalists were selected to be forwarded to the National Selection Committee. The National Selection Committee will announce the Illinois secondary and elementary winners in September. Three additional teachers have been selected as ISTA Award of Excellence winners and four additional teachers will receive Honorable Mention awards.

Congratulations to these outstanding science teachers and the other fine nominees!

NATIONAL Presidential Award of Excellence Nominees:

Michael Offutt
Barrington High School
(Honors Chemistry)
616 West Main
Barrington, IL 60010

Robert Grimm
Wm. Fremd HS (Physics)
1000 S. Quentin Rd.
Palatine, IL 60067

John Baird
Quincy Sr. HS (Physics)
3322 Maine
Quincy, IL 62301

Illinois Award of Excellence Winners:

David S. Goodspeed—6th—8th grade Science
Marie Murphy School
2921 Illinois Rd.
Wilmette, IL 60091

Vivian Crawford—7-8th grade science
Hufford JHS
1125 N. Larkin
Joliet, IL 60435

Brian Poelker—Earth Science
Forman JHS
350 Southmoor St.
Manito, IL 61546

Illinois Award of Excellence Honorable Mention:

James H. Stankevitz—Physics
Marist HS
4200 W. 115th St.
Chicago, IL 60655

Joy Ward—7th grade science
Hope Community Academy
5515 S. Lowe Ave.
Chicago, IL 60621

Roxanne Pettus—Chemistry
Glenbard West HS
670 Crescent Blvd.
Glen Ellyn, IL 60137

Gene T. Kunz—7-8th grade science
Roxana JHS
401 Chaffer Ave.
Roxana, IL 62084

Elementary Division 1991 NATIONAL Presidential Award Finalists

Sylvia Gilbert
Edward Kennedy "Duke" Ellington Branch

Van De Walle, Carol A.
Alwood Elementary School

Morkin, Sharon
Oakland School

1991 Presidential Award State Finalists

Marlene Gregor,
Westview School

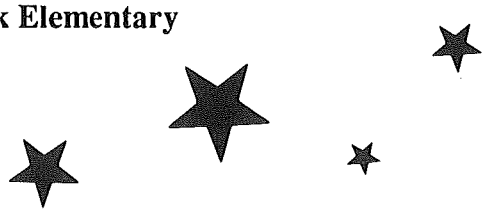
Patricia A. Ross
Cooke Magnet School

Elizabeth Minnaert
Husmann Elementary
Iris Solal
Rogers Elementary School

John A. Rigby,
Clay Street Elementary

Rebecca Keim,
Lalumier School

Carolyn C. Smith,
Reddick Elementary



Request forms for Nominations will be available at the SPECTRUM booth at the ISTA Convention this fall. Or, you can contact Gwen Pollack at the above address after October 1st.

Four Illinois Entries are Take Pride in America National Winners

Four Illinois entries are among 119 top winners selected in the fifth annual Take Pride in America National Awards Program, Governor Jim Edgar recently announced.

Take Pride in America is a national campaign to increase awareness of the need for wise use of the nation's natural and cultural resources, encourage an attitude of stewardship and responsibility toward public resources, and promote volunteerism.A blue ribbon panel of judges, headed by Vice President Dan Quayle, selected the 119 national winners from among 288 finalists. Nearly 800 groups and individuals were nominated for consideration in the 1990 national awards program. In the program's four previous years, Illinois has had seven nominees selected as national winners.

"These individuals and organizations have unselfishly given their time to become involved and to volunteer," the Governor said. "I congratulate them. I hope their efforts inspire others to undertake similar projects in their hometowns."

Conservation Director Brent Manning said the four winners typify the spirit of awareness behind the Take Pride in America campaign. "They took the time to become involved, and the state's public resources are better off because of that involvement," Manning said.

The Illinois winners are: Project PEOPLE, Prospect Heights; Friends of the Fox River Inc., Elgin; ORSANCO (Ohio River Sanitation Commission)/Illinois Environmental Protection Agency, Springfield; and Marie and Joseph Grieser, Washington, Ill. The four will be honored during awards ceremonies in Washington, D.C., in July.

Manning said Project PEOPLE (People Educating Other People for a Long-lasting Environment) was selected for its grassroots environmental education campaign. Conceived and implemented by Diana Feingold's sixth grade class at River Trails Junior High School, the public awareness program encourages individuals and businesses to recycle, to avoid using nonrecyclable materials, to conserve natural resources, and to recruit others to do the same.

He said the constituent organization Friends of the Fox River was recognized for creating a volunteer water quality monitoring program. More than 450 citizens, including teachers, students and members of organizations, are directly involved in identifying and tracking sources of pollution in the water they use. In addition to monitoring water quality, the program also is geared toward protecting biological diversity and scenic beauty along the Fox River.

Manning said a state government entry, ORSANCO/Illinois EPA, was chosen for being part of a one-day riverbank cleanup of the Ohio River. Nearly 600 Illinois volunteers collected and disposed of more than 500 tons of trash along the 133 miles of Ohio River shoreline located in Illinois. The project was part of a multi-state effort encompassing the river's entire length, from Pittsburgh, Penn., to Cairo.

Manning said Marie and Joseph A. Grieser were recognized for providing voluntary patrolling and watching services to federal Farm Creek flood control lands in Tazewell County. As sworn law enforcement officers, they've discouraged use by groups whose activities contribute to wildlife disturbance, littering and soil erosion. At the same time, they've educated youth groups and supervised public service groups in helping establish hiking, horseback riding, cross-country skiing and nature observing at the 670-acre site. The Griesers have volunteered their patrol/watch services since 1984.

Manning invited individuals, organizations and groups to participate in the 1991 Take Pride in America campaign by conducting their own stewardship or awareness programs on behalf of public resources. Informational kits explaining the program are available from the Department of Conservation, Office of Public Information, 524 S. Second St., Springfield, Ill. 62701-1787, phone (217)782-7454.

Announcing a Search for Illinois' Outstanding High School Physics Teacher

The search is on for the 1992 Illinois Outstanding High School Physics Teacher of the Year. This award, sponsored by the Illinois Section of the American Association of Physics Teachers, is given annually to recognize the efforts of one outstanding High School Physics Teacher.

Do you know this person? We would like to hear about him or her. Please send a brief letter of nomination to the following address. This is your chance to help bring recognition to a colleague who places a high value on the physics education of Illinois students.

Send Letters of Nomination **POSTMARKED BY DECEMBER 21ST** to:

Robert D. Grimm
ISAAPT Awards Committee Chairman
814 South Dunton Avenue
Arlington Heights, IL 60004

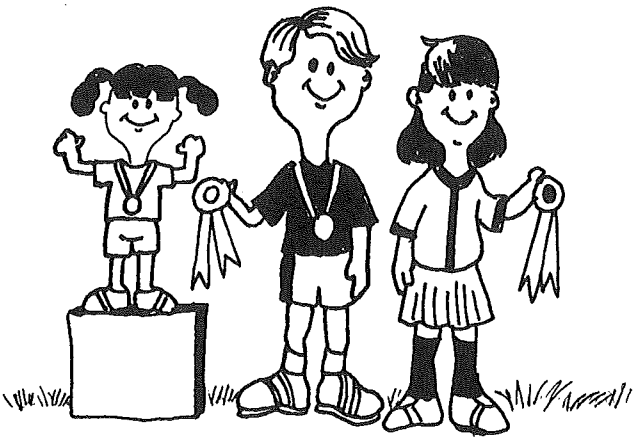
Illinois Section American Association of Physics Teachers

James Hicks of Barrington High School, Barrington, Illinois was recently named as Outstanding High School Physics Teacher by the Illinois Section of the American Association of Physics Teachers. The award has been presented annually since 1981 to an Illinois high school physics teacher.

The ISAAPT is comprised of physics teachers from secondary schools thru universities, and is an affiliate of the national American Association of Physics Teachers.

Danville Teacher Receives Science Honor

Cheryl Eagles of St. Paul School has received the Muriel Green Award for Oustanding New Teachers of Elementary Science. The award is given annually to teachers in the first five years of teaching or students majoring in elementary education, by the Council for Elementary Science International. Cheryl is also a participant in the Honors Project for Outstanding Teachers of Science at Illinois State University



NABT
(National Association of Biology Teachers)
OBTA
(Outstanding Biology Teacher Award)
1990-91

Sherry Yarema
Naperville Central High School
440 Aurora Avenue
Naperville, IL 60540

In addition to being recognized as the 1990-91 OBTA from Illinois, Mrs. Yarema's credentials include the following:

NABT Chicago 1988 Convention - Local Arrangements Committee
Naperville Unit District 203 - Strategic Planning Task Force - Substance Abuse Reduction
Fermilab Summer Science Institute Staff, Biology and Acting Institute Director
Illinois Association of Biology Teachers: President, Board, Secretary
Cook County School District 102, Substance Abuse Curriculum co-author
Wheaton/Glen Ellyn Branch - American Association of University Women
St. Olaf College Honor Scholarship
University of Colorado - DuPont Scholarship
Mt. Holyoke College, NSF, Women in Science
Cold Spring Harbor Recombinant DNA Workshop - Argonne Nat. Laboratory
IJAS State Science Fair Judge
Consultant for Fermilab program - New Explorers series - Bill Kurtis, 1990
Illinois Prairie Conference - 1991
Naperville Central Biology Curriculum Workshop
Scholastic Bowl Team Coach

If you would like applications for the 1991-92 OBTA Award from Illinois, contact:

Mrs. JoAnne Edwards
OBTA Illinois State Chairman
Wheeling High School
Math/Science Division
900 S. Elmhurst Rd.
Wheeling, IL 60090

After November 15, 1991. The deadline for receiving applications is March 15, 1992.

OPPORTUNITIES

IMSA

IMPACT II

The 1991 Catalog of Teaching Ideas written by Illinois Mathematics and Science Teachers will be distributed in October (hopefully in time for the ISTA State Conference). In addition to lessons from the IMPACT II teachers, the catalog contains a form which enables any K-12 teacher to apply for a $200.00 Adaptor Grant. If you see an idea in the catalog that you would like to try in your classroom, contact the disseminating teacher, complete the application and mail it to the Illinois Mathematics and Science Academy by December 15. About the middle of December, your school should receive a Disseminator Grant ($500.00 - $2,500.00) application brochure. These grants are for individual teachers and/or teams of teachers who have creative and innovative teaching ideas in mathematics and/or science. For further information or to receive either or both applications, contact: Ann Hanson, IMPACT II Coordinator, Illinois Mathematics and Science Academy, Office of the Alliance, 1500 W. Sullivan Road, Aurora, IL 60506, (708) 801-6101.

The Lincoln Park Zoological Society
2200 North Cannon Drive
Chicago, IL 60614

ANIMAL CRACKERS

Volunteers lead children aged 5-7 in fun, lively activites about how animalds live and survive. Voluteer training in the handling of small animls is provided in addition to wildlife classes.

Weekday positions are available
Late September - May, 3:00 -5:00 pm.
Call Volunteer Office at 312-294-4676

ZOOTRITION

Volunteers lead children aged 5-12 in fun, fast-paced activites about farm food and nutrition. They milk goats, grow lettuce, play grain games, show how much sugar is in soda pop, and make nutritious snacks to take home.
On the job training, including the handling of the goats is provided by staff and experienced volunteers.

Tuesday, Wednesday and Thursday positions available.
Late September until mid-May
3:00 or 3:30 until 5:00 pm.
Commitment is one day per week, every week except holidays. Call Mary Plunkett 312-294-7807

Conservation Foundation of DuPage County

The Education Committee of the Conservation Foundation of DuPage County is involved in the West Branch Projec. The purposeof this project is to preserve, restore, and enhance the West Branch, DuPage River. In doing so, it can provide a lot of environmental encounters and first hand experience for students in the schools that participate.Those interested in being a part of the project should contact Brook McDonald at (708) 665-5534. If interested in the EE Committee of the Conservation Foundation, contact Ben Heaton, Chairman, at (708) 682-3505.

The Grand Prairie Friends of Illinois is a new group formed in Central Illinois. They now publish a newsletter and are sponsoriing the Third Central Illinois PrairIe Conference in conjunction with the Eastern Illinois University Department of Botany. The conference will be held in Charleston on September 28 and 29, 1991. Contact Professor John Ebinger at (217)581-3525 or Mary Hruska at (217)398-2768 for information on the conference.
To become a volunteer or for more information about the the Grand Prairie Friends of Illinois, call Carolyn Groves at (217)352-9313 or writeNewsletter c/o 1214 W. Church Champaign, IL 61821

Earth Day Chicago

Earth Day Chicago was developed from the managing organization organized in 1990 to make a big event out of the 20th Anniversary of Earth Day. It has now organized (and is seeking members) as a Chicago area environmental education group and it is going strong. They have pulled together a staff, and office, a Chicago Area Resource Directory, a schedule of events, teaching activities, and a wide range of promotional items.

For more information, contact them at: Earth Day Chicago, 28 E. Jackson, #605A, Chicago, IL 60604, (312) 408-0444. An individual membership is $20 per year.

MEETINGS AND CONFERENCES

Roger E. Malcolm
Section Reporter
Kewanee High School
1101 E. Third St.
Kewanee, IL 61443

Report of the Illinois Section Spring Meeting

The Illinois Section of the American Association of Physics Teachers met on April 19 and 20, 1991 at Southern Illinois University at Edwardsville. After the Friday evening banquet, Dr. Neil Ruggieri, McDonnell-Douglas Corporation, Laser Division, spoke on the "Use and Development of Commercial Lasers."

The guest speaker of the Saturday morning session was Paul Hewitt of San Francisco State College. The meeting was topped off by a Demonstration Shoot-out given by the Greater St. Louis Physics Teacher Alliance and the Chicago Section High School Physics Teachers. The clear winners of the demonstration challenge were the audience who saw many innovative demonstrations presented.

The fall meeting will be held October 18 & 19, 1991 at the University of Illinois at Chicago as a joint meeting with the Chicago section and the Illinois Academy of Sciences.

Fall ILEED Workshops Scheduled

ILEED, the Illinois Energy Education Development Project, will offer free one-day workshops throughout the state in the fall to introduce teachers and students to the program and the activities.

Throughout the day, you and your students—usually three or four students accompany each teacher—will have the opportunity to learn about energy by participating in a variety of activities such as Great Energy Rock Performances, Energy Carnival and Jeopardy. You will also be taught how to organize energy education programs in your school.

Teachers, you will have the opportunity to watch your students as they enjoy learning. An energy education poll is given both before and after the workshop. Results of the post-poll have shown an increase in energy knowledge of up to 40%.

Most of this year's workshops will be held in October—National Energy Awareness Month. To register for the workshop nearest you or to learn more about ILEED, please call the Illinois Department of Energy and Natural Resources' Information Clearinghouse toll free at 800-252-8955.

Remember, the workshops have been developed to provide activities for both teachers and students. The schedule is as follows:

October 8, 1991	Kane County School District 301 Central Middle School 44W303 Plato Road Burlington, IL
October 9, 1991	Quincy Holidome Quincy, IL
October 10, 1991	Sangamon State University Banquet Rooms C & D Springfield, IL
October 11, 1991	Lake County Educational Service Center 19525 W. Washington Grayslake, IL
October 16, 1991	Southern Illinois University Red Bud and Oak Rooms Edwardsville, IL
October 17, 1991	Rend Lake College (Ina, IL) Theater Mt. Vernon, IL
October 19, 1991	Board of Education 1819 S. Pershing Road Chicago, IL
October 21, 1991	Eastern Illinois University Arcola and Tuscola Rooms Charleston, IL
October 22, 1991	Olivet Nazarene University 240 E. Marsile Bourbonnais, IL
October 23, 1991	The Cornerstone Building 321 N. E. Madison Peoria, IL
October 24, 1991	Rockford Park District Riverview Ice House 324 N. Madison Rockford, IL
November 7, 1991	Niles College 7135 Harlem Ave. Niles, IL

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 Article: _____

I have a good idea or contribution for:

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

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 but we regret we are unable to use color pictures.

ISTA REGIONS

REGION II
Karen Meyer
Thomas Jefferson School
1307 West 4th St.
Milan, Il 61264
(309)793-5985

Don Nelson
Lincoln School
21st Street and 7th Avenue
Rock Island, IL 61201
(309) 793-5970

REGION III
Gail L. Truho
Rolling Acres Middle School
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 V
Sharon Travous
Alta Sita School
26th and Bond Avenue
East St. Louis, IL 62205
(618)583-8438

Rion D. Turley
O'Fallon Twsp. High School
600 S. Smiley St.
(618)632-3507

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

Rose West,
Huth Upper Grade Center
2718 West 213th Place
Matteson, IL 60443
(708) 748-0470

REGION IV
Marilyn Sinclair
Franklin Science Center
817 N. Harris
Champaign, Il 61821
(217)351-3709

Anthony Brieler
Clinton Jr. High School
401 N. Center
Clinton, IL 61727
(217) 935-2103

REGION VI
Julia D. Faro
Carbondale Comm High-East
1301 E. Walnut
Carbondale, Il 62901
(618)457-3378

Max A. Reed
Hutsonville High School
West Clover St.
Hutsonville, Il 62433
(618)563-4913

Listing of Counties Comprising Each ISTA Region

Region I	McHenry, Lake, Kane, Cook, DuPage, Kendall, Will, Grundy, Kankakee
Region II	Jo Daviess, Stephenson, Winnebago, Boone, Carroll, Ogle, DeKalb, Whiteside, Lee, Rock Island, Henry, Bureau, LaSalle, Rutnam, Marshall
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

MEMBERSHIP APPLICATION

NAME _____
LAST FIRST

DATE _____ REGION (SEE MAP) _____

HOME ADDRESS _____
STREET APT. NO.

_____
CITY STATE ZIPCODE

EMPLOYER ADDRESS _____
STREET

_____
CITY STATE ZIPCODE

(HOME ADDRESS WILL BE USED UNLESS OTHERWISE SPECIFIED)

PROFESSIONAL ASSIGNMENT ELEMENTARY _____ JUNIOR HIGH _____ HIGH SCHOOL _____
COLLEGE _____ OTHER _____

REGULAR MEMBERSHIP **$20.00**
ASSOCIATE MEMBERSHIP (RETIREES AND STUDENTS) **$10.00**

SEND FORM WITH CHECK OR MONEY ORDER TO:

GEORGE ZAHROBSKY
MEMBERSHIP CHAIR
GLENBARD WEST H. S.
670 CRESCENT BLVD.
GLEN ELLYN, IL 60137

ISTA SPECTRUM
UNIVERSITY OF ILLINOIS
COLLEGE OF EDUCATION
1310 S. SIXTH STREET
CHAMPAIGN, IL 61820

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DUES TO 9/91
GARY BUTLER
22 HYDE PARK
SPRINGFIELD IL 62703

FALL 1991