SPECTRUM

THE JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION

Good

Is...

Attending the 1999 Illinois Science Teachers Convention

Springfield
October 1-2, 1999

Preconference
September 30

FALL 1999

SPECTRUM

JOURNAL OF THE
ILLINOIS SCIENCE TEACHERS ASSOCIATION
Volume 25, Number 2, 1999

SPECTRUM is published three times per year, in April, August, and December by the Illinois Science Teachers Association, University of Illinois, College of Education, 1310 S. Sixth Street, Champaign, IL 61820. Subscription rates are listed on page 48.

Send submissions, subscriptions, and inquiries regarding the journal to:
Diana Dummitt
ISTA Executive Director
University of Illinois
College of Education
1310 South Sixth St.
Champaign, IL 61820
(217) 244-0173 (217) 244-5437 FAX
e-mail: ddummitt@uiuc.edu

The Illinois Science Teachers Association (ISTA) is a state chapter of the National Science Teachers Association, 1840 Wilson Boulevard, Arlington, VA 22201-3000.

Typist: University of Illinois
College of Education
Word Processing Center

Printer: East Central Communications, Inc., Rantoul, IL

Cover: 1999 ISTA Convention Logo designed by Kendra Pamenter, Springfield District 186

ISTA NEWS

FALL PRESIDENT'S LETTER: A THEORY OF 'EVOLVING' CREATIONISTS

Like many of you, I was surprised to hear that, according to the State Board of Education, evolution no longer exists in Kansas. On a 6 to 4 vote, the Board has stricken any questions regarding evolution from state-mandated student assessments. Does this mean that evolution will no longer be taught in Kansas? No, but it does send a chilling message to science educators and scientifically literate citizens, not only in Kansas, but throughout the nation. Kansas State Board Member Scott Hill suggests that this action will "improve science education in Kansas" by fighting back against teachers who "glorify evolution as dogmatic fact." Make no mistake about it, Mr. Hill's point of view has nothing to do with science, but a whole lot to do with power and control. As Roger Welsch (see reading list below) has suggested, the creationist agenda for public education is not about their own children, its about inflicting their will on the children of others.

The pressure to set aside evolution as one of the unifying theories of biology is hardly new. From outlawing evolution (optimized by the infamous Scopes Monkey Trial in Tennessee in 1925) to efforts in Louisiana and Arkansas to mandate "creation science" (now there's an oxymoron), creationists have attempted to impose their particular religious perspective as science in the public schools. With each legal defeat, new approaches (including the Kansas strategy) have "evolved" in a continuing effort to push their agenda.

Events such as the Kansas decision do provide opportunities for science educators to consider again our understanding of science and our approach to science teaching. Teachers often feel unprepared to deal with students, parents, administrators or board members who challenge the teaching of evolution. Under those circumstances, it is tempting to take the path of least resistance and to avoid controversy. However, I believe that it is the nature of science that provides our best defense to such attacks.

Part of the problem is derived from our definition of theory. In an everyday sense "theory" has become synonymous with "opinion." We frequently hear someone say, "I have a theory about..." Scientific theories are not opinions. They are statements that provide explanations for the way the world works, statements that are supported by evidence collected over time. By their very nature, however, they are tentative. That is, scientific theories are subject to change as more evidence accumulates. (Ironically, new evidence published last week has "tentatively" pushed the age of life on earth back by a billion years!) Scientifically literate citizens not only understand that scientific theory is fluid...they value that perspective.

Creationists seize on this strength as a weakness. They suggest that because scientific knowledge changes over time, it has little merit. This attitude reveals a serious misinterpretation of science as a way of knowing about the world. Science by its very nature is non-authoritarian. Literal religious explanations, on the other hand, rely on the authority of leaders and documents. This literalist perspective rejects the theory of evolution as contrary to the teaching of such authorities. (Mr. Hill's characterization of evolutionists as "dogmatic" is interesting considering the term implies "belief in doctrine authoritatively affirmed").

The bottom line is not that a scientific theory, such as evolution, is superior to a religious explanation of phenomena. Rather that evolution is a scientific interpretation of reality and therefore appropriate for the science classroom. As ISTA's position statement on evolution suggests, "The exclusion of religious explanations from science class does not amount to telling students that they should not maintain those beliefs--only that those beliefs do not qualify as science."

There is little likelihood that we will move Mr. Hill and others who hold his views by our eloquence and our logic, that's all right. We are, however, obligated to provide our students with an understanding of science that both informs them today and motivates them to search for more information tomorrow.

Some Additional "Food for Thought"

I want to thank our ISTA members (Mike, Melanie, Carl, Janice, Jerry, Jim, Barbara, et al) who have batted this issue back and forth on ISTA's listserv, ISTA-talk. If you are not a current subscriber, why not join the conversation? ISTA's web page, ISTA-il.org, tells you how to sign up. ISTA's position paper on evolution is also available at our page. Also NSTA's web page, www.nsta.org does include several relevant items; a press release (nsta.org/pressrel/evolution.htm) and NSTA's position statement (nsta.org/handbook/evolve.htm).

To build your own knowledge base on evolution, take a look at www.talkorigins.org. "Evolution is a Fact and a Theory" by Larry Moran is especially useful to consider. NSTA's *Pathways to the Science Standards* (secondary edition, p. 96) has an excellent discussion on how evolution can be presented effectively and sensitively in the classroom. For thought provoking consideration of the Skopes Monkey Trial, read Roger Welsch's "Monkey Business" in Natural History magazine. Also from Natural History, see Stephen Jay Gould's "Genesis and Geology" (September 1988). Gould has also written an interesting piece on the current Kansas story ("Dorothy, It's Really Oz") in August 23rd issue of Time magazine.

Don Nelson

SCIENCE
ISTA 1999 •

PRAIRIE CAPITOL CONVENTION CENTER
SPRINGFIELD, ILLINOIS
OCTOBER 1-2, 1999

Do you consider yourself to be a professional teacher? Would you like to improve your teaching techniques? Would like to learn all about the new initiatives in the State of Illinois such as the new requirements for recertification and the ISAT? Are you ready to try new ways of teaching but need some encouragement and ideas? Is your district deciding on textbooks and you wish you could preview them and talk to other teachers and company reps?
If you answered YES to any of these questions, you need to join the nearly 2,000 teachers and administrators who will be attending this year's ISTA convention. Here are some reasons why:

• Thursday Leadership Pre-conference on Technology
"Build Your Learning Community: Teams, Themes and Technology Integration," presented by Diana Moon from Apple. Attend a variety of breakout sessions for all K-12 teachers, curriculum supervisors and administrators.

• A special strand of ISTA-sponsored workshops
Join us for the Friday luncheon with our very special speaker, State Superintendent of Education, Glenn W. McGee. We have invited other experts to train on ISAT, Technological Design, Implementing the Science Learning Standards, the latest information on Recertification from ISBE, Assessment, and many other timely topics. Don't miss this one-time opportunity to ask questions and get answers from those who really know.

• Entertaining Speakers
An excellent keynote presentation by Leon Lederman, Director Emeritus of Fermi National Accelerator Laboratory and winner of the 1988 Nobel Prize in Physics is scheduled for Friday morning. Nationally recognized science educator Ronald Bonnstetter will present Saturday on Models of Inquiry.

• Packed Exhibit Area
Over 140 booths and special exhibits in the exhibit area, full of scientific teaching materials, the latest in technology, new science teaching equipment, textbooks, audiovisual aids, lab equipment, computer programs, supplementary materials, and other services and facilities to help make teaching and learning more effective.

Although the deadline for advance registration is September 20th you can easily register onsite by filling out the preregistration form and bringing it with you to Springfield!

• State Agencies Room
Dozens of agencies have lined up a wide array of free materials for you to take home. You won't want to miss it! Here are some of the agencies:

DNR global climate change	Lily Ruan
ISM State Museum	Beth Shea
DNR PLAN IT-EARTH	Chuck Wheeler/Tracy Satterthwaite
DNR--Groundwater	Harry Hendrickson
SIUE--Rivers Project	Bob Williams
DNR Educational Services	Randi Wiseman
USGS Water Education	Kelly Warner
ISWS Water Science	Mark Peden
DNR Urban Fishing	Brenda Harris, Rol Steinhauser
DNR Forestry	Dick Little
UICES Secret Agent Worm Books	Doug Peterson
DNR Internet and Web Demonstations	Lori Myers
DNR GIS Computer mapping	Sheryl Oliver et al
DNR--C2000	Tammy Watson
IEPA (3 spaces) ozone, lakes, ee	Janet Hawes-Davis
DNR-Natural History Survey	Michael Jeffords
IDOT--Highway Science	Barb Welk
IDPH--groundwater protection	Jerry Dalsin
IDPH--lead awareness	Stephanie Tharp
IDPH--STD/HIV/AIDS prevention	Jamie Burns
IDNS--Radon	Pattie Thompson
NRCS--Soil Science	Paige Mitchell-Buck
DNR-ISGS—Geology Maps	Wayne Frankie, et al,
DNR-ECOWATCH—Citizen monitoring	Dana Curtiss, et al
IDOA--Soil and Water Conservation	Rich Nichols
IDOA--Water Resources Protection	Mark Werth
IDPH--Fish Contamination Advisory Program	Tiffanie Saxer
IDPH--Division of Laboratories	Mary Ellen Sronce
ISP--Forensic Science	Barb Freesen
IDPH--Immunization Program	Carol Gibson Finley
Zoo Educators--Survey of Science Teachers	Troy Gilmore
USEPA--Waste, Pesticides, & Toxics Division	Jonnie Wilson

• Over 130 Workshops on Every Science-related Topic Free to Registered attendees Including:

CHECK OUR WEBSITE FOR THE LATEST INFORMATION
http://www.ista-il.org

• **Illinois Science Olympiad**
13 workshops — Reach for the Stars, Mystery Architecture, Water Quality, Experimental Design, ISO for Elementary Schools, Amphibians and Reptiles, Metric Mastery, Building a Science Olympiad Team, Battery Buggy, Towers and Bridges, Road Scholars, and Disease Detectives. **Free student manuals will be provided.**

• **Ron Bonnstetter and the NERDS (Nebraska Science Educators Really Doing Science)**
Build and Launch your own Two-Liter Pop Bottle Rockets. Meet at the front entrance to the Renaissance Hotel to walk to Lincoln School field.

• **People, Animals, and the Environment**
Join the I-DNR staff in an all-day simulation game workshop, either Friday or Saturday. You will receive a $50.00 stipend for attending. Conference registration and workshop preregistration are required. Send the conference registration form and fee to Diana Dummitt and **call the I-DNR at 217-782-6384 by September 15, 1999 in order to preregister for the workshop.**

• **SPRINGFIELD SCHOOLS SHARE FAIRS FOR ALL LEVELS. Extensions and Ideas from the FOSS Kits**
First Grade — Insects, Solids and liquids, Pebbles, sand, and SiH
Second Grade — New Plants, Balance and motion, Air and weather
Third Grade — Measurement, Structures of life, Physics of sound, and Earth materials
Fourth Grade — Human body, Magnetism and electricity, Ideas and inventions, Water
Fifth Grade — Variables, Food and nutrition, Environments and solar energy
Sixth Grade — Models and designs, Levers and pulleys, Mixtures and solutions, Landforms
Middle School and High School Sessions Will be Held as Well!

• **ISTA Town Meeting Friday 4:15-5:30**
Meet with your region and then express your views on the future of science education as you enjoy refreshments.

• General Membership Meeting Saturday morning
Complimentary deluxe continental breakfast and fantastic giveaways. Over 200 prizes were given away last year. You won't want to miss it!

CONFERENCE LOCATION

The Prairie Capitol Convention Center is located in downtown Springfield. Parking is located at the Renaissance Hotel and on the street. Hotel Garage Parking is $5.00 for 24 hours (with in/out privileges). All sessions will be held either at the Prairie Capitol Convention Center or in the Renaissance Hotel.

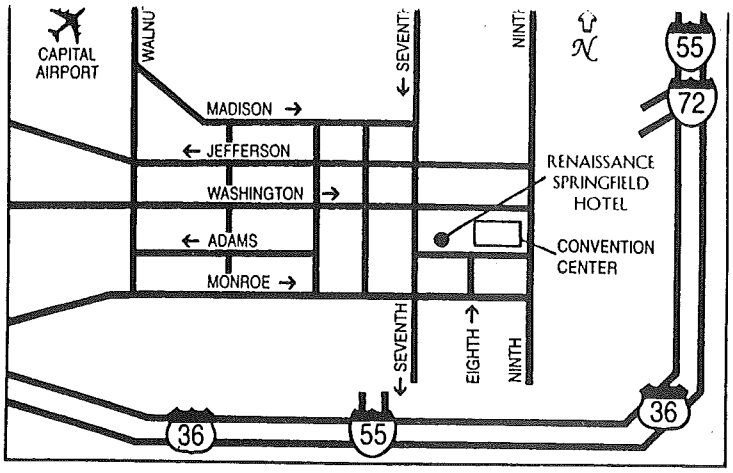
HOTEL RESERVATIONS

Reservations should be made directly with the Renaissance Hotel, 701 East Adams Street, Springfield, Illinois (217) 544-8800. Be sure to mention that you are a participant in the Illinois Science Teachers Association convention to receive the discount rate. Special room rates are $88.00 for a single or double. You must make your reservation by **September 13, 1999 in order to receive the special rate.**

REGISTRATION AND FEES

By action of the ISTA Board of Directors, registration is required for participation in any aspect of the ISTA convention. The lapel badge issued to each registrant is the "ticket of admission" to all sessions, exhibits, and activities except those for which a separate fee is stated. Don't forget to add in cost for paid workshops, social events and the tour listed on the form. Space for these events is limited so please register early if you want to attend.

An Advance Registration Form is included on the next page. **The deadline for Advance Registration is September 20, 1999. Please bring your form with you to Springfield if you cannot meet the deadline.** We will have plenty of staff on hand to expedite your on-site registration this year. Just drive over and join your colleagues!



CONVENTION COMMITTEE

Karen Thompson, Co-chair Springfield Schools	Mike Holinga, Co-chair Springfield Schools
Duke Wilber Franklin Middle School	Sandy Spengler Southeast High School
Teresa Kaiser Southern View	Tracy Buscher Southeast High School
Cindy Huson Springfield District 186	Susan Rhodes Springfield District 186
Kendra Pamenter Springfield District 186	Christy Jones Franklin Middle School
Sue Ruff Springfield District 186	Karen McNamara Franklin Middle School
Elizabeth Langford Southeast High School	Stella Taft Washington Middle School
Krista VanderLeest Franklin Middle School	Siri Hartsfield Springfield District 186

Registration Contact:
Diana Dummitt, ISTA Registration, College of Education, University of Illinois, 1310 S. Sixth Street, Champaign, IL 61820
Phone: 217-244-0173 Fax: 217-244-5437 ddummitt@uiuc.edu

SPECIAL OPTIONS

In addition to the dozens of activities offered without additional cost to registered attendees, several paid workshops, social events, and a tour are offered. **To register for these special offerings, consult the listing below, then fill out the Advance Registration Form and enclose payment.** (Check times carefully so that you don't schedule two events for the same time) **Space is limited so register early.**

TOUR OF THE ILLINOIS STATE MUSEUM'S RESEARCH AND COLLECTIONS CENTER

Friday October 1 **2:00 - 3:30 pm.**

Join us on a special behind the scenes tour of the Illinois State Museum's Research and Collections Center (RCC) in Springfield. This 97,000 square foot building houses the Museum's natural history, anthropology, and decorative arts collections; laboratories where scientists are conducting research on topics; and computer facilities — including a new state-of-the-art Technology Learning Center. The RCC is visited by museum professionals from around the world, not only for research purposes but also to gain ideas for their own research and collections facilities. The tour will be led by Dr. Bonnie Styles, ISM Associate Director for Science and Education, and Beth Shea, ISM Education Chair.

FEE: $10.00

PAID WORKSHOPS

#1 Applied Environmental Science

Joe Webel Friday 8:30-9:20 am

This workshop will demonstrate a new curriculum guide that includes hand-on activities in: water and air quality, chemicals and the environment, land uses, and others. Any grade level. FEE: $20.00

#2 Constructing a Tabletop "Hydroponics" Classroom Display

Richard Treat Friday 9:40-11:40 am

Construct a 36"x14"x36" hydroponics classroom display. All materials including PVC pipe, air pump, and hosing provided. FEE: $45.00

#3 Using the Internet to Promote Inquiry-based Learning

David Jakes, Howard Knodle, and Mark Pennington
Friday 8:00-11:30 am

This workshop provides educators with a framework for incorporating effective Internet research projects into their curriculum so that the experience is meaningful and improves learning. FEE: $35.00

#4 Using Digital Imagery in the Science Classroom

David Jakes, Howard Knodle, and Mark Pennington
Friday 12:30-4:00 pm

Learn how to acquire, manipulate, organize, present, and incorporate digital imagery into daily instruction. A toolkit of resources will be distributed to each participant.

FEE: $30.00

SOCIAL EVENTS

Fabulous Friday Luncheon

Friday October 1 **11:45 am-1:00 pm**

Join us for a great time honoring our members who have won awards, meeting with other teachers, and enjoying a wonderful buffet lunch at a bargain price. FEE: $10.00

Candlelight Reception at the Old Capitol Building

Friday October 1 **6:00-8:00 pm**

Travel back in time to early Illinois history. Relax and enjoy hot Hors D'oeuvres and drinks by candlelight. Our visit will be enhanced by tour guides dressed in historical constumes who will answer questions and conduct tours. FEE: $10.00

1999 CONVENTION REGISTRATION SCHEDULE FOR ONSITE REGISTRATION AND PICK-UP OF MATERIALS

Thursday, September 30, 6:00 pm — 9:00 pm
RENAISSANCE HOTEL LOBBY

Friday, October 1, 7:00 am - 4:00 pm or
Saturday, October 2, 7:00 am - 9:00 am
PRAIRIE CAPITOL CONVENTION CENTER
REGISTRATION AREA

1999 Illinois Science Teachers Association Convention Preregistration Form
"Everyone Teaches, Everyone Learns"
Prairie Capitol Convention Center—Springfield
October 1-2, 1999

PLEASE FILL OUT FORM COMPLETELY
(PRINT CLEARLY: INFORMATION WILL BE USED FOR MAILING YOUR CONFIRMATION.)

Name: _____ Spouse's Name (if attending): _____

Home Address: _____ Home Phone: (____) _____

City/State/Zip: _____

Affiliation (school, college or organization): _____

Business Address: _____ Business Phone: (____)_____

City/State/Zip: _____ E-mail_____

_____ CHECK HERE IF YOU NEED SPECIAL ASSISTANCE DUE TO HANDICAP.
_____ CHECK HERE IF YOU WOULD LIKE TO BE A PRESIDER FOR A SESSION.

REGISTRATION	**COST**	
_____ Registration	$75.00	_____
_____ Full Time College Student (includes Membership)	$15.00	_____
_____ Non-teaching Spouse	$10.00	_____

PRE-CONFERENCE - Thursday (Fee Includes Continental Breakfast and Lunch)

_____ "Build Your Learning Community"	$50.00	_____
FABULOUS FRIDAY LUNCHEON	$10.00	_____
OLD CAPITOL BUILDING CANDLELIGHT RECEPTION	$10.00	_____

PAID WORKSHOPS - See Listing

Workshop #	Workshop Title	Fee	
_____	_____	_____	_____
_____	_____	_____	_____

BEHIND THE SCENES TOUR OF THE ILLINOIS STATE MUSEUM COLLECTIONS	$10.00	_____
***I want to pay my ISTA dues (See label on back cover). I am paying my 2000 dues.**	$25.00	_____

PRE-REGISTRATION DEADLINE: Form must be postmarked no later than **SEPTEMBER 20, 1999. After that date please bring form with you to Springfield.** **TOTAL**: _____

Make checks payable to: **Illinois Science Teachers Association**. Send registration form and check to: **Diana Dummitt, ISTA Registration, College of Education, University of Illinois, 1310 S. Sixth Street, Champaign, IL 61820**

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. THE LAST DATE TO CANCEL WITHOUT PENALTY IS **SEPTEMBER 13, 1999**. WE ARE UNABLE TO MAKE EXCEPTIONS.

LETTER FROM THE EDITOR

Dear ISTA Members:

As the availability and use of electronic technology has increased over the past several years, a number of professional organizations around the nation have started investigating putting their journals into electronic format, making them available on the internet to their members. Some journals have already tried trial electronic journal issues, and at least one science education journal presently is produced entirely in electronic format.

The ease with which readers can access the electronic journal issues and the savings in paper have been two of the major arguments used in support of placing journals in the web in electronic format. However, research has clearly indicated that more than half of science teachers still do not have ready access to the internet at home or at work, and they would therefore be unable to utilize an electronic format journal.

The ISTA Board and editor of the *Spectrum* are interested, as always, in promoting and helping our members get on and stay on the cutting edge of science education. As a result, we have initiated discussions regarding placing the Spectrum on-line for our membership. Keeping in mind that a number of our members may not have easy access to the journal if it was entirely electronic, we have considered making the journal available in two formats: both electronic and in hard printed copy.

We are now asking for your feedback regarding this matter. We would like to hear from you as to whether you would prefer to receive your journal issues electronically or continue receiving them via hard copy, or even if you'd like to receive them in both formats. Although we cannot at this time guarantee that electronic changes will take place, or that we can maintain the journal in both formats at the current subscription level, we do think that the time has arrived to address the needs and wants of our membership with respect to electronic media if it is warranted. Therefore, I am asking each of you to contact me and let me know your preferences along with a short rationale (the rationale is optional, of course) for your preference. I will compile the feedback and present the results to the ISTA Board during our fall meeting, and we will likely continue the discussion with the membership during the conference. I wish to remind each of you that the *Spectrum* is your journal, not just the editor's or the board's journal. We wish to and need to hear from each of you about this. Let us know how you want your journal to be as we prepare to enter the next century.

You can send your feedback to me via e-mail at Kevin_Finson@CCMAIL.WIU.edu
or you can mail it to me at
Kevin Finson
Department of Elementary Education and Reading
Western Illinois University
1 University Circle
Macomb, IL 61455- 1390.

ISTA LAUNCHES NEW INITIATIVES!

Within the next twelve months, Illinois teachers will be facing new challenges as never before. New recertification requirements have been passed into state law requiring teachers to make professional development central to their vocation. What counts as professional development, how to judge whether a professional development offering is valuable, and where to find good sources for professional development are all issues that our members will have to deal with. In addition, ISAT, implementation of the Illinois Learning Standards so that they are central to the way science is taught, and measurable improvement of student learning will come to the forefront.

In an effort to fund several new initiatives to address these issues (to be announced at the 1999 convention in Springfield), the ISTA Board of Directors voted in their June 1999 meeting to raise dues to $35.00 per year, effective for the year 2000 (January Through December 2000). If you have already paid your 2000 dues you are all set. If you have not yet paid your dues (see mailing label on the back of this journal), you can still receive a whole year of the benefits of being an ISTA member at the old rate of just $25.00 for Y2000 IF we receive your check and form postmarked by Saturday January 1, 2000. Anyone who pays after the January 1 date will need to pay the $35.00 rate. Use the form on the back cover of this issue. Don't procrastinate! Join your colleagues who are on the cutting edge of excellence in science education. Avoid the Y2K crunch and renew your membership today!

SPECIAL INTERESTS

American Geological Institute
4220 King Street
Alexandria, VA 22302-1502 U.S.A.
(703) 3 79-7563
Web Site. http.//www.earthsciweek. org

EARTH SCIENCE WEEK OCTOBER 10-16, 1999 OFF TO A GREAT START IN '99

October is coming right up! Here are some things you can do right now to promote and prepare for Earth Science Week. Use this checklist to help organize your event or activity.

- Appoint an Earth Science Week Committee
- Get information packet from the AGI
- Develop overall operational plan
- Decide on theme/activities
- Select and reserve sites, such as schools, malls, museums, libraries, community centers, and parks. Appoint site coordinators, presentation teams, and materials suppliers
- Contact local companies, industries, and restaurants for participation and/or donations to offset costs
- Establish contacts with local media
- Contact teachers, school administrators, head librarians, museum curators, and shopping center managers
- Contact government officials for proclamations
- Plan demonstrations and/or activities
- Recruit and schedule volunteers
- Order materials and collect supplies
- Mail an Earth Science Week news release to your media contacts
- Contact participants to confirm dates, times, and duties
- Visit sites of planned Earth Science Week activities
- Prepare handouts and giveaways
- Mail additional news releases and call TV, radio, and newspaper reporters
- Finalize details for events
- Celebrate Earth Science Week
- Take pictures and send them to the AGI along with a summary of your Earth Science Week event or activity.

In 1998, more than 15,000 individuals and organizations helped make the first Earth Science Week a roaring success.
Order your kit today from the above address!

GREAT IDEAS FOR EARTH SCIENCE WEEK

The items listed below barely scratch the surface of ideas and possibilities for celebrating Earth Science Week. We hope that you'll share your plans for Earth Science Week with us as well as photos and post-celebration comments.

Earth Scientists at Work
Invite local high school and university Earth science students to attend an open house at an Earth-science related company, association, or agency.

Earth Scientists in the Classroom
Volunteer to visit a classroom to lead an Earth science activity, conduct a demonstration, or talk about your career.

Adopt-A-Teacher
Sponsor a workshop that gives educators the opportunity to perform Earth science activities under the guidance of experienced demonstrators.

Earth Science for Commuters
Hold an annual poster contest for area school students as part of Earth Science Week. Arrange for the winning entry to be displayed in buses and other public transportation during the month of October.

Earth Science in your Community
Conduct a field trip in a park or on a campus.

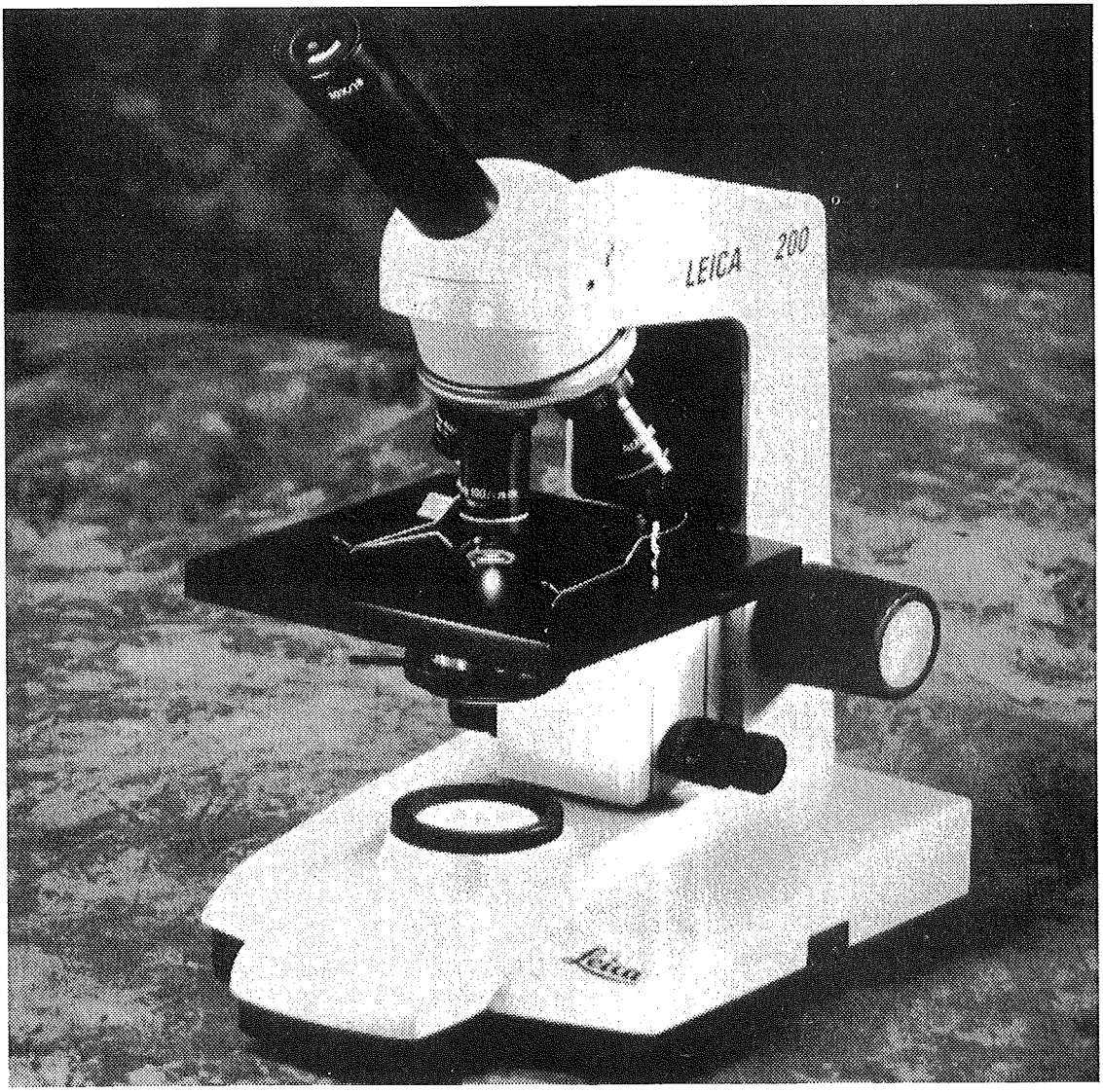
Building Stones
Conduct a building-stone field trip.

Whole Earth Place Mats
Design educational place mats that feature information highlighting the importance of Earth science in everyday life and arrange to have area restaurants use the place mats throughout Earth Science Week.

The Wonders of Water
Develop hands-on activities demonstrating "The Wonders of Water."

Getting Earth Science on the Books
Arrange an Earth Science Week display at your local library.

Research Systems offers IDL posters and software to Earth Science Week participants. The Illinois State Geological Survey is playing a major role in promoting ES Week. Earth Science Week information kits are now available. Each kit contains Earth science posters, bookmarks, and postcards, plus ideas and activities for celebrating ES Week. A new book, *Sustaining Our Soils and Society*, highlights environmental concerns. This colorful nontechnical publication complements the poster, Soils Sustain Life, and the soils bookmark in the Earth Science Week information kit. Order Yours Today!



The Eyes of Science

Leica Microsystems presents high quality educational microscopes and accessories featuring superior optics and high performance at an affordable price. Leica microscopes are built for years of use. From the superior illumination system to precision engineering and optics, Leica provides the eyes of science for your students. Call your local sales rep, Don Carter at (800) 248-0665 x7055, for more information.

Leica Microsystems Inc.
111 Deer Lake Road
Deerfield IL 60015

Telephone (847) 405-0123 (800) 248-0123
Fax (847) 405-0147
In Canada call (800) 205-3422
www.leica-microsystems.com

Leica

ATTENTION HIGH SCHOOL PHYSICS TEACHERS

Here is an excerpt from a guest commentary by David Hestenes in the *American Journal of Physics*, June 1998 on his initial conclusions about teacher effectiveness. Dr. Hestenes has been in a unique position to study teaching competence on a broad scale. For more than a decade he has been PI on NSF teacher enhancement grants for inservice high school physics teachers. This has generated extensive data on the teaching of nearly 150 teachers. A thorough analysis will be published when the study is complete, but here is a preview of some of his pertinent conclusions:

(1) SUBJECT COMPETENCE is essential to teacher effectiveness. Teachers with low Force Concept Inventory (FCI) scores are unable to raise student scores above their own.

(2) Proficiency in SCIENTIFIC INQUIRY is more important than specific content knowledge. Beyond a minimal background of a few physics courses, teaching effectiveness depends only weakly on the extent of academic physics training. The best teachers love the challenge of learning something new and are eager to share the experience with students.

(3) Managing THE QUALITY OF CLASSROOM DISCOURSE is the single most important factor in teaching with interactive engagement methods. This factor accounts for wide differences in class FCI score among teachers using the same curriculum materials and purportedly the same teaching methods. Effective discourse management requires careful planning and preparation as well as skill and experience.

(4) Teachers create an environment wherein students CONSTRUCT THEIR OWN UNDERSTANDING of the subject. The quality of the constructions depends crucially on the conceptual tools available to the students and facilitation by the teacher.

(5) EFFECTIVE TEACHING REQUIRES COMPLEX SKILLS which take years to develop. Technical knowledge about teaching and learning is as essential as subject content knowledge. Few teachers can acquire it without participating in a strong program of professional development. However, most are capable of achieving a high level of teaching proficiency, and even the best need the stimulus of peers to keep improving.

ILLINOIS ASSOCIATION OF BIOLOGY TEACHERS NEWS

IABT Fall Outing

When: Saturday, September 25, 9:00-12:00
(Refreshments at 9:00).

Where: Camp Sagawau, 12545 W. 111th St., Lemont, 60437

Who: IABT members and friends

Features: Tours of canyon and prairie. Wear old shoes that might get wet. Update on opportunities and happenings involving the Cook County Forest Preserve.

Plus: Short Meeting with the opportunity to share outdoor activities, meeting fellow biology teachers and share summer opportunities and experiences.

Directions:
From North:
I-294 to I-55 South. Exit Route 83 South, continue to site.
From West:
I-355 to I-55 North. Exit Route 83 South, continue to site.
From East:
I-90 to I-55 South. Exit Route 83 South, continue to site.
From South:
I-55 South. Exit Route 83 South, continue to site.

Fall Happenings

ISTA Convention. Oct 1-2, Prairie Capitol Convention Center Springfield.
Join us at the conventionin for our Friday afternoon session to honor this year's OBTA winner (Gloria Latta, Wheaton Warrenville South High School) + share successful activities from across the state.

NABT Convention October 27-30, Tarrant County Convention Center, Forth Worth, Texas.

For More Information:
Shari Cohen 708/799-31422 (sjcohen@kiwi.dep.anl.gov)
President Carl Koch 708-442-7500 (AECKoch@aol.com)

To Become a Member:
Phil McCrea 847-446-7000 (mccreap@nttc.org)
Membership Director and President-elect NABT.

Sherry Yarema 630-420-6417 (sly@wwwa.com)
NABT State Representative

Other officers include Marilyn Havlik, Dave Jakes, Marty Miller, Kathleen Seilheimer and Chris Hilvert.

Brent Williamson, State Director, ISO
Science Dept Chair, Hinsdale South HS
7401 Clarendon Hills Rd
Darien, IL 60561
630-887-1730 ext.310 work 219-838-3429 evenings
219-923-3742 messages Fax: 630-920-8649
jbwillia@ngwnameserver.district86.k12.il.us

SCIENCE OLYMPIAD UPDATE

This past spring regional winning teams from all over the state competed at the Science Olympiad state finals at the University of Illinois. There were 23 individual events in both the junior high and high school division. Overall team winners were:

HIGH SCHOOL

1st Niles West coached by Elizabeth Ramseyer
2nd Libertyville coached by Mike Bush and Craig Bomgaars

JUNIOR HIGH

1st Park View School coached by Matt Cole and Jeff Marcus
2nd South Middle School coached by Katie Kaufman

Park View was 7th in the nation and South was 17th out of 54 teams with a gold medal being won by Jamie Willis and Hannah Rutzen from Park View in Birds. Niles West was 8th in the nation and Libertyville was 42nd out of 54 teams.

New events this year include Amphibians and Reptiles replacing Don't Bug Me, Dynamic Planet replacing Earth, Sea, and Sky, Rocks and Minerals replacing Fossils, Bridge Building, Metric Mastery, and Water Striders added to junior high and Flight, Disease Detectives, and Qualitative Analysis added for high school. Polymer Detectives, What Are You Trying to tell Me, and Surfing the Net were dropped.

What Parents, Students, and Teachers said about Science Olympiad*

Science Olympiad is an organization dedicated to improving science literacy, improving the quality of science teaching, and motivating students to go into science and engineering careers. We try to make science fun for students. It consists of 23 events in the junior high division and 23 in the high school division covering all areas of science and technology. Teams are made up of 15 students who work together all year preparing for the competition. Last year my research showed that indeed we are being successful at accomplishing our mission. Results came from over 1100 students and their parents and 94 teachers from across the nation. The results just from Illinois schools show that students in junior high are spending 4.5 hours per week and high school students are spending 6.0 hour per week on average outside of school preparing for their competition by studying science.

Data from the questionnaires given to teachers showed that the average years of teaching experience were 7.7 for the Junior High group and 7.6 years for the High School teachers. Parents were involved in 90% (High School) and 79% (Junior High) of the events. The community was involved 66% (High School) and 65% (Junior High) of the time. Eighty-two percent of the Junior High teachers and 75% of the High School teachers included Science Olympiad activities in the classroom and more than 85% of all teachers said that Science Olympiad had changed their outlook on teaching.

When parents were asked, "as a parent, would you describe how you feel about your child's involvement with Science Olympiad?" some sample responses were:

- Makes me proud that my daughter enjoys participating in the competition. She loves the challenge, but more so working with other school members. Science Olympiad makes science twice the fun for her.
- My child has had a lot of fun. She has worked very hard and learned a lot. It gives them great self-esteem to win a medal.
- Very positively. The program is motivating, stimulating and enjoyable for my son.
- My child has been participating Science Olympiad since 8th grade. It has been a very positive experience for him to interact with students that enjoy science as much as he does. The team spirit has encouraged him to work hard on his projects. I wish more teachers would become involved — their encouragement is the best.
- This program has emphasized creativity, productivity and practical knowledge with great enthusiasm for learning. It is a very positive influence on my daughter's education.
- I feel it's a great opportunity for her to be involved in something that is fun and challenges her mind at the same time. Her father and I encourage and attend all levels of the contest with her.
- I feel very proud that my child can participate in an activity of this type. Participation in Science Olympiad provides my child with opportunities to learn and use skills that may benefit him in a future career. I feel really good about the sense of accomplishment my child experiences from his involvement with Science Olympiad.

The next question was a student question which asked, "how would you evaluate your experience in the Science Olympiad?" All of the responses were positive and the following is a sampling:

- It was a great experience, especially this year because I won a gold medal. The memories and lessons I have learned will carry with me throughout the rest of my life.
- It has been a lot of work and learning, but it is a lot of fun, also. I have learned more about Biology than I did from one year of class.
- My experience with science Olympiad has made me a better student, and a better friend. It has showed me how to work with others.
- It was a lot of fun.
- It has been very memorable. I will continue for the rest of my high school years.
- Awesome. Wonderful (and I learned something too).
- Science Olympiad has been my life for the past three years — in school and out of school. My Science Olympiad team has become my second family. We compete together; we have fun together. We've become very good friends.

The next student question specifically asked the students how they prepare for their competition:

Answers varied from CD roms, study, practice, testing or experimenting with their devices in the engineering competition, studying books, building projects, practice, help from coaches, trial events, go to the library and get books, ask my teacher questions, take notes, and my partner and I quiz each other.

When asked, "what is your favorite way to learn about a topic in science that interests you?" There was a narrow range of answers.

Examples included by doing a lab, reading about it, asking a person who knows about it, going to the library and getting books on it, perform an experiment, try it out, a one-on-one discussion with a coach, hands-on work, and labs/visual learning. There were three distinct choices which included reading, experimentation, and one-on-one discussions. All of the activities involved the students being engaged in the learning process.

The next student question focused in on, how important was the team aspect of the competition to you? Give an example! Again a variety of responses are presented.

- We came in wanting to win. The night before, the entire team was studying and even when they didn't have an event they were studying on their lunch hour.
- Some of the projects you must have more than one person to work on it. Also the teammates encourage one another.
- It is very important. I learn more when I am with friends and we can quiz each other on the material.
- Very important. My team is always cheering everyone on. We are very close.
- I think it's important that the team be into team spirit and cheering each other on. Especially during the awards ceremonies and everyone gets so excited and there are slaps on the back, high-fives, and hugs.
- I believe we must work as a team because there is no "I" in team!
- I think it is great because everyone on the team can contribute to the success of the team.
- I like working with a team because you belong to something.

The following are some specific comments from teachers to the question, "has Science Olympiad affected your outlook on teaching?"

- Science Olympiad has pushed me further in the direction of student projects and problem solving skills in my classroom. We like to integrate the activities into the classroom.
- Science Olympiad helps me stay positive - I like the one on one interaction with students.
- Absolutely! It has energized my teaching and created examples for me to use in the class.
- It has given me much more meaning and direction.
- Yes, it makes teaching worthwhile and revitalized me.
- Yes, I try to make what I do more problem solving. I give projects to my students to do. It also pointed out weaknesses in the high school curriculum.
- Yes, being able to work with these talented and dedicated students and their expectations has motivated me to work harder and longer to help them reach their goals.

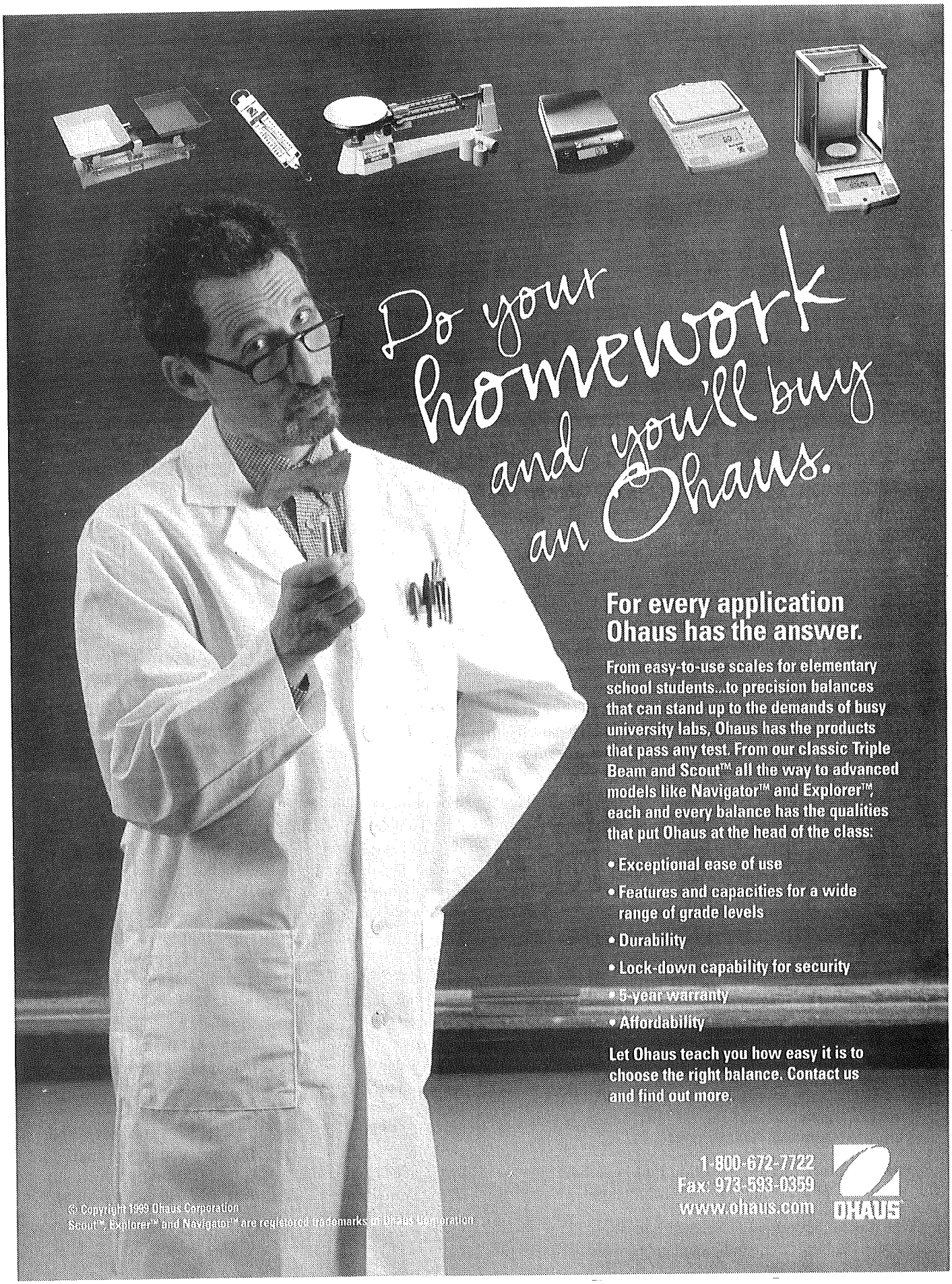
When you read these comments, you have to ask why doesn't my junior high or high school have a Science Olympiad team? Join the 160 schools now competing in Illinois and get your Science Olympiad team going!

100% of the teachers surveyed at all levels found the ISO workshops to be a valuable experience. Don't miss the 13 workshops that will be presented at the 1999 ISTA Convention. ISO will also have a booth full of information. See details for registering starting on page 2 of this issue.

*These results were based on surveys and interviews with 46 out of 54 junior highs teachers responding and 48 out of 54 high schools responding.

Regional and State Competition Dates

Site	Date	Director(s)
Champaign	3/4/00	Kevin Erlinger
Macomb	2/12/00	Dr. Don Powers
Niles West	3/18/00	Elizabeth Ramseyer and Ann Min
SIU-Edwardsville	2/29/00	Pam Abbott, Dr. Virginia Bryan, and Dawn Olive
Lisle	2/19/00	Dave Kludsenderf and Joe Cave
Hinsdale South	3/4/00	Staff
Northeastern University	3/18/00	Dr. Harvey Barrett
U. of Illinois (STATE)	4/29/00	Brent Williamson and Dr. Howard Guenther


Do your homework and you'll buy an Ohaus.
For every application Ohaus has the answer.
From easy-to-use scales for elementary school students...to precision balances that can stand up to the demands of busy university labs, Ohaus has the products that pass any test. From our classic Triple Beam and Scout™ all the way to advanced models like Navigator™ and Explorer™, each and every balance has the qualities that put Ohaus at the head of the class:
• Exceptional ease of use
• Features and capacities for a wide range of grade levels
• Durability
• Lock-down capability for security
• 5-year warranty
• Affordability
Let Ohaus teach you how easy it is to choose the right balance. Contact us and find out more.
1-800-672-7722
Fax: 973-593-0359
www.ohaus.com
OHAUS
© Copyright 1999 Ohaus Corporation
Scout™, Explorer™ and Navigator™ are registered trademarks of Ohaus Corporation

COMPUTER SPECTRUM

Jim Kaler
Skylights
UIUC Department of Astronomy
103 Astronomy Bldg.
1002 West Green St.
Urbana, IL 61801
kaler@astro.uiuc.edu
Phone: (217) 333-9382 Fax: (217) 244-7638
Web: http://www.astro.uiuc.edu/~kaler/skylights.html

ARE THERE STARS IN YOUR FUTURE?

As those of you who subscribe to ISTA-Talk know, I am creating a large set of web pages on stars, and add a description of a new one each week.

Go to: http://www.astro.uiuc.edu/~kaler/sow/sow.html

The site now has 80 stars and the relevant constellation photos. The site is being used from elementary schools through college. From the main stars page you can click on an elementary tutorial on stars, which is linked to the outside world, and on another on stellar spectra, which is cross-linked to the tutorial. Recently, I introduced a new page in which the stars are arranged by spectral class and by luminosity. These pages, along with Skylights, may be useful in instruction. If you teach and use the pages let me know, and pass on any exercises you may develop that use them. Whether you teach or not, please pass on the sites to anyone who may be interested in the public community or in other schools.

OTHER SCIENCE-Y SITES

Looking to upgrade your computers? This site may help you find used computers for your classroom.
http://www.microweb.com/pepsite/Recycle/recycle_index.html

Environment
http://www.enviroliteracy.org/resources.htm

Rivers Project
Http://www.siue.edu/OSME/river

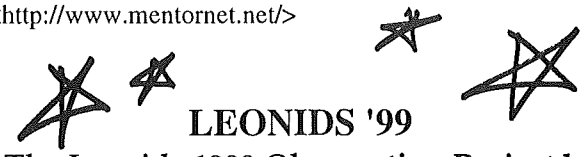
UIUC Honors Physics Program Fall Schedule
http://web.physics.uiuc.edu/outreach/honors/

The Electronic Journal of Science Education
Visit us at http://unr.edu/homepage/jcannon/ejse/ejse.html

MENTORNET: THE NATIONAL ELECTRONIC INDUSTRIAL MENTORING NETWORK FOR WOMEN IN ENGINEERING AND SCIENCE

We pair women who are studying engineering or science at one of our participating universities with professional scientists and engineers working in industry, and help them form e-mail based mentoring relationships. Industrial sectors sign up for the program using our on-line application forms. Information from the application enters a central database, and sorting software identifies several probable matches. Our mentoring specialist, Dr. Peg Boyle, reviews and completes the match, and launches the pair on their e-mail relationship. We are continuing the start-up phase of the national program started in early 1998, with a pilot semester for 225 student/mentor pairs.

MentorNet is a project of WEPAN, the Women in Engineering Programs &Advocates Network.
<http://www.mentornet.net/>



LEONIDS '99

The Leonids 1999 Observation Project by High School Students All Over the World

Cosponsored by the Society for Teaching and Popularization of Astronomy, Astronomical Society of Japan, and The Japanese Society for Planetary Sciences.

Join us on our observation campaign of The Loenids meteor shower on the night of November 17, 1999. Over 3000 high school students representing 276 schools participated in the "Loenids 1998" project in Japan. This year we would like to expand this observation network all over the world.

For information or to register, connect to our Website:
http://www.leonids.net

Send your school (or group) information
Name of school, name of instructor or leader, e-mail address (official or private), postal address of school, city, country, observing site, and number of observers.

Observation
Our goal is to have as many students as possible all over the world watching the same astronomical phenomenon on the same night (November 17, 1999).

Report
Download the specialized MS Excel 95 worksheet on our website. Write in your data and send via e-mail to leo99data@leonids.net

If you contribute to this project, you will receive all of the worldwide data.

The National Institute for Urban School Improvement invites you to subscribe to its E-Newsletter!

E-News, the Institute's electronic newsletter, is designed to keep individuals who have indicated an interest in our work informed of new developments in urban education and inclusive schooling. Distributed once per month, E-News serves to inform individuals of the work of the Institute and other organizations engaged in similar work, upcoming conferences and events, new online and off-line products and resources, and other news happening in the field. Sign up to receive E-News via your emailbox. Currently, we have over 430 subscribers and the number is growing daily!

To subscribe to E-News free of charge, follow the directions below:
1. Create an email message to: majordomo@mail.edc.org
2. In the body of the message, type: subscribe E-News
3. Send the message.

Back issues of E-News can be found at: http://www.edc.org/urban/enews.html

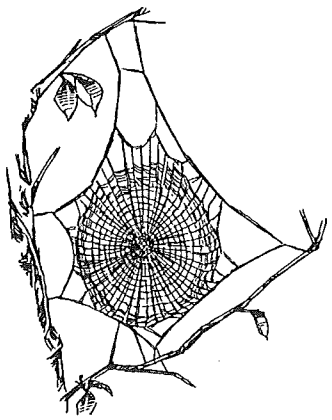
Web site: http://www.edc.org/urban

UNITED STATES DEPARTMENT OF EDUCATION

A NUMBER OF RESOURCES have been added to the U.S. Department of Education's website since mid-May, including publications about...
Blue Ribbon Schools, charter schools, civil rights, community involvement, construction & modernization, diversity, early childhood, elementary & secondary education, higher education, homeschooling, libraries, mathematics & science, reading, research, satellite events & town meetings, special education, & technology. For a complete list, please see: http://www.ed.gov/News/

Attention Chicago-Area "WEB-BUILDERS"

A new mailing list is starting up, and you are invited to join. The list is named "Web-builders" and is intended to carry tips, questions, answers, issues, and discussions about creating school and classroom web pages and sites. Participation is welcome from all members of the Chicago-area K-12 education community involved in web-building or planning to be. The list will be maintained partly under the sponsorship of CUIP and WIT, and we hope to get started with a nucleus of participants from CUIP schools and WIT 99. TO SUBSCRIBE Visit the web page and form at
<http://cuip.uchicago.edu/mailman/listinfo/web-builders>



Top Chemistry Sites

http://www2.shef.ac.uk/chemistry/web-elements/ web-elements-home.html
Web Elements: An entire periodic table on your screen.

http://www.stc.westinghouse.com
Westinghouse Science and Technology Center

http://www.che.ull.edu/WWW-CHE/index.html
Dale Kirmse's Chemical Engineering Resources.

Michael J. Owens
National Geographic Society Update
No. 40, Winter 1998-99

LOOKING DOWN FROM ON HIGH: FINDING EARTH IMAGES AND MAPS ON THE INTERNET

Playing the part of an unorthodox prep school teacher in the 1989 film *Dead Poet's Society*, Robin Williams instructs his students to stand on top of their desks to "look at things in a different way."

"The world looks very different from up here," he exclaims. And indeed it does. The views from a desk—or from a high bridge, a skyscraper, or a jet thousands of feet up—offer perspectives of Earth that inspire and intrigue, and contribute to our understanding of our surroundings.

But you don't need to be on a desk, a bridge, a skyscraper, or a jet for these great views from on high. All you need is a comfortable chair and access to the Internet, for a start. My search for ways of seeing Earth differently began with a visit to a Web site of the United States Geological Survey (USGS), at edcwww.cr.usgs.gov/webglis/

Specifically, I hoped to obtain an aerial view of Washington, D.C.—my home. At this site, I found exactly what I wanted: the chance to order a detailed black-andwhite photograph of Washington from 20,000 feet directly overhead—available in 10"-, 18"-, and 36"-square prints.

After I ordered and received the print, I was delighted to study the image, clearly seeing the tops of my favorite museums, as well as bird's-eye views of my running paths and nearby parks. It was easy—and fascinating—to trace my movement through the city streets from my home to work and other destinations. And if I ever plan to leave Washington, it's nice to know there are aerial photographs for all cities and towns in the United States.

ARTICLES

Bertram C. Bruce, Umesh Thakkar, and Maureen P. Hogan
Department of Curriculum and Instruction
University of Illinois at Urbana-Champaign
Champaign, IL 61820
Tel: (217) 244-3576
Email: chip@uiuc.edu

INQUIRY-BASED LEARNING AND TEACHING WITH NEW TECHNOLOGIES

Many educators today are talking about inquiry-based teaching and learning, with a wide variety of conceptions of what that really means. They also have many concerns about how to promote learning through inquiry given the many constraints on schools and the diverse demands that teachers face. Let's start with the working definition (from Barry Beyer, 1971, p. 6) that inquiry is

> one way of making sense out of what we experience ... Inquiry teaching is putting learners into situations in which they must engage in the intellectual operations that constitute inquiry. It requires learners to make their own meaning out of what they experience.

Thus, teachers strive to create a student-centered classroom, where students' questions and problem-solving abilities drive the curriculum, and where they have the opportunity to reflect on their own learning. Then, a number of key questions arise:

1. How do we get students to engage in inquiry?
2. How do we ensure that ALL students are involved in inquiry activities?
3. How do teachers link to other teachers and student teachers to facilitate inquiry learning and teaching?
4. What are the roles for scientists in supporting inquiry in the classroom?
5. How can teachers study their own inquiry practice and share what they learn with others?

We describe here a project in which K-12 teachers worked together to address these questions and to develop practical methods for supporting inquiry in the classroom. The professional development model we developed could be useful for other emerging technology projects.

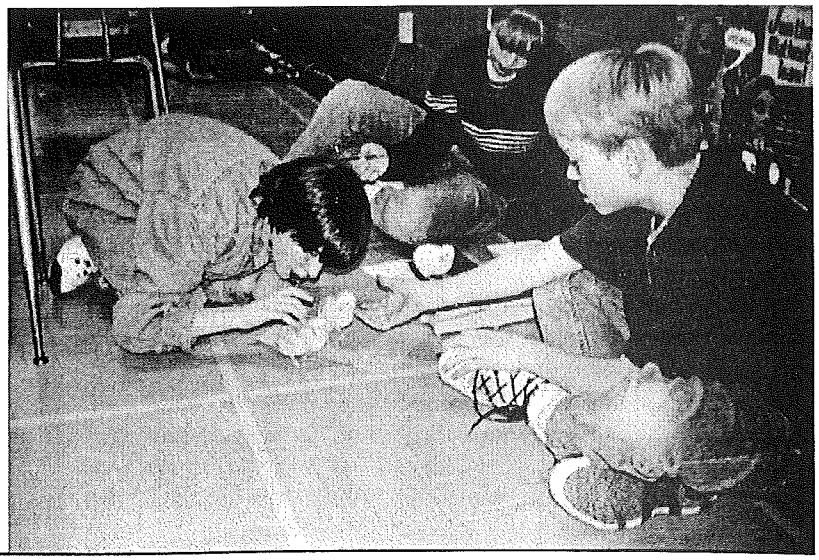
Chicken eggs + MRI = Chickscope

The Chickscope project http://chickscope.beckman.uiuc.edu was initiated at the University of Illinois at Urbana-Champaign by Clint Potter and scientists across eight departments (see Acknowledgements). Chickscope allows students to study chicken embryo development using a variety of educational resources, such as inquiry-based curriculum materials, egg incubators, interactive modules on egg mathematics, image processing, and a remotely-controlled magnetic resonance imaging (MRI) instrument. Participating classrooms incubate fertile chicken eggs, look at MR images of developing embryos, and share their inquiries with students and teachers in other classrooms.

As Kristen Morris, a seventh- and eight-grade mathematics teacher at Urbana Middle School says,

> Chickscope is a multi-dimensional project which incorporates many kinds of learning. It includes web based learning and discovery, hands-on science experiments, and the ability for students to interact with scientists. It is a wonderful project.

An evaluation report documented that the first Chickscope project in 1996 was successful in immersing students and teachers in a scientific community (Bruce, et al., 1997). Students and teachers learned how to collect and analyze data, how to ask questions, and how to communicate their findings with others. Since the completion of this project we have had inquiries from around the world asking if the project would be repeated and requesting access to the resources and expertise. Responding to this early success, we initiated an Eisenhower Professional Development Program for K-12 teachers.



Professional Development

The professional development program began with the introduction of Chickscope to 57 preservice teachers in the fall of 1997 through a month-long unit on chicken embryo development. These teachers then took their new pedagogical knowledge into their student teaching. During the spring semester, 32 K-12 classroom teachers from 15 schools in Champaign, Clark, and Coles counties participated. These inservice participants learned about Chickscope during five inservice days. As Brenda Foster, a fifth-grade teacher at Dr. Howard Elementary School, Champaign says,

> I feel that this project provided me with lots of background information as well as resources for using chicken embryology in the classroom at my grade level. The MRI data base and the Chickscope homepage offers a variety of resources that I can use.

During a week-long summer inservice, the teachers used these resources to develop inquiry-based curriculum materials for their own classrooms. The teachers returned for one day of inservice in the fall 1998 semester to introduce the project to new preservice teachers and other interested teachers. Each inservice session included interactive discussions, hands-on and computer-based activities related to chicken embryology, mathematics, and MR imaging. The project continued in a similar way in 1999 with a second cohort.

The workshops included experienced teachers from primary grades, upper elementary, middle school, and high school, as well as preservice elementary teachers. Graduate students both assisted in and learned from the project. Faculty and university staff from diverse departments shared their knowledge and worked with the teachers to develop inquiry-based activities.

Evaluation Methods

Although early experience with Chickscope suggested that it could be beneficial in the classroom, the idea of extending it to larger numbers of teachers was unproven. Many issues arise (e.g., Loucks-Horsley, Styles, & Hewson, 1996) in the attempt to move beyond the original innovators and deal with the realities of diverse classrooms. In our research, we asked whether Chickscope could fulfill its original objectives, to

- Engage preservice and inservice teachers in substantive professional development for inquiry-based mathematics and science teaching.
- Support continuing learning by teachers in the classroom through reflection and collaborative curriculum development.
- Promote a model for successful classroom implementation in the areas of mathematics, science, and technology.
- Support collaboration among classroom teachers, preservice teachers, and content experts.
- Develop a community of learners to scale up the project.

A variety of data was collected for the evaluation, including answers to survey forms administered at the end of each session, classroom observation data, and teacher-constructed web sites, now available on the Inquiry Page for any teacher to use. Both formative and summative evaluations were conducted, with the results presented by teacher participants as well as by project staff at conferences including Supercomputing '98, the American Educational Research Association, and the Illinois Science Teachers Association. Formative evaluations of the Chickscope and the Inquiry Page web sites are also being conducted.

Participation in Professional Development

One or more teachers from each of the participating schools attended throughout the project, with an average of 24 teachers in attendance at each session. School administrators would not always allow all the participating teachers from to leave at one time, especially at the high school level.

Each inservice session included interactive discussions, hands-on, and computer-based activities related to chicken embryology, mathematics, and MR imaging. Illinois Chickscope built a community of teachers; linked that community with scientists in a variety of disciplines; promoted an integrated understanding in science and mathematics; and taught new ways of using the Internet.

In several schools, participants brought their colleagues into the project. These included librarians, science specialists, technology coordinators, and art teachers, as well as other regular classroom teachers. Over two years, the project involved around 40 teachers from 17 schools, 150 preservice teachers, 2000 students, and many others. Counting unofficial participants–parents, family, farmers, university faculty and graduate students–several hundred people were involved in significant ways and learned from the project.

Continued Learning by Teachers

Teachers attending the inservice during the spring semester had opportunities to give input on the program as well as reflect on their participation through online forms. Most teachers found the Illinois Chickscope inservice visits "very useful" to their classroom teaching. For example, a teacher who developed an activity about fertile and infertile eggs for her third- to sixth-grade students said:

> *Chickscope means bringing life and interest into the lives of several children. It means giving students something exciting to learn about and do in school. It means giving students an opportunity that they might not otherwise have. Chickscope means giving students additional technical skills and knowledge both about computers and about science. Chickscope has meant a lot of things to me. It has encouraged me to think differently about teaching and about learning. It affirmed for me that it is okay to do things that aren't necessarily normally done. For instance, hatching chicks in the computer room is not something that is done every day.*

It amazed several students, parents, and community members that we did hatch chicks in the computer room but it also helped show those connections in real life science that aren't always seen. Chickscope brought a lot of excitement and fun to my classroom and to my students. I have thoroughly enjoyed it and plan on using the information I have gained from it a lot in the future. –Tara Allen, Marshall North Elementary School, Marshall

However, the spring and summer inservice visits were not enough for most teachers to fully integrate Chickscope materials into their classrooms. One reason for this is that Chickscope has resources that are applicable to different subject areas–even social science, language arts and art–across K-12. Consequently, teachers needed ample time to not only to familiarize themselves with the Chickscope resources, but also to share curriculum ideas with each other.

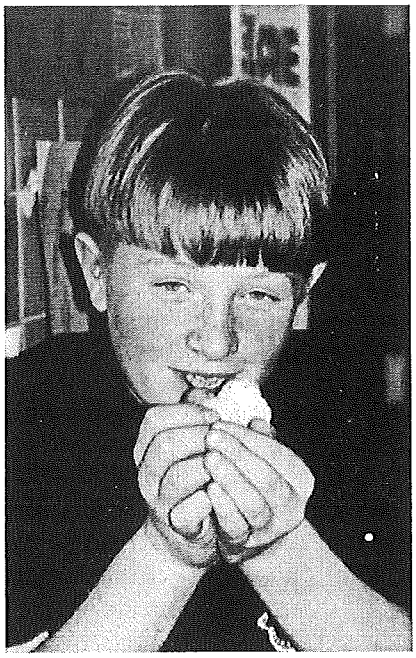
Another reason is that teachers who have developed curriculum materials that are still works in progress need additional time to continue working by trying out these materials initially in their classrooms with small student groups. For example, a fifth-grade teacher who worked with a fifth-grade teacher from another school on a curriculum project about investigating vertebrates said:

I feel that this project provided me with lots of background information as well as resources for using chicken embryology in the classroom at my grade level. The MRI database and the Chickscope homepage offers a variety of resources that I can use. – Brenda Foster, Dr. Howard Elementary School, Champaign

Teachers shared their growing knowledge through curriculum units, lesson plans, and classroom stories that have been posted on a new web site, called *The Inquiry Page* <http:/ /www.ed.uiuc.edu/inquiry/>. This web site has been recognized for its potential as a resource for both preservice and inservice teachers for a variety of projects like Chickscope.

Classroom Implementation

A detailed situated evaluation of classroom implementation of the Chickscope ideas is given in Hogan (1999). Here, we briefly report on one classroom as an exemplar of the kinds of changes we documented in the project.



In mid-March of 1998, one of us (Maureen Hogan) observed in two sixth-grade classrooms at Hawthorne Middle School in Mattoon, Illinois, where Illinois Chickscope teachers were incubating chicken eggs. The field notes and analysis of documents indicate that students improved knowledge, skills, and attitudes toward science because of the program.

Specifically, the teachers' inquiry-based science curriculum helped students learn scientific method and measurement. During the 21-day incubation period, the students observed eggs, candled them, and made predictions about their development. They also learned about incubation, a process that requires careful administering in order to ensure successful hatching: not bumping the incubator, turning the eggs regularly, carefully monitoring temperature and humidity, were all important lessons.

When the chickens hatched, students named them, identified their breed, weighed and measured them at two-day intervals and charted their age and growth. Charting growth was not always easy for children to do, because chickens move around a lot. The children discovered that they had to weigh and measure the chickens more than once in order to get a satisfactory reading.

As a result of this project, the students' knowledge and skills about embryology, incubation, the scientific method, and measurement improved. Most remarkable, perhaps, was an improvement in their attitudes toward science, as indicated by their level of involvement. Children unsolicitedly helped in incubator management and chick care. The sixth graders were so excited about this project that they often came in early and stayed late to care for their chickens. They invited their parents and grandparents to their classrooms to see the project. One parent told a Chickscope teacher that her child was more excited about the hatchings than about Christmas!

Interaction with Content Experts

In general, all teachers were appreciative of the opportunities to interact with experts from different disciplines during the Illinois Chickscope inservice visits. For example, excluding the project staff and students who worked closely with the teachers, there were over 15 experts who gave presentations and interacted with the teachers during the spring and summer semesters. In their final feedback, more than half of the teachers volunteered that the expert speakers provided them with new science information, encouraged them to inquire further, use new skills, apply it to instruction, and share what they learned with their colleagues.

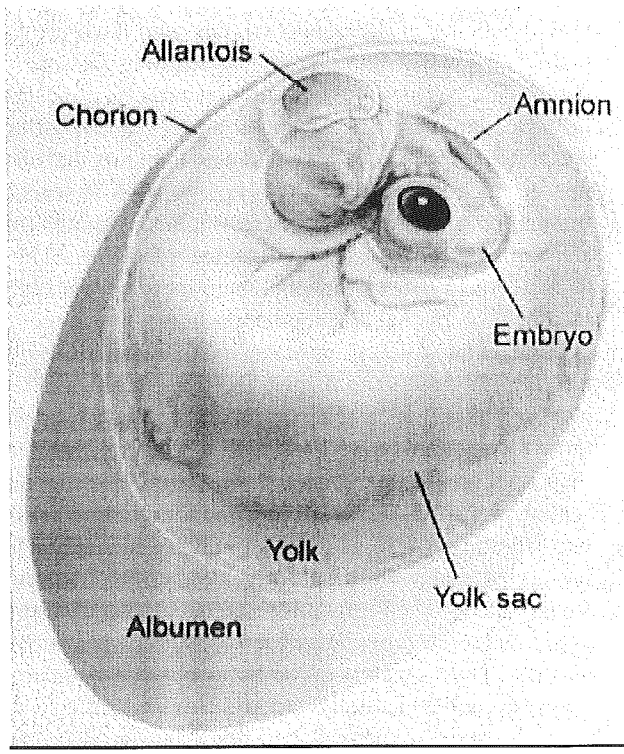
As a result of these interactions, the main Chickscope web site underwent extensive revision and expansion during the project. A major unit on egg mathematics was added along with an interactive database of MR images. Information about chicken breeds, poultry farming, embryology, imaging technologies, chemistry, genetics, and many other areas of science and social science have been incorporated. The site receives over a hundred visits a day from around the world.

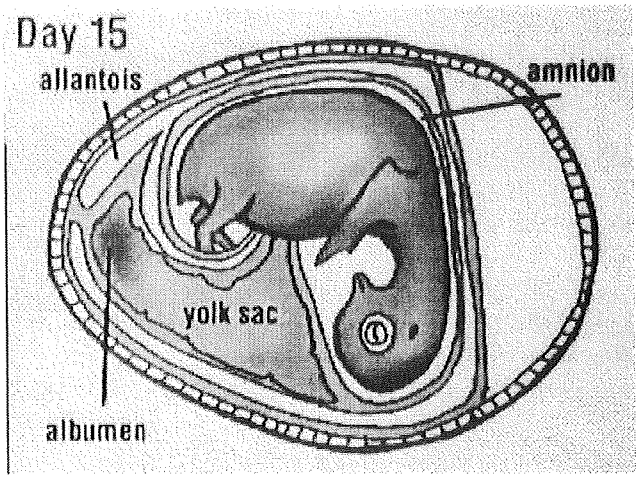
Community for Learning

During the inservice, especially during the summer, the teachers focused on a broad question: How do we build a community for inquiry learning?

It was critically important to include teachers in the dialogue about inquiry-based learning and teaching. Each day in the summer inservice began with one of the inquiry questions listed above to guide the discussion as well as the design and development of curriculum materials. Teachers developed personal definitions for inquiry. One teacher said that inquiry learning refers to a "process to stimulate students' critical thinking skills in which the teacher serves as a facilitator. It helps encourage a desire for learning, and problem solving." Sabra Culp, a sixth-grade teacher from Hawthorne Middle School, Mattoon, who constructed a Chickscope unit on measurement with Clyde Self, pointed out how important it was to learn from one another:

> I feel that the group (instructors and participants) feel comfortable in sharing their successes and problems. We certainly are learning from each other, as well as being provided with material (some applicable, some not) that we as professionals have to evaluate to see if it fits our needs.





Indeed, building a supportive teacher community to discuss inquiry-based projects was the centerpiece of the Chickscope inservice.

Conclusion

In sum, Illinois Chickscope built a community of teachers; linked that community with scientists in a variety of disciplines; promoted an integrated understanding in science and mathematics; and taught new ways of using the Internet.

The project has been described favorably in a variety of news media, including *The News-Gazette* (in news, education, and agriculture sections), *Inside Illinois, info.ed, The Marshall Choice Independent,* and WOR-TV. See attachment for the complete list of Chickscope publications and presentations.

Bibliography

Beyer, B. K. (1971). *Inquiry in the social studies classroom.* Columbus, OH: C. E. Merrill.

Bruce, B. C., Carragher, B. O. Damon, B. M., Dawson, M. J., Eurell, J. A., Gregory, D. D., Lauterbur, P. C., Marjanovic, M. M., Mason-Fossum, B., Morris, H. D., Potter, C. S., & Thakkar, U. (1997). Chickscope: An interactive MRI classroom curriculum innovation for K-12. *Computers and Education Journal*, 29(2), 73-87.

Hogan, M. P. (1999). *Chickscope realized: A situated evaluation of an inquiry-based sixth-grade classroom.* <http://dd.davedash.com/Chickscope/hogan-19990421-chickscope.html>

Loucks-Horsley, S., Stiles, K., & Hewson, P. (1996). Principles of effective professional development for mathematics and science education: A synthesis of standards. *NISE Brief*, 1(1), 1-6.

Acknowledgements

Chickscope has been developed by educators and researchers from eight university units in collaboration with inservice and preservice teachers. Participating University of Illinois units include Animal Sciences, Beckman Institute Visualization Facility, Biomedical Magnetic Resonance Laboratory, Curriculum and Instruction, Electrical and Computer Engineering, Mathematics, National Center for Supercomputing Applications, and Veterinary Biosciences.

In addition, the Earth Partners, the Regional Office of Education SchoolWorks, and the Area IV Learning Technology Hub are involved in the project. Also, the Image Processing for Teaching project at the University of Arizona has developed Chickscope imaging activities to introduce students and teachers to software and methods for analyzing image data <http://spuds.lpl.arizona.edu/chickscope>.

Illinois Chickscope is supported in part by the Illinois Board of Higher Education through the Dwight D. Eisenhower Professional Development Program. Additional support was provided by the Lumpkin Foundation and the Illinois Consolidated Telephone Company, the University of Illinois at Urbana-Champaign Campus Research Board, the Committee on Institutional Cooperation, and the National Science Foundation's Partnership for Advanced Computational Infrastructure (PACI) Research Experiences for Undergraduates Program.

The project is indebted to the teacher participants for their work as true collaborators and to university scientists and mathematicians, Stephen Bradlow, Bridget Carragher, Jo Ann Eurell, Ken Koelkebeck, Stuart Levy, Barbara Mason-Fossum, Clint Potter, Janet Sinn-Hanlon, J. Sullivan, andAndrew Webb. We would also like to thank many colleagues in the College of Education and at NCSA for their generous support throughout the project. Special thanks go to Alexis Benson, Robbie Berg (Earth Partners), Myrna Craig, Dave Dash, Eunice Greer, Dean Grosshandler, Karl Koenke, Scott Lathrop, Kay Nichols, Frank Rusch, Ken Travers, Daniel Weber, and Elyse Wright for their assistance and support.

Marianne Barker
Carmel High School
One Carmel Parkway
Mundelein, IL 60060

THE ROLE OF THE K-12 CLASSROOM TEACHER IN THE REFORM OF THE UNDERGRADUATE COLLEGE SCIENCE CURRICULUM FOR PRESERVICE TEACHERS

In the middle of the nineteenth century, North American preservice teacher educators were usually exemplary classroom teachers, who regularly managed to teach grades 1-8 in a single room. They fostered the desires and talents of some of their best students and prepared them to assume the role of teachers. As our population burgeoned and our need and desire for secondary education mushroomed, normal schools and teacher colleges were established for the specific purpose of training teachers for the common and high schools. In this milieu, former classroom experts taught a review of high school subjects and a methods-imbued education curriculum. Eventually, entire programs of teacher education were established within universities, with professors regularly teaching university academic coursework, and the responsibility for the weeks of practical training handed over to classroom teachers. Thus, the preparation of new teachers in the theoretical realm became divorced from their preparation in the practical realm. This estrangement did not go totally unmourned. In 1935, George Counts wrote of "...teachers now practicing in the public schools who have proved highly capable of stimulating the learning powers of pupils. These artists of the profession exercise almost no influence upon teacher training at present. An appalling waste is involved... It may be said with impunity that until master teachers are placed in a key position in teacher training programs, no real progress in raising qualitative standards in the profession will be recorded". (p. 221)

Efforts to reform teacher preparation since the 1950s include professional development schools, which recognize the unique perspective of the practitioner and provide a forum for teachers to display their best practices. The craft of classroom teachers sometimes challenges the more formal knowledge base that professors present for their undergraduate students. Professional development schools prepare teachers for leadership within their schools, but do nothing to reform the undergraduate curriculum for preservice teachers. In a paper presented in 1994, Katherine Boles stated, "The formulation and development of programs and reforms has never been considered the work of teachers. They just carry out plans developed by someone higher up in the hierarchy." (p. 4)

Another favored strategy for reforming teacher education since the 1980s is mentoring, in which an experienced classroom teacher provides onsite support and assistance to a novice during the first year of teaching. While mentoring has had a positive effect on teacher retention, it has a questionable effect on reform. (Feiman-Nemser, 1996) Unless novices are placed with mentors who are already reformers in their schools and classrooms, the mentoring system often promotes conventional norms and practices, thus limiting reform. (Cochran-Smith, 1991)

Both professional development schools and mentoring simply occur too late in the preservice training of teachers. Generations of experience have demonstrated that new teachers teach the way that they themselves were taught. This statement is substantiated by a qualitative study undertaken as part of the Salish I Research Project. After exhaustive interviews and observations of several beginning science teachers, one inescapable conclusion was that the most profound influence on how the beginning teachers practiced in their own classrooms was their most significant learning experiences in their content courses, not their methods courses. (Adams & Krockover, 1997a) "What is evident is that subject matter courses serve as a model for instruction. It is unfortunate that the model may be faulty." (p. 647) One implication is that the way the subject matter courses are taught should change. (Adams & Krockover, 1997a, 1997b) The teachers of today have been, of necessity, students who benefited from lecture and textbook-driven curricula when they were in colleges and universities. At least as important as how undergraduate students *learn,* should be the ways they did *not* learn. Among my personal acquaintances are many elementary teachers suffering from what I refer to as "terminal math(ematics) and science anxiety". This is an indication that they did not experience success in their undergraduate mathematics and science courses. However, new teachers usually perpetuate the style of the courses they experienced in college, along with the attendant anxiety. After a few years, they realize that they are "reaching" very few of their students. A teacher in this dilemma has three options: blame the perceived decline in student intelligence and keep plodding, abandon teaching and turn to another line of work, or start experimenting with all the different ways that students learn. The committed educator will engage in graduate coursework and/or enroll in summer programs that integrate what research has shown to be effective with practical classroom applications. When teachers start to explore professional journals and innovative professional development opportunities, they usually experience positive results. Unfortunately, a gap of several years often occurs between the completion of the undergraduate degree and further exploration, due to constraints of time, money, or loss of enthusiasm. Therefore, any major effort in the reform of science teaching must occur in the undergraduate preparation programs for teachers. (Yager, 1991)

In order to minimize or eliminate this gap, the preservice teacher needs to be exposed to the more successful and many ways that students learn while they are still undergraduates. They need to learn in a different way than the limiting lecture/textbook curriculum still prevalent in so many universities. One important component in the reform of the undergraduate curriculum is communication between successful K-12 classroom teachers and college educators. This communication is critical since 17% of education professors in a recent survey have never been K-12 classroom teachers, and of the remaining 83%, 51% have not been K-12 teachers in 16 or more years, (Public Agenda, 1998) and nearly 100% of college science faculty have never been K-12 teachers. Classroom teachers, who have invested years of energy and learning in their professional lives in the schools, have expertise based on their inside-school perspective that is different from and as valuable as, the expertise of outside researchers, administrators, arid specialists. (Cochran-Smith, 1991)

Truly creative teachers love to share their successes and new materials with others by way of professional meetings and journals. There are dozens of competitions and award programs which encourage innovation and communication of enhanced learning by students. Prospective master teachers, who could be the partners with college science and science education professors in creating new curricula, can easily be found among the award winners, the authors, and the participants in competitive summer programs. These teachers, themselves lifelong learners, also love experimenting with new methods to see what "works" in the K-12 classroom, and find that they have students who are also enthusiastic about trying something new.

Collaboration between college science and science education faculty and experienced classroom teachers is not a new idea, but contemporary reformers are becoming more vocal in their encouragement for this cooperation. (Goodlad, 1990; Cochran-Smith, 1991) While the encouragement is strong, collaboration has been slow to spread among teacher education programs. An ERIC review of the available literature using the descriptors: Preservice Teacher Education, Reform, produced 496 articles, but unearthed only a handful of references that specifically incorporated master teachers from the K-12 classroom into the reform of the undergraduate curriculum earlier than the student teaching experience. The University of Northern Colorado Preservice Elementary Science/Mathematics Project utilizes on-campus teaching fellows (experienced elementary and middle school teachers) to cooperate with college faculty to revise, deliver, and evaluate science and mathematics content and pedagogy courses and model effective teaching strategies. (Heikkinen, et al., 1992) The Model Clinical Teaching Network in North Carolina includes 12 pilot programs, four of which incorporate master teachers as partners with university professors. (North Carolina University, 1992)

Nowhere is the call for reform in teacher preparation more urgent and vocal than it is for science and mathematics. The urgency of the call is evidenced by the considerable support of the National Science Foundation grant-funded Collaboratives for Excellence in Teacher Preparation Program (CETP). The description of the CETP program states: "Collaboratives derive from the leadership and participation of faculty members in science, mathematics, and engineering departments, in concert with colleagues in education departments, and in the pre-K through grade 12 community." (National Science Foundation, 1998) As of 1998, there are 16 funded full collaborators in the CETP program. An Internet visit to each of their sites found that only four of the Collaboratives (25%) tap into the experience and insight provided by committed and creative K-12 educators earlier than the student teaching internship. The collaboratives that mention using teachers as teachers in residence or as clinical faculty are: the Rocky Mountain Teacher Education Collaborative, the Oklahoma Teacher Education Collaborative, the Virginia Urban Corridor Teacher Preparation Collaborative, and the New Mexico Collaborative for Excellence in Teacher Preparation. The remaining partnerships (75%) utilize mentors for new teachers, professional development schools, or college faculty to recreate their undergraduate curricula.

Roger Neil (1992) describes six paths along which regular classroom teachers can presently develop themselves: 1) toward teacher federation positions; 2) into consultancies; 3) to board-level administration; 4) into governmental ministries; 5) to the scholarship of a university faculty; or 6) to become an increasingly excellent classroom teacher. He asserts that there are subtle and overt rankings within each career path, but not between them. "The road to becoming an excellent teacher is not lower or easier, or less meaningful than the road to becoming a faculty professor, yet preservice teacher education programs have failed to connect classroom practitioners with faculty members in any consistent fashion because teachers' lack of recognition is congenital in the faculties and endemic in school boards." (p. 34) On the other hand, the mistrust extends in both directions. The authors of a new report, *Talking About Leaving: Why Undergraduates Leave the Sciences,* found that both students who left the sciences and those who did not voiced similar concerns about the teaching, advising, assessment practices, and curriculum design of their science, mathematics and engineering courses. Among those who are lost to the sciences are very talented students who are turned off by poor teaching and a boring curriculum. Furthermore, in the competitive culture of college science, with many courses structured to "weed out" a certain percentage of students, faculty also actively discourage students who are science, math, or engineering majors from entering K-12 teaching, conveying the impression that it is an inferior profession. At the same time that reformers are calling for science for all students, colleges and universities are limiting its pursuit to the so-called elite, those who can learn in spite of poor teaching, unrelenting competition, and lack of support. (Seymour & Hewitt, 1997)

If true reform is to occur in teacher preparation, we must include teachers into the work of teacher education as partners, not subordinates. While professors epitomize knowledge in their content areas, most are not able, due to constraints of time or other commitments, to keep abreast of innovative teaching practices and cannot have the same experiences as classroom practitioners. Among the basic ingredients, examined by MPR Associates for the U.S. Department of Education, that are necessary for the success of a reform effort, are shared vision and gaining the support and commitment of a wide range of stakeholders. (MPR Associates, 1997) Truncating communication with those closest to classroom teaching seriously undermines the likelihood that the reform will succeed. Collaboration of teachers and professors in teaching prospective teachers by the same methods considered most successful in enhancing learning in the K-12 classroom by classroom experts will re-form, not merely re-arrange, the undergraduate curriculum for preservice science teachers. People who are excellent educators exist and practice at every level of the educational continuum from pre-K through graduate school. Working together will help us realize our common goal of preparing our teachers for the 21st century.

References

Adams, Paul E. & Krockover, Gerald H. (1997a) Beginning Science Teacher Cognition and Its Origins in the Preservice Secondary Science Teacher Program. *Journal of Research in Science Teaching*, 34(6), 633-653.

Adams, Paul E. &I Krockover, Gerald H. (1997b) Concerns and Perceptions of Beginning Secondary Science and Mathematics Teachers. *Science Education*, 81(1), 29-50.

Boles, Katherine & Troen, Vivian. (1994) Teacher Leadership in a Professional Development School. Paper presented at the Annual Meeting of the American Educational Research Association. (New Orleans, LA, April 4-8, 1994) (ED375103)

Cochran-Smith, Marilyn. (1991) Learning to Teach against the Grain. *Harvard Educational Review*, 61(3), 279-310.

Counts, George. (1935) Break the Teacher Training Lockstep. *Teacher Education in America.* ed. Merle Borrowman (New York Teachers College Press, 1965; original in the *New Frontier*)

Feiman-Nemser, Sharon. (1996) Teacher Mentoring: A Critical Review. *ERIC Digest*, ERIC Clearinghouse on Teaching and Teacher Education, Washington, DC, July, 1996. (ED397060)

Goodlad, John. (1990) *Teachers for Our Nation's Schools.* Jossey-Bass, Inc., Publishers, San Francisco, CA.

Heikkinen, Henry W., et al. (1992) Classroom Teachers as Agents of Reform in University Teacher Preparation Programs. *Journal of Teacher Education*, 43(4), 283-289.

MPR Associates the U.S. Department of Education. (1997) Fitting the Pieces: Studies of Education Reform. U.S. Government Printing Office, Washington, DC. *NSTA Reports!*, 8(5), 11. April, 1997.

National Science Foundation. (1998) Collaboratives for Excellence in Teacher Preparation. <http://www.ehr.nsf.gov/ehr/due/progi-ams/cetp.htm>

Neil, Roger. (1992) Increasing Fidelity between Faculty and Field in Teacher Education - Reconceptualized Institutional Settings, Programs, and Roles. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA. (ED349284)

North Carolina University. (1992) Learning to Teach in North Carolina. Model Clinical Teaching Network. North Carolina University, Chapel Hill. (ED366548)

Public Agenda. (1998) Different Drummers: How Teachers of Teachers View Public Education. *NSTA Reports!*, February-March, 1998, 4.

Seymour, Elaine & Hewitt, Nancy. (1997) *Talking About Leaving: Why Undergraduates Leave the Sciences*, Westview Press, Boulder CO. *NSTA Reports!*, 8(5), 15. April, 1997.

Yager, Robert E. (1991) Science/Technology/Society as a Major Reform in Science Education: Its Importance for Teacher Education. *Teaching Education*, 3(2), 91-100.

STUDENT BILL OF RIGHTS FOR SCIENCE EDUCATION IN THE 21ST CENTURY

1. Student learning shall not be based solely on a text-book.
2. Students shall learn through experience.
3. Students shall learn that science is a way of investigating questions in order to understand enough to ask new questions.
4. Students shall learn the difference between evidence and belief.
5. Students shall learn to use risk analysis and assessment in personal decision making.
6. Students shall learn to use evidence and tradeoffs in personal decision making.
7. Students shall learn the difference between science and public policy.
8. Students shall learn science that is related to their interests and responsibilities as a citizen.
9. Students shall learn in an atmosphere conducive to learning.
10. Students shall enjoy the experience of learning science.

Herb Thier, University of California Berkeley

Bora Simmons
Northern Illinois University
DeKalb, IL 60115
Reprinted from Project Learning Tree

HOW DO YOU KNOW A GOOD ENVIRONMENTAL EDUCATION CURRICULUM GUIDE WHEN YOU MEET ONE?

Answering this question is not easy. Yet, as we design our programs, selecting materials for a variety of settings and audiences, it is a question we face constantly. There are literally hundreds of environmental education materials available, on every environmental topic imaginable. So how do you decide whether a particular environmental education guide will meet your needs and the needs of your students? The following checklist will help you in the selection of materials for your programs*:

1. Are the materials fair and accurate?

__Materials reflect sound theories and well-documented facts about the subjects or issues.

__The range of perspectives is presented in a balanced way.

__Learners are encouraged to form their own opinions.

__Different cultures, races, genders, social groups, ages, etc. are included with respect and equity.

2. Do the materials encourage an in-depth examination of concepts and issues?

__The materials acknowledge that feelings, experiences, and attitudes shape environmental perceptions and issues.

__Rather than just presenting a series of facts, a unifying theme is used or important concepts are emphasized.

__Environmental concepts are taught within a context that includes social and economic as well as ecological aspects.

3. To what extent do the materials help learners build thinking skills?

__Learners are challenged to use and improve their critical thinking and creative thinking skills.

__Learners are given opportunities to arrive at their own conclusions about what needs to be done based on thorough research and study, rather than being taught that a certain course of action is best.

__Through the various activities, the learners gain basic skills needed to participate in resolving environmental issues.

4. Do the materials promote civic responsibility, encouraging learners to use their knowledge, personal skills, and assessments of environmental issues as a basis for environmental problem-solving and action?

__The materials encourage learners to examine the possible consequences of their behavior on the environment.

__Learners are challenged to apply the results of their research and thinking and act on their own conclusions.

__A variety of individual and community strategies for citizen involvement are discussed.

5. Do the materials present instructional techniques that create an effective learning environment?

__Activities allow students to build from previous knowledge and lead toward further learning.

__Linkages to informal and service learning opportunities in the community are made.

__Where appropriate, materials are keyed to national standards or standards adopted by the school district or state.

6. Are the materials well-designed and easy to use?

__The purpose and direction of the materials is clear to both educators and learners.

__Materials can be adaptable to a range of learning situations.

__Claims are substantiated by systematic evaluation and field testing.

Using the above guidelines, the PLT Activity Guides were reviewed by teams of classrooms teachers, content experts, and environmental educators. The results are published in *The Environmental Education Collection: A Review of Resources for Educators*. PLT's materials received a very positive review. Noted strengths of the PLT curriculum included: "encourages students to explore and develop their own opinions and values; students move through the stages of awareness, knowledge, consensus and action; clearly states goals, objectives and options for assessment."

* The checklist has been abridged from *Environmental Education Materials: Guidelines for Excellence, The Guidelines, and the Review of Resources for Educators*, published by the North American Association for Environmental Education (NAAEE) as part of the National Project for Excellence in Environmental Education. For more information contact NAAEE, at www.naaee.org.

Project 2061, Winter 1998-99
American Association for the Advancement of Science
1333 H Street, NW
PO Box 34446
Washington, DC 20005

WORKING TOWARD UNDERSTANDING IN THE CLASSROOM

Steve Holman, a science teacher at McNary High School in Keizer, Oregon, has recently embarked upon a new approach to teaching. Last spring Holman received training from Project 2061 Professional Development Programs in understanding the nature of benchmarks and standards, analyzing curriculum frameworks and materials, and designing instruction. Incorporating the Project 2061 training into his teaching led Holman to the discovery that his students were not attaining adequate depth of understanding of fundamental science concepts. Project 2061 staff member Terry Handy talked with Holman about what he has learned from Project 2061, why and how he has changed his teaching methods, and how he hopes to help his students to better understand what they are being taught.

TH: What alerted you that your students were not attaining the depth of understanding they needed?
SH: Last spring I was invited to take part in developing training for workshop leaders for Project 2061 Professional Development Programs. That experience opened my eyes to the fact that a lot of teachers are finding that their students do not really understand what they are being taught. Of course, I assumed that my students were learning what I was teaching. After all, they were doing well on tests. But upon closer scrutiny, I discovered that I really wasn't reaching them. For example, when a concept is fully understood, it's possible to apply it or at least speculate how to apply it to real life situations. But when I interviewed some of my students one-on-one and gave them a written test to see how well they understood the concepts I had taught, I realized that they could not translate what they had learned to applications outside the classroom. Part of this was lack of understanding and part of it was the students had never been asked to do this before. Either way, this is a real barrier for students.

TH: How are you attempting to correct this lack of understanding?
SH: One of the things I learned from my Project 2061 training is the importance of providing students with multiple experiences for each concept I introduce and the need to approach each concept from several different angles. I'm also trying to provide more opportunities for students to practice concepts and ideas in a lot of different contexts. I'm also re-teaching if it's clear that they're just not getting it, rather than shoving on under the pressure of having to cover every topic in the curriculum. I've tried to take more of a scaffolded approach-breaking down the concept into smaller, more "teachable" pieces. Then I try to teach each piece as a separate lesson, scaffolding or building up to the final concept. It seems to be working pretty well for some things and not so well for others. I think it's the right approach, but I need more experience with it.

TH: Describe the approach to teaching you used prior to this year.
SH: I think my approach was a little bit more traditional. My goal was to cover material, to get through a unit, to get to the next unit. I could only spend so much time on each unit, and when a unit was done, we moved on. That gets you through material efficiently, but it doesn't allow you to go back and ask, "Did they get it?" And if they didn't get it, "Now what do I need to do?" So for selected units, I'm teaching now with the notion that if they don't understand, then I'm going to have to devote more time. That's the main difference in my approach: I'm trying to be sensitive to whether I'm just covering material or truly helping them to master fundamental concepts.

TH: Are you satisfied that you're on the right track?
SH: Absolutely. I'm still struggling with what model to use to achieve that understanding. I think a teacher should expect to struggle with that for a while. I'm trying a lot of things. The scaffolding approach is something we spent a lot of time on in one of the Project 2061 workshops, and I'm finding that extremely helpful. So I'm on the right track, but I'm not there yet.

TH: Are any of the other science or mathematics teachers in your school using Project 2061 methods?
SH: Right now, I'm the only one, and it's difficult. Some of my lesson sequences are quite a bit slower than those of my colleagues because I stop and go back and re-teach. It just takes more time to be sure students really know the material.

TH: What impact have the changes in your approach to teaching had on you?
SH: It's been tough to realize that what I had been doing simply wasn't working. It's easier to go along and blithely assume that things are going the way you think they are going. Since this is the first year I've tried this new approach, I didn't expect it to work right away. Yes, last year and the year before I felt more successful, but it was only because I wasn't asking the right questions.

TH: What advice would you offer to teachers who want to know whether their students really understand what they're being taught?
SH: Pick one or two units that you know well and say, "What do I want them to know at the end of this?" Then design an interview where you can talk with a few students to find out what they really understand. Ask application questions instead of recall questions, and then try to identify the pieces that are missing from their understanding and redesign the unit based on that feedback. But only do it for a couple of units to start with. I think if you try to do it for everything it will be overwhelming, and you'll be more likely to give up and go back to the old way. I would also advise teachers to get some training in teaching to benchmarks and standards and teaching for understanding. I think that is something a lot of teachers are missing. I don't think you can expect things to change overnight. I think that next year I'll be far better and the year after that better still. I hope that in three or four years I will be where I want to be, and I will just be fine-tuning from then on.

Augden F Windleborn
Physics Department
Northern Illinois University
DeKalb, IL 60115

TEACHING TECHNOLOGY

The Illinois Learning Standards, available through the ISBE homepage (http://www.isbe.state.il.us/), list state standards by subject area. An examination of each of those subject areas will show that they all include a technology component. Every teacher in Illinois should be trained and comfortable working with technology if the goals are to be met. If this is to be achieved, many teachers will need to significantly improve their knowledge of using technology as a teaching tool. Science and math teachers in particular take on a leadership role in the use of technology at many of the state's schools. If they can successfully infuse technology in their courses, other teachers will have a mentor and an example to follow.

I have conducted or been involved in a number of science-education grants that have employed computer technology. In some of the programs teachers claimed to have been previously trained in the use of computer technology. In most of the programs, teachers have been trained in the use of technology as part of each grant. As a result of my experiences, I have a number of recommendations concerning how teachers should be trained in the use of technology and suggestions for future technology training projects. This information can be helpful if you are designing a training experience or evaluating the type of training experience you will take.

One person, one computer - It is the rare situation where enough computers exist at a training site for there to be one computer per person. Unless this is the case however, individuals are sitting and watching at least half the time when they should be doing. The only way to truly learn to use computer technology is to use it often enough so that the participant's comfort level rises high enough to ensure continued use. This also means that the majority of the training, if not all, takes place at the computer. Watching someone else do the work doesn't work well with computers.

Use your own computer - MACs or PCs, ZIP drives or floppy, handheld or flatbed scanners. It is important to provide teachers with an exposure to the available technology but if they don't have it they can't use it. Teachers were often frustrated because they could do some task on one of my machines but not on their own. Some programs are dependent on computer configuration or components. All PCs with Windows 95 or 98 are not created equal. The best way to ensure that teachers will continue to use computers as a teaching tool is to train them on their own computers. Training teachers on a PC and then sending them off to work on MACs does not make sense. To use a program on their machine, teachers must have the program installed on their machine. When teacher are done with the training, their computer and the software on it go with them.

Use only available software - There are extremely impressive things that can be done if you have the software. Again, it is helpful to show teachers what is available but they should only be trained on software which they will have. Some amazing things can be done with graphics programs that cost $500 but I seldom meet teachers who have that much money to spend on a single program. I make it a point either to give teachers software to use and keep (purchased through a grant program) or to make sure that I only use freely available software. There is a lot of good quality software available at little or no expense if you only hunt for it. It

may not do everything the expensive software does but the price is right. I have found that sometimes I prefer the free software. Some wonderful sites for free software include Nonags at (http://www.nonags.com/index.html) and Freeware Home at (http://www.freewarehome.com/). These sites feature programs and not curricular materials. Many sites exist for instructional materials and every teacher soon finds a favorite source. As teachers learn more about their needs and abilities they can get their own software. Regardless of your views on MAC's versus PC, it must be recognized that there is more software available for PCs now than for MACs. If you are taught how to do a task with software only available for a PC and you own a MAC (or vice versa), the training was a waste.

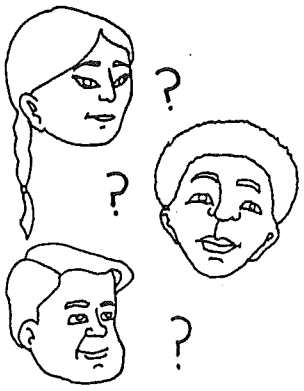
High-speed connections - A new source of frustration is slow or out-of-service internet connections. Not everyone has a high speed connection in their classroom but not everyone needs it. For teachers of younger children, I recommend developing cds which contain all programs and files needed for activities. In this way, young children don't access the Internet. I don't care how fast your Internet connection, you can read it from a cd faster than you can download it from the net. It also means that learning continues even when the gateway goes down. While teachers are developing their lessons they will need to access the Internet. To keep teachers from getting bored or limiting their searches for material, a high speed connection is truly valuable. In other words, try to avoid teaching people to access the net using a 28.8 kbps connection.

Work together, separately - Sharing ideas is a great way to stimulate the imagination. Having one computer per person doesn't mean that people can't work together. It just means that they each can, and should, do everything that needs to be done. I find the best arrangement is to have about no more than 8-10 people per room per support person. Too many people in a room leads to a production line feeling. Too few support staff means that people are sitting waiting for help when they could receive a word or two of help and be on their way again. The quality of the support people involved in training is crucial. When teachers are first being trained on a topic, the questions are much more frequent and require more in-depth answers. The support person desired is one that can answer nearly all the questions immediately in a simple, clear manner. One who takes over and uses the computer is not desired.

Lead, don't push - Not everyone wants to learn everything that is being taught. That is a surprise to some teachers but it shouldn't be based on their experiences as students. Some people just aren't ready to learn what is being taught when it is being taught. I have found that the best thing to do is to show what can be done then let people proceed toward that goal at a *reasonable* rate. Reasonable means different things to different people. The best definition in this circumstance is that the individual keeps learning. Technology can be very intimidating to the average person with little previous experience. Pushing technology at too fast a pace simply breeds resistance. Remember the goal is to get the teacher to acquire skills and use them.

Start simple - Show the simple way of doing things before the sophisticated method. This might seem obvious but in the rush to teach the most current and up-to-date technology simplicity is often lost. I have much more luck using a WYSIWYG HTML editor (such as AOLpress) as an introduction to webpage design instead of a program that requires that code be written. Once people feel comfortable, it doesn't take long before they can be encouraged to start looking at the code to correct problems and add features that the program can't handle.

Scheduling - It is more effective to offer many short classes instead of one long class. Too much material at one time is overwhelming. By offering a number of short training sessions, people can pick what they need. My experience has shown that most teachers who claim computer experience overestimate their abilities rather than underestimate them. By offering short classes, with specific goals people are more likely to receive the training they need. Unless the subject is very small, you usually can't learn everything in one sitting. Time should be left between sessions so that new skills can be practiced. Have a short assignment which requires "homework" to be shared to ensure that practice is done.



Software versus hardware - Teaching people how to use software is a worthwhile task but often ignores the fact that many of the problems teachers have are related to the hardware. I have met an extremely limited number of teachers who know hardware well enough to repair or troubleshoot a hardware problem. My exposure to teachers may be limited but hardware people are hard to find. Most people are afraid to even open their computer, let alone change something inside. The US Department of Labor and Education established the Secretary's Commission on Achieving Necessary Skills. Its purpose was to determine the skills and competencies that American workers would need in the future. The results were published in a document entitled "What Work Requires of Schools: A SCANS Report for America 2000" (U.S. Department of Labor, June 1991). In addition to the being able to select and utilize technology, the section on technology listed the ability to troubleshoot and maintain equipment as an important skill. To address these problems I have decided to begin teaching a course which will guide people through the process of constructing their own computer. Sessions will proceed from the selection of hardware to the installation and testing of necessary software. My experience so far is that the confidence and knowledge gained by such an experience helps in all computer areas, not just hardware. The cost of such a project is so low that teachers can pay for the equipment and class and still save money compared to buying a comparable computer.

I hope that these suggestions are helpful. If you would like additional information regarding upcoming training sessions, feel free to contact me at augden@niu.edu.

Project 2061, Winter 1998-99
American Association for the Advancement of Science
1333 H Street, NW
PO Box 34446
Washington, DC 20005

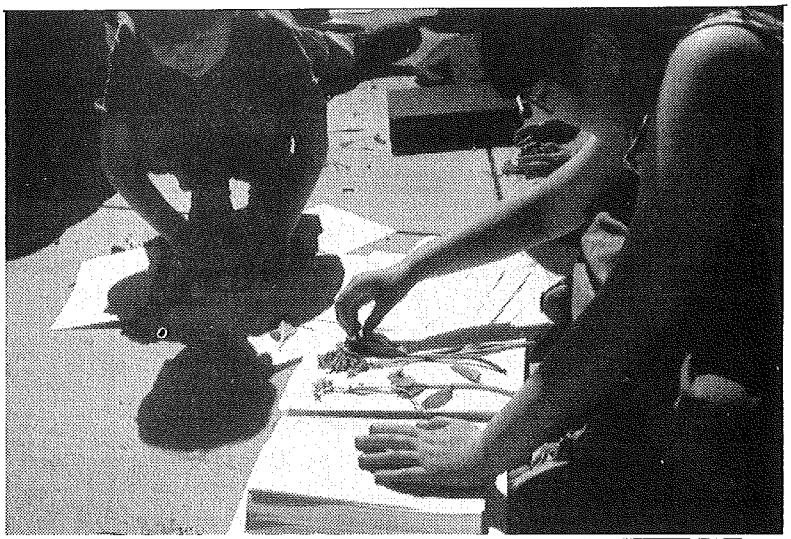
EXPLORING SCIENCE, MATHEMATICS, AND TECHNOLOGY FOR PRESCHOOLERS

What children experience in the pre-kindergarten years could determine how well they learn science, mathematics, and technology when they are older. Unfortunately, early childhood education in these areas is largely inadequate in the United States. These are just two of the findings revealed in *Dialogue on Early Childhood Science, Mathematics, and Technology Education*, the latest publication from Project 2061.

Although past educational research has cast doubt on very young children's abilities to understand these subjects, several experts contend that young children may be capable of learning more than previously thought. According to Jacqueline R. Johnson, a sociologist and anthropologist at Grand Valley State University, "More recent [research] grounded in developmental and cognitive psychology suggests that children are indeed capable of concept-based, theoretical learning."

The best ways to develop science, mathematics, and technology experiences for young children are explored in Dialogue, a compilation of 15 papers commissioned by AAAS for its February 1998 Forum on Early Childhood Science, Mathematics, and Technology Education. More than 100 experts gathered at the Forum, which was funded by the National Science Foundation, to exchange ideas and identify the most promising directions for new research. In addition, the book contains an extensive bibliography and list of resources for educators, parents, and advocacy groups.

To order a copy of *Dialogue*, please contact the AAAS Distribution Center, 1-800-222-7809, P.O. Box 521, Annapolis Junction, MD, 20710. (Item #99-06S: 200 pages, $12.95.) The full text of this publication is also available on-line at Project 2061's Web site, http://project2061.aaas.org.

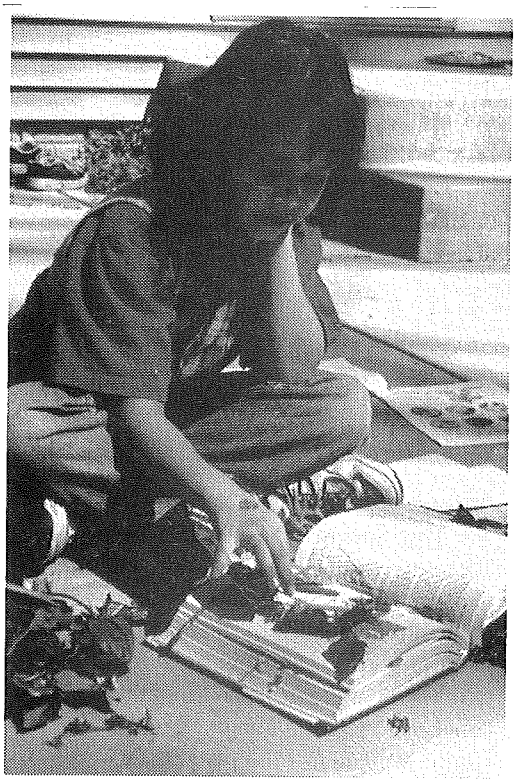


Photos on these two pages were taken by former ISTA Board member Marlene Gregor. Students of Linda Ball, kindergarten teacher at Thomas Metcalf Lab School, on a wildflower field trip in April on the property of Dr. Tak Cheung and Dr. Jonë St. John along the Vermillion River near Cornell, IL.

Gary Scott, California High School Director
Reprinted from *California Classroom Science*, May 1999

INQUIRY AND THE NATURE OF SCIENCE

Resisting the Folly of a Text-Driven Approach to Standards-Based Science Teaching



"It's like child's play." If you didn't know from the title of this article what question elicited this quote, then let me provide it, "Why did you become a scientist?" If you asked science teachers the same question, replacing scientist with teacher, many would respond, "Because I like science, and I want to make a difference."

What attracts people to the teaching and doing of science? The answer lies, in part, in the nature of science. Although there is some disagreement as to what constitutes the elements of the nature of science, there is general agreement on the following four areas (Eflin, et al. 1999).

1. **The Main Purpose of Science Is to Acquire Knowledge of the Physical World.**
2. **There Is An Underlying Order in the World Which Science Seeks to Describe in a Maximally Simple and Comprehensive Manner.**
3. **Science is Dynamic, Changing, and Tentative.**
4. **There is No One, Single Scientific Method.**

Kimball elaborated on the first tenet; "The fundamental driving force in science is curiosity concerning the physical universe. It has no connection with outcomes, applications, or uses aside from the generation of new knowledge," (Kimball, 1967).

Based on this consensus and description of the first tenet, this article will focus on inquiry and how it can inform and guide instructional practices. But what is inquiry? Some commonly used synonyms would include: investigation, inquest, inquisition, exploration, examination, study, research, quiz, scrutiny, interrogation. Webster's New College Dictionary defines inquiry as, "Search for truth, information, or knowledge; research; investigation, or a seeking for information by asking questions; interrogation; a question or questioning." The National Science Education Standards (NSES) has defined inquiry in the following way, "Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work." This definition goes beyond the common everyday use of inquiry by including how scientists study the natural world and how proposed explanations are evaluated. Often scientists study the natural world with more than their senses; for instance, specialized tools and instruments are commonly used to conduct inquiries. And when scientists propose explanations for their investigations or inquiries, they use well-defined logical thinking processes and procedures that are more rigorous than used in everyday life.

Colburn points out the distinction between scientific inquiry and inquiry based instruction (Colburn, 1999). Scientific inquiry refers to what scientists do whereas inquiry-based instruction describes teaching procedures.

Inquiry-based instruction does not imply a singular approach to the teaching and learning of science, rather it is a diverse activity involving problem posing and solving; observing; hypothesizing; examining written information; listening to others talk about concepts related to the investigation; designing investigations; using technology and scientific tools to gather, analyze, and interpret data, as well as effectively communicating results; and consistent use of critical and logical thinking. Students will develop knowledge and understanding of scientific ideas, as well as knowledge of how scientists study the natural world, through inquiry-based instruction.

Colburn, in his 30 year review of inquiry research in the journal of Research in Science Teaching, elaborates on the difficulties of defining inquiry-based instruction (Colburn, 1999). "Suchman described the inquiry-based instructional model. The author (Suchman) believed three conditions to be necessary for inquiry to occur in classrooms. First, children needed a focus for the attention, preferably a discrepant event. Second, children needed freedom to explore. Finally, they needed what he called a responsive environment." In contrast, Colburn describes Staver & Bay's categorization of inquiry to include structured inquiry, guided inquiry, and open inquiry. These terms "essentially correspond to those use by Herron for describing the extent to which laboratory structure is provided by the teacher versus being figured out by the students," (Colburn, 1999).

In structured inquiry, students are provided the problem, methods, and materials, but not the outcomes. In guided inquiry, only the problem and materials are given, and in open inquiry students must do all of the elements (Colburn, 1999).

Brian Poelker
Midwest Central Middle School
Green Valley, IL 61534
bpoelker@ntslink.net
309-352-2300

THE SPECTROSCOPIC CHRISTMAS TREE: A LEARNING CYCLE

Introduction for the Teacher

The Spectroscopic Christmas Tree is used to introduce the concept of spectroscopy. Students know that light is a combination of all the colors of the rainbow. I have found that few of my students have internalized this concept. The vast amounts of information we gather from distant stars and galaxies is based on the spectra of the stars. Information about the chemical structure or materials or medicines, or amounts of pollution present in the environment, comes from the spectroscopic analysis of "light" absorbed or emitted from the chemicals. "Light" is in parenthesis because we also use invisible light to make our analyses. Radio, infrared, UV and X-rays provide different information about the presence and structure of atoms and molecules. The Spectroscopic Christmas Tree is a first step in understanding this information.

A few days before Christmas break I attach strands of white Christmas lights to the wall of my classroom in the shape of a Christmas tree. When students ask when we will turn the lights on, I explain that this is most wonderful and colorful Christmas tree in the world but we have to wait until just before Christmas to turn it on. I try to keep the suspense up about the tree for a few days, and let students wonder what it will look like when it it finally lit.

Objectives:

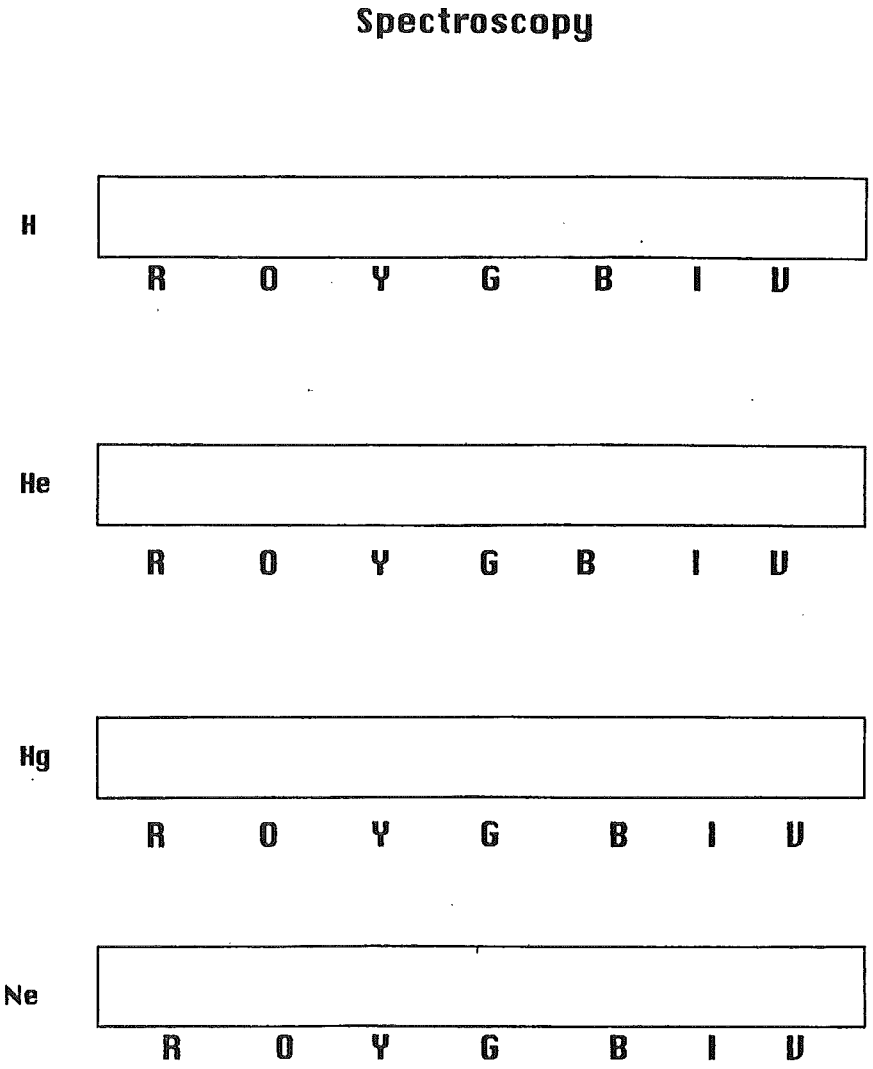
1. Students will know that light is a combination of the colors of the rainbow.
2. Students will know that we can identify elements based on the colors they emit.

Exploring:

(Materials: strand of white Christmas tree lights) Students are asked to make careful observations and look for details as we light the tree. The lights are turned out and the tree is lit. Students record details. (Students are disappointed because the tree is "only white". Emphasize the need to record all of the details that can be observed.)

Discussion:

1. Describe the details you observed. (A variety of student answers.) The tree is "only" white. However, students observe shapes, shadows, rays of light, numbers of bulbs and a variety of miscellaneous features like the number of lights, etc. When I ask the students what colors they see. "White," is the unanimous answer. Students are placed in teams of three and compare their observations and make a master list. Student teams share their observations with the class. I next ask students to think like an astronomer or a chemist and try to add more details to their list.



More Exploring

I hand each student a pair of "Diffraction Glasses". They go by various names. The glasses are made of a plastic diffraction gratings. The lines are sketched in an overlapping pattern to produce multiple spectra. We wait until all of the students have their glasses and the lights are turned out. The room must be very dark. All of the students put the glasses on at the same time. Now we have "oh's" and "ah's" and even some "wows!" The diffraction grating produces a rainbow of colors for each light, a very colorful pattern indeed! Students standing 3 to 4 meters from the tree seem to have the optimal view. Students record details.

Discussion:

1. What are the differences in the patterns now visible? (Colors! Also, the patterns of shadows are no longer visible.) 2. What is the pattern of colors? (Students should notice that the violet is always on the inside of the spectrum and the red on the outside. Rainbow of colors. ROYGBIV. Those colors were "hidden" in the white light we just needed some help to see them.) 3. What can we say about white light? (White light is a combination of colors.)

Application

Individual elements produce a bright line spectrum of light. The light emitted by elements is not pure white, but it can also be broken into components. When viewed though a diffraction grating the colors separate, not into a rainbow, but into lines of color, "the backbone of the rainbow". By comparing the spectral lines we can tell the elements apart. Four elements in vacuum tubes are used for the application; hydrogen, helium, mercury vapor and neon. The tubes are placed in a spectrum tube power supply and the students record the color of light coming from each. Students are ask to predict the color of light when they look though a diffraction grating. An ideal student prediction would be that the light will be divided into colors but some of the colors will be missing. Holographic diffraction gratings that produce lines on a single plane are preferred for this part of the learning cycle. Students view the elements through the diffraction grating and record their observations and compare them to their predictions.

Students are asked how it is possible to tell the elements in stars apart. (Each element produces its own set of lines.) Why is it better to use a slide diffraction grating for the spectrum tubes rather than the glasses? (Only one set of spectral lines to view instead of several.)

Extension

1. View the video segments of Annie Jump Cannon, Nancy Houk, and Cecilia Payne from The Ring of Truth Public Television Series, by Philip Morrison. This segment, titled "Doubt", depicts the first analysis of the spectroscopic message of starlight.

2. Explore the elements in the sun. The web page http://www.coseti.org/highspec.htm provides students with a detailed spectrograph of the sun. This includes an analysis of each line of the sun's spectrum. There is also a smaller version that can be downloaded and printed for classroom use.

3. Shine a helium-neon laser on the wall. Ask students to predict the color of the light through a diffraction grating. Shine the laser through a diffraction grating. Safety note: Do not allow students to look directly at the laser, shine it on the wall. (Students will quickly notice that the laser produces a dot of light in the red portion of the spectrum. Laser light is monochromatic. The light emitted by LED's is also monochromatic if a laser is not available. A research question could be "Why would laser light be a better transmitter of information than white light?"

Assessment

1. Draw the spectrum of white light. (12.C.3b)

2. You are a chemist and have just completed collecting a sample of a gas. Describe an experiment to determine what element(s) the gas is made of? (11.A.3a)

3. (Extension #1) What contributions were made by the women astronomers in the video? How does the work of the current researchers, Dr. Nancy Houk and Dr. Vera Rubin, build on the work of the early astronomers, Annie Jump Cannon and Cecilia Payne-Gopschkin. (13.B.3b)

Bibliography

Poelker, Brian. 1996 Holiday Lights. *Science Scope*. National Science Teachers Association 20(3) p50

Morrison, Philip and Phylis Morrison. 1987. The Ring of Truth. Vintage Books, Random House. New York. ISBN 0-679-72130-4 (pbk)

Resources

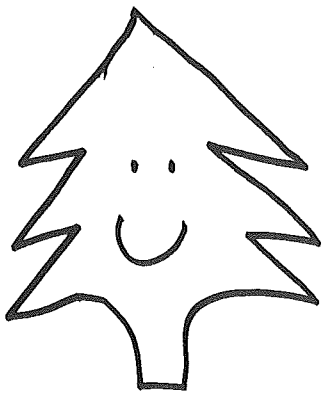
"Diffraction Glasses" are available from Rainbow Symphony, Inc. 6860 Canby Ave #128. Resida, CA 91335. Phone 818-708-8400. www.RainbowSymphony.com

Spectrum tube power supply, gas spectrum tubes; hydrogen, helium, mercury vapor, and neon available from Carolina Biological Supply or Flinn Scientific P.O. Box 219 Batavia, Illinois 60510, Tel: 800 452-1261

Holographic Diffraction Gratings available from Rainbow Symphony, or Arbor Scientific http://www.arborsci.com/ Tel: 1-800-367-6695

Cenco http://www.cenconet.com/ Tel: 1-800-262-3626

Flinn Scientic offers a sheet of holographic diffraction grating called C-Spectra. You can cut up pieces and fit them in slide mounts for the most cost effective method.



Esther Freentan
Tabb HS. Yorktown
Reprinted from the MASTHEAD June 1999

FUN WITH WIND BAGS

What is a Wind Bag? Unlike an ordinary balloon having elastic properties, a wind bag will not stretch making it very easy to inflate. Also, a wind bag is much bigger...8 feet long! Your students can do many creative things with a windbag...following are some ideas to get them started.

1. Race to Fill the Wind Bag:

Depending on the size of the student, it can take anywhere from 20 to 50 deep breaths to completely fill a wind bag. However, using a principle of physics, a student will be able to inflate one with just one breath!

* Tie a knot in one, end of two wind bags and ask for two student volunteers (it's more fun if one student is a big, "macho" type).
* Stand the two students back-to-back so that they can't see what the other is doing, and give each a wind bag.
* Tell them that there will be a race to see who can fill the wind bag the fastest using only their breath. You can ham it up at this point by getting a vote from the class as to who they think will win, etc.
* Leaving the bigger student to his own devices, silently demonstrate to the other student how to do it with only one breath: have the student hold onto the closed end of the bag and, while you hold the open end about 10 inches away from your mouth, blow as hard as you can into the bag and then quickly seal it with your hand so that none of the air escapes (when done properly, this only takes a moment). Quickly hand the bag to the student and call the race over.
* Have the students turn around so they can see what the other has done. Take the unfilled wind bag from the other student and, closing the open end with one hand, squeeze the air inside towards the closed end with the other hand. It should be no more than 1/3 to 1/2 filled - much less than the other student's
* Explanation: A fast moving stream of air is surrounded by an area of low atmospheric pressure (known as Bernoulli's principle). The faster the stream of air moves, the greater the drop in the surrounding air pressure. When you sharply blow into the wind bag, a low pressure area is created by this stream of air from your lungs and, as a result, draws higher pressure air from the surrounding atmosphere into the stream. These two sources of air (but primarily from the atmosphere) quickly fills the wind bag. The Bernoulli Principle is also responsible for the "lift" created y the shape of an airplane wing. The top of the wing is arched so that the stream of air moving along the top must travel a greater distance than the stream of air along the flat bottom. As the wind moves through the air, the same amount of air is displaced on the top and bottom of the wing-, therefore, the stream on top must move faster in order to cover its greater distance. Lower atmospheric pressure is created on top of the wing and the higher atmospheric pressure on the bottom pushes the wing upward.

2. Air Float:

Fill a wind bag and tie off the ends. Use permanent markers to decorate the outside with school spirit messages and take it to pep rallies, games, etc. Toss it into the crowd for hours of fun keeping it aloft!

3. Structures:

Use several filled wind bags and connectors (two interlooped large rubber bands) to construct 3-D geometric shapes or animals. Your students will long remember the huge tetrahedral molecule created in this way!

4. Table Lift:

Amazingly, two wind bags can be used to lift several hundred pounds of weight! Tie a tight knot at one end of two windbags and spread the out flat and lengthwise on top of a 2"x6' table. The open end of each wind bag should be at opposite ends of the table and should overhang the edge. Using help, position an identical table upside down on top of the first table (the windbags should now be sandwiched between the two tables). Ask two volunteers to sit on the inverted table and two others to kneel down by the open ends of the windbags and to begin blowing into the bags. Instruct them to squeeze the wind bag closed immediately after each breath so that air does not escape. The pressure of the compressed air inside the bags is distributed equally throughout and will cause the inverted table to rise slowly. This is the same principle used by a bicycle pump or by an air lift used by auto mechanics.

Resources: 'Windbag" by Wren Enterprises, Inc. Wind bags may be purchased from Wren Enterprises, 3145 W. Monmouth Ave., Englewood, CO 80110, or Flinn Scientific, Inc. (catalog #AP8767, $3 each), call 1-800-452-1261 for free catalog reference manual.

David G. Willey
University of Pittsburg at Johnston, PA
Reprinted from the MASTHEAD June 1999

BALLOON POWERED ROCKET IN A CAGE

Materials:

2-liter soda bottle	Plastic drinking straw
Sausage shaped balloon	Scotch tape
Fishing line	Elastic bands
Felt tipped pen	Scissors

There are many uses for empty soda bottles, from collapsing them using a vacuum pump, to turning them into terrariums. I found another use for them, when teaching Newton's Third law and the conservation of linear momentum. I had tried taping sections of a drinking straw to a balloon to give it directional stability, when it slid along a stretched, horizontal fishing line. This did not work well for me, as setting it up was awkward and the tape holding the straw sections did not adhere well once the balloon deflated. Also it was not possible to easily repeat the demonstration as the fishing line in my lab is about two meters from the floor, so as to keep it above head level.

I solved these admittedly minor problems by making a light open ended "cage" for the balloon from a two liter soda bottle and fastening the drinking straw sections to it.

1. To make the cage, start by removing the black end cap from the base of the bottle, if there is one. Cut off the neck end of the bottle where the middle of the bottle first starts to narrow. If the label is still on, the top edge of it is a convenient line along which to cut.
2. Stand the bottle on its open end on a flat surface and draw three parallel lines around it, by holding a pen at a constant height and rotating the bottle while keeping it pressed against the pen.
3. Use the felt tipped pen to mark 6 lines perpendicular to the first three lines. These lines should be spaced about five centimeters apart and extend over the curved end. It is easiest if a small circular section is left at the top of the bottle.
4. Cut away the sections between the lines, leaving strips of plastic forming the skeleton that are two to three millimeters wide. The idea is to end up with as light a structure as possible that still retains the shape of the bottle.
5. Two four centimeter sections of a drinking straw are taped to the plastic and fishing line is run through these sections and used as a support.

I use a fairly weak spring to keep the line under tension, though elastic bands could be substituted. My classroom is about ten meters from front to back and a medium sized balloon will usually power the rocket from one end almost to the other. Balloons of the correct sausage like shape can usually be found at supermarkets, party supply outlets or toy stores.

Alicia Mundorff
Bolivar, PA
Reprinted from the MASTHEAD June 1999

PUFF THE CHEESEBALL

Materials:
Cheeseballs/Cheese puff snacks
Flexible drinking straws
Paper clips—optional

Procedure:

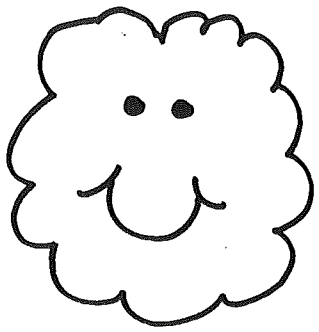
1. Bend the flexible end of the straw to form an approximate 90-degree angle.
2. Place the long end of the straw in your mouth and hold a cheeseball over the other end that is sticking up in the air.
3. Blow steadily into the straw. The cheeseball should "hover" approximately 1-3 inches above the top of the straw.
4. If desired, the paper clip can be bent to create a platform that is inserted into the straw to support the cheeseball.

Discussion Opportunities:

1. Before the demonstration, talk about how high your students think that you can blow the cheeseball.
2. What do you need to do to make the cheeseball go higher?
3. What do you need to do to keep the cheeseball hovering in the air?
4. Discuss Bernoulli's principle and the ability of the cheeseball to hover.
5. Discuss how the paper clip platform helps and/or hinders the ability of the cheeseball to hover.

Explanation: Bernoulli's principle states that a fast moving fluid (air is a fluid) creates an area of lower pressure. This principle helps to explain why airplanes can fly (faster moving air on top of the wing, greater pressure pushing up on the bottom of the wing) and why it feels like your car is being pushed into a truck that is passing you (less pressure around the truck, greater pressure pushes your car toward the truck). In this experience students will find that as they blow through the straw-creating a stream of fast moving air which lowers its air pressure - the cheeseball will stay suspended in that stream of air. The surrounding air, which has greater pressure, pushes inward toward the lower air pressure. This keeps the cheeseball within the stream of air.

References Adapted from the AIMS Educational Foundation - January 1998. Created by Betty Cordel.



NSTA National Science Teachers Association

NATIONAL CONVENTIONS
Orlando—April 6-9, 2000
St. Louis—March 22-25, 2001
MIDWESTERN AREA CONVENTIONS
DETROIT—OCTOBER 19-21, 1999
MILWAUKEE—OCTOBER 19-20, 2000
Don't miss these great opportunities!

Toni Solak
IUP University School
Reprinted from Pennsylvania Science Teachers Association Journal

GREAT GOOEY GUMDROPS

Materials:
Package of gelatin (any flavor)
Dixie Cup
Toothpick
Eyedropper
Bowl of Cool Water

Procedure
1.Pour approximately one inch of gelatin into the Dixie cup.
2. Fill the eyedropper with water. Squeeze one drop of water onto the center of the gelatin.
3. When the water has disappeared into the gelatin, squeeze another drop onto the same place.
4. Keep squeezing one drop of water at a time onto the gelatin. Make sure you squeeze the water on the same place each time and wait until the water is absorbed by the gelatin.
5. After you have squeezed about eight drops, use a toothpick to pick up the lump that has formed. You'll have a Great Gooey Gumdrop.

What's Happening?
Gelatin holds the water in between its molecules. A liquid suspended in (or held within) a solid in this way is called a suspension.

BRAIN MODELS*

Learning Goal: Students will demonstrate and increase their knowledge about the brain by comparing and contrasting objects (brain models) with what they know about a real brain. Students also can investigate the concept of a model and why we use models to learn.

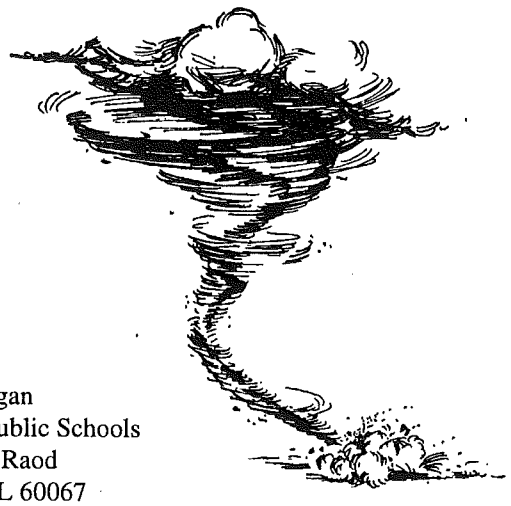
Procedure: Students work in small groups (3-5 people); each group is given a different object that is a brain model. Each group discusses how its model is like a brain and not like a brain, and then reports its observations to the whole group. Observations are recorded and discussed. This works with students of all ages, from early elementary to adult, though of course different observations will be shared. It's appropriate as an introduction to studying the brain (pre-assessment or engagement activity), and also as a summative assessment. Students can also suggest or bring in their own models for discussion.

Materials: Objects used as brain models include: cooked oatmeal, cauliflower, a water balloon, an orange, a book, a calculator, a walnut, a remote control device, a rock, a shoe, a plant...Try different things, depending on the level of your students and on what features of the brain—structural vs. functional, for example—you would like them to think about.

Time: This activity can easily be done in one class period. The length of time will depend on the extent of reporting, the amount of discussion, ad whether or not the teacher asks probing questions.

Discussion: This activity provides an opportunity for students to share what they know about the brain, for misconceptions to be revealed, and for questions to be asked. The teacher/facilitator can be passive and simply record the descriptions, or can comment and clarify during the report-out. Unusual or unexpected objects often generate the most interesting observations, though more "obvious" models may be more appropriate for younger students.

* Adapted from Baylor College of Medicine, *The BrainLink Activity Guide for Teachers, Brain Comparisons* (Houston: WOW Publications, 1997).



Steve Galligan
Wilmette Public Schools
615 Locust Raod
Wilmette, IL 60067
847-853-2900

PURSUING HURRICANES IN YOUR CLASSROOM

Hurricane and tropical storm season is upon us again and it gives students about a three to four month window of opportunity to observe the development and track these fierce and destructive storms. The hurricane hunters in my classroom use a variety of sources to track these storms. Some of the tools that they use include internet sites, television weather reports, and newspapers.

The internet has become one of our most important sources of information. My students use some of the Weather Channel's web sites as a major source of information. www.weather.com/weather/maps/ is a great starting point. Students can review a variety of features such as the jet stream forecast, national and international regional satellite pictures (which are updated every 30 minutes), and severe weather forecasts. When you are tracking tropical storms and hurricanes, you should go to www.weather.com and click on "Breaking Weather." From there, you can track current tropical storms and hurricanes. Students could even find the paths of tropical storms and hurricanes from the past few years at this site.

My students track the progress of these storms several times each day. Students keep a log on each hurricane and tropical storm. As students monitor the progress of each tropical storm and hurricane, they make predictions as to their movements and changes in strength. Information that can be logged is:

- Location of the storm (latitude and longitude)
- Wind speed and category (if the tropical storm develops into a hurricane)
- Amount of rainfall
- Heading
- Expected landfall
- Amount of destruction that the storm has caused.

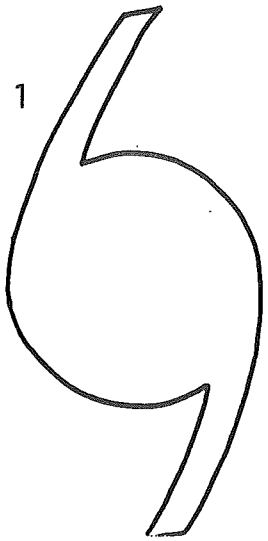
We also keep track of each storm's progress on one of my classroom bulletin boards. Using an overhead projector, I will trace an outline of the eastern portion of North and South America and North Western Africa on to one of my bulletin boards. This gives the students equatorial region of the Atlantic Ocean and the Caribbean Sea. Hurricane symbols, such as the one in figure 1, are placed on a daily basis at the storm's location. Students also write down its category classification and sustained wind speed. Each new tropical storm or hurricane receives its own color. After placing these storms on the bulletin board, students become familiar with the paths that these storms take and how the strength of each storm increases the longer the storm stays over water. As the number of hurricanes grow, students get a real appreciation for the violent nature of weather in this region. Students could also track Pacific Ocean tropical storms and hurricanes too. Other helpful internet sites that I use in my classroom when my students predict the weather are:

www.intellicast.com/weather/ord/sat/
(This site puts the satellite images in motion-it's great!)

www.intellicast.com/weather/jet/
(This site is great when you want to monitor the movement of the jet stream.)

At home students can use newspaper and television news reports to continue tracking storms. Students can compare their predictions with that of meteorologists. Data from these sources can also be placed in their logs.
This activity was a great way for my students to learn how to use different sources of information, keep an accurate data log, and make predictions. The summer and early autumn of 1998 saw a great deal of hurricane and tropical storm activity. Weather forecasters are predicting another active hurricane and tropical storm season for 1999. So keep an eye on the sky and on the internet and track those hurricanes!

Figure 1



OPPORTUNITIES

AVS

"The American Vacuum Society will give a free vacuum system to your school, because we want students to share the excitement of understanding how things work.

The Prairie Chapter of the American Vacuum Society (AVS) is seeking applicants for the High School Science Educators' Workshop to be held in Seattle, Washington, October 25 - 26, 1999.

The American Vacuum Society is hosting the workshop at its annual meeting as part of its commitment to science education. The Prairie Chapter will sponsor up to two teachers who will be selected for excellence, leadership, and commitment to development of new experiments. All travel expenses will be paid by the Prairie Chapter of the AVS. Limited funds are available for substitute teacher pay. Teachers will receive CE units.

The Society will provide grants allowing the schools the teachers represent to purchase vacuum equipment consisting of a vacuum pump and a vacuum bell jar having a value of approximately $700.

See http://home.vacuum.org/prairie/announc98.html for more information.

SUMMER SCIENCE IN ENGLAND

The University of North Carolina at Asheville (UNCA) will conduct a summer comparative science education program through the cooperation of the College of Education of the University of Bath, England, June 28 to July 26, 2000. U.S. science teachers can visit English classrooms that are still in session and attend lectures on the new "National Curriculum," the historical development of the British education system and on global environmental problems. Field trips to areas of special educational interest such as Oxford University the Slimbridge wildfowl and wetland field station, Kew Gardens, and science museums are also part of this program.

Any person who is or has been involved with science education, k-12, is eligible. The $2,200 fee covers tuition, ground transportation for the course and private room housing, which will be on the University of Bath campus.

The spouse and/or dependent adolescent children of the participant also may attend at a cost of $1,100 each.

For information or to enroll, contact Dr. Gary Miller, Environmental Studies Department, CPO #2330, UNCA, One University Heights, Asheville, NC 28804-8511, Phone 828-232-5184, Fax 828-251-6041. Registration will remain open until the course is filled. If possible, enroll prior to February 1, 2000.

GOLDENROD GRANT PROGRAM

Goldenrod Research Corporation is awarding grants to elementary schools. Each grant provides one-to-one funding for a YouthTouch Technology Integration Station designed to bring practical technology into third- through sixth-grade classrooms. The stations help students understand ratios, arcs, coordinates, graphing, and over 100 other mathematics, science, technology, language arts, and social studies concepts.

Interested schools should complete a grant application and provide a 100-word description of how the integration package will benefit its teaching environment. Deadlines vary from state to state. Call Goldenrod Research Corporation at (888) 827-2260 for an application and deadline information.

GTE ANNOUNCES GRANTS FOR MATHEMATICS AND SCIENCE TEACHERS

The GTE Corporation has announced grants totaling $72,000 to 120 math and science teachers selected from 27 states for the 1998-1999 school year. The grants are part of GTE's Growth Initiatives For Teachers (GIFT) program http://www.gte.com/g/community/gift.html, an effort designed to strengthen math and science education in grades 6-12.

Through the annual GIFT program, 60 teams consisting of one math and one science teacher from the same school are awarded a grant of $12,000. Individual GIFT teachers receive $2,500 for professional development activities, and the twomember team receives $7,000 to implement an innovative classroom project. "The GIFT initiative is important to our nation's math and science classrooms for two reasons," said Maureen V. Gorman, vice president of the GTE Foundation. "It significantly boosts teachers' enthusiasm for teaching and also increases student achievement by providing hands-on learning opportunities."

Come and let your Christmas be filled with the sea, sun, and all the wonders that a pristine island environment holds. Celebrate the holidays in the Bahamas where surf and service are a natural pair.

In a giving spirit, we will provide service for a few hours on a few of the days; beach cleaning, building repairs, painting, etc. Countless opportunities exist for us to explore, island hop, snorkel, beach comb, dive, and learn about the Bahamian culture.

Where:	Andros Island, Bahamas
When:	December 18-27, 1999
Cost:	$640 Adults (children are half price) Tax Deductible!!!
Includes:	Round Trip Airfare from Ft. Lauderdale, room and all meals, insurance, taxes, transfer and application fees

Please send this form to:
Dr. Marylin Lisowski
Eastern Illinois University
600 Lincoln Avenue
Charleston, IL 61920

Questions?
Marylin Lisowski
217-581-7830
cfmfl@eiu.edu
Bob Williams
618-692-3788
rwillia@siue.edu

Name_____ Phone #_____
Address _____

_____

E-Mail _____

AWARDS AND RECOGNITION

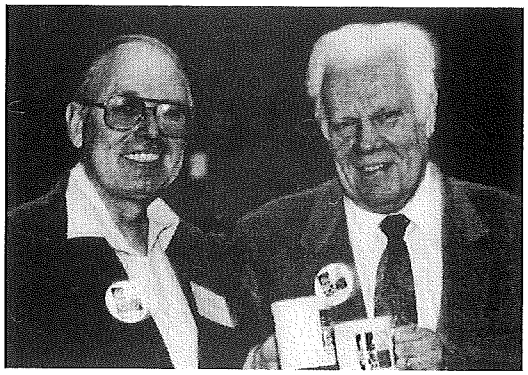
Bob Johnson, Public Relations
SEAOI
203 North Wabash Suite 1000
Chicago, IL 60601
TEL: 312-372-4198

SEAOI ACKNOWLEDGES EFFORTS OF FUTURE ENGINEERS AT STATE SCIENCE FAIR

Best known to *Spectrum* readers for its Future City involvement (see photos), for the ninth consecutive year, SEAOI was also present at the Illinois State Science Fair to judge and award the efforts of the next generation of structural engineers. The state wide educational competition is sponsored by the Illinois Junior Academy of Science and brings together the top 1000 science projects prepared by students at the junior high and high school level. Selection of the top projects began at the school level with students competing against their classmates. The winners of the school competition advanced to the regional level where they competed against the top students from other schools. The winners of the regional competition met the other top 1000 students in the state at the University of Illinois in Champaign-Urbana on May 8, 1999.

Tim Laken, Elizabeth Gallagher, and Deb Zroka represented SEAOI in judging projects in the Engineering category. On behalf of the Board of Directors and all members of SEAOI, a Certificate of Outstanding Mention and a $100 savings bond was presented to the top project entered in the category of Engineering. In addition, three other students were awarded certificates of Honorable Mention and $50 savings bonds for their projects.

Future City Regional Finals. Saturday, January 23, 1999
Infant Jesus of Prague Middle School-Flossmoor — Champions!
Coach: ISTA Member Nancy Mosher
Team Members: Jasmine Davis, Andrew Obrien-Penny, Maura Bahu, Nicole Morrison



Bob Johnson and Walter Linzing, past chairs of the Chicagoland EWEEK program toast EWEEK '99.

Through the presentation of these awards and acknowledgment of the effort put forth, SEAOI is supporting and encouraging these young students to continue their interest in structural engineering. At this year's science fair, 40 projects related to structural engineering were judged. Among these projects, half of them were about bridges; constructing and then testing the strength of different bridge types. Among the remaining projects, subjects include testing the strength and elasticity of different woods and composite materials, testing the strength of different concrete mixes, investigating different types of arches, investigating wind effects on building sway, and evaluating different types of foundation systems subjected to a simulated earthquake.

SEAOI presented the top award to Daniel Wido, an eighth grade student at Holy Childhood School in Mascoutah, for his project titled "Shake, Rattle, and Shift" in which he constructed a testing platform to simulate the motion of an earthquake with two different magnitudes. Then, he created four different foundations to test, which included a hard, flat surface, marbles, sand, and swivel. The purpose was to determine which foundation system would allow a structure to shift and maintain its structural integrity the longest.

Honorable Mentions went to the following students and their projects: David Davila, an ninth grade student at H. D. Jacobs High School in Algonquin, for his project titled "Moment of Inertia" which investigated which type of beam structure would hold the most weight; Daniel Virgilio, an seventh grade student at Hubble Middle School in Wheaton, for his project titled "Wood Strength" which determined if solid or composite wood has more resistance to bending

Future City Regional Finals — Presentation to judges, Hubble Middle School

composite wood has more resistance to bending and torsional pressure; and Levi Swartzentruber, an eighth grade student at Metamora Grade School in Metamora, for his project titled, "Down She Blows" which investigated how much wind stress three buildings of different frame designs could withstand before breaking. The abstracts for these winning projects can be obtained through the SEAOI office. Our sincere congratulations to all students everywhere who worked to develop projects to test and investigate aspects of structural engineering. The future belongs to these young inventors and innovators, and to their spirit of discovery.

Steve Silbiger
Toyota Motor Sales USA, Inc.
(310) 618-5032
steve_silbiger@toyota.com

LARGEST NATIONAL GRANT PROGRAM FOR K-12 SCIENCE TEACHERS HELPS SPARK STUDENT INTEREST IN SCIENCE

Fifty of the Nation's Best and Brightest Teachers Will Be Awarded up to $10,000 to Implement Innovative Science Projects

A project to explore the mystery of the declining frog population, a mobile observatory to study light pollution, an interactive paleontology laboratory, and a hands-on program to study Alaska, s glacial smog are just a few of the innovative projects science teachers around the country are working on to spark students, interest in science. The award-winning programs are funded by the Toyota TAPESTRY Grants for Teachers program. The 2000 Toyota TAPESTRY program, sponsored by Toyota Motor Sales (TMS), U.S.A., Inc., and administered by the National Science Teachers Association (NSTA), celebrates its 10th anniversary this year and will award 50 grants of up to $10,000 to K-12th-grade science teachers.

Interested teachers should propose innovative science projects that can be implemented in their school or school district over a one-year period. Individual science teachers or a team of up to five teachers can submit proposals in two categories: environmental education and physical science applications (applied physics, chemistry, and technology). A judging panel of distinguished science educators will evaluate and select the award-winning projects based on their innovative approach in teaching science, ability to create a stimulating and hands-on learning environment, interdisciplinary approach, and ability to increase student participation and interest in science.

Toyota TAPESTRY projects demonstrate creativity, involve risk-taking, possess a visionary quality, and model a novel way of presenting science. Melissa Forsythe, a 1999 Toyota TAPESTRY winner from San Vincente Elementary in Big Bend National Park, TX, wanted to give her students the opportunity to participate in scientific activities that would establish an interest and love of the scientific process. Her winning project, called Project FLORA, provides students the opportunity to work closely with National Park Service scientists learning about disturbed areas within Big Bend National Park that need assistance in re-establishing native plants. With funds from the Toyota TAPESTRY grant, students will grow the plants, design and build a lath house for the plants, revegetate the disturbed areas, and monitor the results for years to come.

Over the past nine years, 343 Toyota TAPESTRY grants totaling over $3.4 million have been awarded to science teachers across the country. In addition to the grants, the 50 awardees selected will receive an all-expense-paid trip to the Awards Banquet at the NSTA National Convention to be held in Orlando, FL, April 6-9, 2000. The NSTA National Convention is the largest gathering of science educators in the country. To obtain Toyota TAPESTRY guidelines and entry forms, write to Toyota TAPESTRY Grants for Teachers, 1840 Wilson Blvd., Arlington, VA 22201-3000, call (800) 807-9852, or e-mail tapestry@nsta.org. Deadline for receipt of proposals is January 20, 2000. Also see competition information at http://www.nsta.org/programs/toyota.htm.

Founded in 1944, the National Science Teachers Association seeks to promote excellence and innovation in science teaching and learning for all. Its 53,000-plus members include science teachers of all grade levels, science supervisors, administrators, scientists, business and industry representatives, and others involved in science education. Toyota TAPESTRY grants are one element of Toyota,s commitment to the community by contributing approximately $14.5 million to U.S. philanthropic programs with more than 50 percent going to education. In addition to supporting education, Toyota funds health and human service organizations, civic and community development programs, and arts and culture.

Gwen Pollock
Illinois State Board of Education Center for Educational Innovation and Reform
Secondary Education Division
100 North First Street, N-242
Springfield, IL 62777
217/782-2826
gpollock@smtp.isbe.state.il.us

WHAT'S NEW WITH PAE?

The Presidential Awards of Excellence in Mathematics and Science Teaching is beginning its Year 2000 search for the nominees from each state for both science and mathematics in both elementary and secondary categories in the nation's schools. The Presidential Awards program is the nation's highest commendation for K-12 science and math teachers. It recognizes a combination of sustained and exemplary work, both in and outside of the classroom. Each award includes a grant of $7,500 from the National Science Foundation to the recipient's school. Awardees use the money at their discretion to promote their school's program. They also receive an expense-paid trip to Washington, D.C. during which each receives a citation signed by the President (and depending on the other current events of the week, meet at the White House, sometimes with the President!).

This program is coordinated in Illinois by myself and Sue Eddins for ICTM. The brochures which announce this year's program will be mailed to all public and private attendance centers in September, asking for principals and science/math lead teachers consider their excellent teachers for nomination and request applications. Instructions are given within the brochure to access these applications or you may call Gwen at ISBE at 217/782-2826 to make sure that you receive the application packet. Information about the program is found at its web site: http://www.nsf.gov/PA The state selection process begins immediately after the February 14, 2000 due date. A selection committee will be meeting shortly afterward, during which three nominees for both the elementary and secondary categories will be chosen based on the same rubric used by the national selection committee. The Illinois nominees' packets are submitted to NSF for the summer work of the national committee, which carefully selects the awardees in each of the categories. Each state will have four awardees. The national recognition process is dependent on the release of the names by the White House Office of Science and Technology Policy, following FBI security clearances!!! This particular portion of the process has delayed the announcement of the names last year until May, 1999 for the 1998 awardees, unfortunately.

In Illinois, Donna Brown from Margaret Mead Middle School in Elk Grove and Susan Wagner from Jay Stream Elementary School in Carol Stream were our Science Awardees for 1998. They went to Washington in June and were treated royally with the other awardees from each state and US territory. We want to congratulate each of them at the upcoming ISTA convention in Springfield. The six nominees from Illinois for 1999 are:

Elementary Science
Coleen Martin, Wilder-Waite Grade School, Peoria
Jennifer May, Ellis School, Belleville
Barbara Short, Parkside Elementary, Normal

Secondary Science
Kathy Costello, Millstadt Consolidated School, Millstadt
R. Jean Smith, Lostant School, Lostant
Lynne Zielinski, Glenbrook North High School, Northbrook

We are beginning a new effort using the talents of our current and past awardees and nominees in Illinois. At this year's convention, our 1999 nominees will kick-off this opportunity by hosting a double session on Saturday (see the convention program) during which they will share their applications' successful unit and assessment strategies with NEW TEACHERS ESPECIALLY. We will begin a mentoring project for new teachers this year, starting at the convention. A second and third prong of this talent-multiplication project will focus on the process for national board certification for excellent teachers, as well as how we can help incumbent teachers address their own certificate renewal plans, building a network from this core of teachers. More information will follow about this. For more information, contact me at the above address.

CONGRATULATIONS TO OUR NEW ISTA REGION 1 DIRECTOR!

Nancy Nega received the Paul DeHart Hurd Award for an outstanding middle level educator for 1999. She is an 8th grade science teacher at Churchville Middle School in Elmhurst, Illinois. She is the 1995 Presidential Awardee in Secondary Science for Illinois. Nancy is involved in education at the local and state levels. She is currently on the Science Performance Standards Committee and has served on the Illinois TIMSS Analysis Task Force. She is also a core member of two networks for middle level science teachers at the local level. Nancy's philosophy is "Science is an Action Verb" and she has her students engaged in investigations and simulations that connect with real life.

TEACHERS SWEPT AWAY THIS SUMMER

Fifteen south suburban science teachers participated in SWEPT 99 (a Scientific Workplaces Exploration Program for Teachers). a collaborative program of the Career Development System (CDS), South Suburban College, an member businesses of the Southland Education to Careers (ETC) Partnership. Members include Rhodia, Inc., DynaGel Inc., Griffith Laboratories, Biomanagement Services, Silliker Labs, Bremen Community High School District 228, Thornton High School District 205, and Thornton Fractional High School District 215.

The four-day program (June 21-24, 1999) consisted of daily business site visits, followed by curricular integration of applied topics and hands-on activities at South Suburban College.

The Southland ETC Partnership collaborates with the Education for Employment Systems (EFE) of the Illinois State Board of Education in the delivery of education-to-career opportunities for students, staff, and community to enable students to achieve the skills and competencies needed to successful employment, responsible citizenship, and continuous learning.

Mr. John Kotash of Rhodia, Inc., located in Chicago Heights, hosted the first day site visit. Rhodia is one of the world leaders in the production of specialty chemicals for the beauty, clothing, foodstuffs, and healthcare markets as well as for the environment, transportation, and industry.

The second day's site visit was hosted by Mr. Conrad Heisner at DynaGel Inc. located in Calumet City. DynaGel has over 90 years experience and is a world leader in the production of Type A pork skin gelatine. Gelatine's ability to gel, thicken, emulsify, bind, and aerate makes it a highly desirable nutritive fat-free component in confectionery, molded desserts, diet foods (hydrolyzed protein), glazes, and dairy products.

Ms. Ellen Bettenhouse hosted the third day's site visit at Griffith Laboratories located in Alsip. \Griffith Laboratories specializes in the application, technical concepts, and creative solutions for commercial customers including specialization in food coatings, bakery and dough mixes, poultry and meat seasonings, soups, sauces, side items, snack seasonings, and savory flavors.

The final day's site visit was hosted by Dr. Kathy Knutson at Silliker Laboratories located in Chicago Heights. Silliker Laboratories provides chemistry and microbiology testing services to the food industry for maintaining state, local, and international regulating agencies' certifications accreditations, and compliance.

SWEPT will enable teachers to include career awareness in their subject areas, ensure that their students are aware of the wide variety of career options available to them, identify student interests and develop realistic expectations about specific careers, and enable their students to see the link between how the knowledge and skills they are learning in school will help them to succeed in the future.

ETS coordinator Debby Balatzer, CDS Director Debbie Canna, and CDS Assistant Director Janice Stoettner accompanied the teachers during the various site visits.

The SWEPT Program was coordinated by Dr. Diane Ostojic, Associate Dean of Mathematics and Science at South Suburban College. Assisting Dr. Ostojic in the afternoon activities were Dr. Lucette Held, Chemistry instructor and Dr. G.A. Griffith, biology instructor, both at South Suburban College.

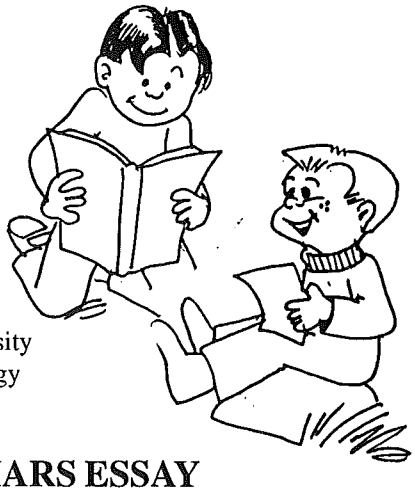
Participating teachers included:
Joy Anderson, Julie Gerber, and Jolynn Powney, TF South High School

Carol Bozovic, Roy Inlow, Mary Kay LePore, Alan Perry, and Wanda Russell, Thornton High School

Mark Furstenau and Dawn Sasek, Oak Forest High School

Kent Grant and Chad Robson, Tinley Park High School

Joseph Kerke and Louise Pusateri, Hillcrest High School



Sheri Klug
Arizona State University
Department of Geology
PO Box 871404
Tempe, AZ, 85287

MARS ESSAY

The Planetary Society is sponsoring an essay contest for students based on the Mars Microphone that recently launched as part of the Mars Polar Landing mission. The first prize is an all-expenses-paid trip to Planetfest '99 in Pasadena, Ca, an event that will celebrate the landing of the Mars Polar Landing. To enter, students should write an essay of 300 words or less describing what sounds we might hear from Mars. The first half of the essay should hypothesize what sounds might be heard on Mars and their origins, and the second half should focus on what sounds might be heard on Mars 100 years in the future. Students should research their essays and use their imaginations to envision the future of Mars. Essays must be received by October 1, 1999. Students should include their names, addresses, phone numbers, dates of birth, and T-shirt sizes. Submit entries to Shari Klug at the above address.

EDUCATIONAL MATERIALS

NUTRITION TEACHING KITS

The National Cattlemen's Beef Association (NCBA) is offering two free teaching kits. Dig In! is an integrated thematic unit for third and fourth grade that stimulates creative and critical thinking through hands-on activities. It focuses on the ancient Egyptian culture and its pyramids to teach the importance of sound food choices, good nutrition, and physical exercise. Fuel for Flight is a supplemental video program designed to help teach 5th- and 6th-grade math science, and nutrition using a space theme. It compares the fueling needs of the space shuttle to the body's need for nutritious food.

To obtain these free kits, send a letter on school stationery that includes your name, shipping address, telephone number, and three reasons why the kits would be useful to you. Write to NCBA, Education Department, 444 N. Michigan Ave., Ste. 1800, Chicago, IL 60611. For more information, contact Sharlet Teigen at (406)972-4540; sharlet@msn.com

AGI, SSSA, USDA-NRCS

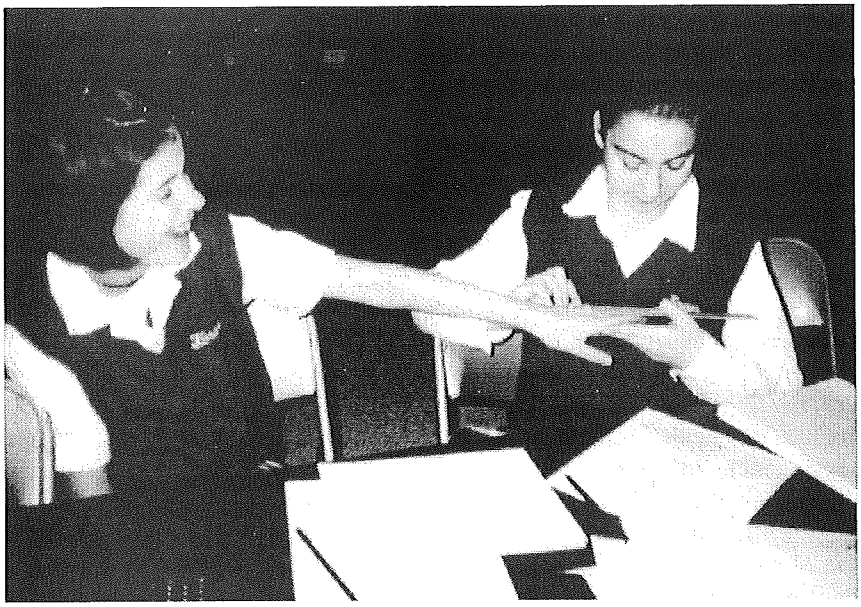
Sustaining our Soils and Society is a high-quality, four-color publication that explores our most precious natural resource. The softcover publication is divided into six sections—*It Helps to Know, Why Soils are Important, Soils and Construction, Food and Fiber Production, Environmental Consequences of Mismanagement, and Improving and Sustaining Our Soils.* Additional features include a colorful two-page map of soil distribution in the United States, a glossary, and a four-color soil poster.

The section, *It Helps to Know*, focuses on what the environmental concerns are, what soil is, how soils form, where soils form, and why soil quality matters. Soils have many uses in addition to food, fiber, and fuel production. *Why Soils are Important* examines how soil plays a major role in recycling carbon to the atmosphere and nitrogen in the soil, filters surface waters, and aids in disposal of solid and liquid wastes. This section also reveals that soil is an important source of building materials.

The next section reviews the engineering and construction properties of soils. Population and land use trends, soil as a plant growth medium, productivity, and precision farming are part of the section on *Food and Fiber Production.* Depletion of organic matter and nutrients, loss of biodiversity, and contamination are discussed in *Environmental Consequences of Mismanagement.* The last section looks at the opportunities to reclaim damaged soil. *Sustaining our Soils and Society* also includes an educational glossary consisting of over 100 soil terms, additional information of career opportunities, and an 18" x 24" four-color poster featuring a variety of soil types. The reverse side of the poster provides step by step instructions on how to make your own soil probe and collect your first soil sample! An assortment of classroom investigations are included.

Sustaining our Soils and Society. Thomas E. Loynachan, Kirk W. Brown, Terence H. Cooper, and Murray H.Milford, editors. Published by the American Geological Institute in cooperation with the Soil Science Society of America and USDA-Natural Resources Conservation Service. Softcover, color, 64 pages, 1999. ISBN 0-922152-50-0. Price: 1-10 copies, $8.00 each; 11-15 copies, $7.00 each; 16-20 copies, $6.00 each; 21-25 copies, $5.00 each; 26-30 copies, $4.00 each; over 30 copies, write for information. *We pay shipping costs on all prepaid orders!*
Send your order to:

SSSA Headquarters Office
Attn: Book Order Department
677 South Segoe Road
Madison, Wisconsin 53711-1086 USA.
Internet: http://www.soils.org
E-mail: books@soils.org
FAX: 608-273-2021



Photos on these two pages were contributed by Dr. Abour H. Cherif, Columbia College, Chicago. They were taken at a conference on integrating mathematics and science in the classroom.

ZPG Publications
Pamela Wasserman
1400 16th Street NW, Suite 320
Washington, DC *20036*
(800) 767-1956
(202) 332-2200
Publications@zpg.org
202/332-2200

ZPG RELEASES NEW EDITION OF HIGHLY ACCLAIMED TEACHING GUIDE

ZPG announces publication of an all-new edition of *Earth Matters: Studies for Our Global Future,* the critically-acclaimed high school curriculum guide. This invaluable resource is designed to help students examine some of the most pressing environmental, economic and social issues of our time.

Through 12 new student readings and 34 innovative activities, *Earth Matters,* 2nd Edition helps high school students understand the complexities of population pressures, global climate change, natural resource use, wildlife endangerment, distribution of wealth and food, gender equity, economic progress and how all of these issues are interrelated.

Because the issues covered in *Earth Matters* are interdisciplinary, the book is designed for use in several curriculum areas including science, social studies, math, language arts and family life education. In fact, the Teachers' Guide includes a matrix linking each activity to the latest professional standards for seven subject areas.

Since its first edition was released in 1992, *Earth Matters* has received rave reviews from teachers, professional associations and education agencies, including an "A" rating from the California Department of Education and the California Energy Commission.

"A course that used this text would be valuable in all high school curricula, as students would be stimulated to learn more about global reality and what must be done to achieve sustainable economic systems," stated the American Association for the Advancement of Science.

All of the activities are designed to engage students and encourage critical thinking, using a variety of teaching strategies such as role-playing simulations, laboratory experiments, problem-solving challenges, cooperative learning projects, research, writing and debate.

In one activity, "Go for the Green," students make economic and environmental decisions regarding tropical rainforests in a lively board game. In "Gender Quest," students are anthropologists from a far-off planet, examining gender roles on Earth and what they tell us about our society.

In other activities, students act as United Nations delegates at a climate change summit, debate the environmental impacts of paper vs. plastic grocery bags, observe the population growth of duckweed plants in a lab, and attend a luncheon where your meal is determined by your assigned global economic status.

For ease in duplicating student worksheets and readings, *Earth Matters* is printed in a spiral- bound format including a visually dynamic game board and colorful chapter divider pages. All 12 of the student readings are illustrated with lively cartoons and charts. An extensive appendix of resources for further research includes web sites, books, periodicals and videos to explore Earth Matters topics in greater depth.

Earth Matters: Studies for Our Global Future (208 pp.) is available from ZPG for $19.95 plus $5.00 shipping and handling. To order a copy, contact ZPG Publications, 1400 16th Street, NW, Suite 320, Washington, DC 20036; (800) 767-1956; (202) 332-2200; Publications@zpg.org..

Zero Population Growth, Inc. (ZPG) is a national, nonprofit membership organization which works to educate the public about the interconnections of population, resource use and the environment. Since 1975, ZPG's Population Education Program has produced quality K-12 curriculum materials and conducted teacher training workshops throughout North America.

AMERICAN SOCIETY OF AGRONOMY

Order your Free copies of *Exploring Careers in Agronomy, Crops, Soils, and Environmental Science.*

Contact:
Leann J. Malison
Program Manager for
Outreach Activities

American Society of Agronomy
677 S. Segoe Rd, Madison, WI 53711
Tel: 608/273-8080, Fax: 2021
Direct Tel: 608-273-8090, ext. 314
E-mail: lmalison@agronomy.org

MATERIALS ABOUT WOMEN IN SCIENCE

The National Women's History Project selected 23 items featuring women in science and mathematics for their latest, free Women's History Catalog. These include CD-ROMs, full-color posters, biographies, booklets and display sets, and "Science is Women's Work" T-shirts, buttons and magnets.

"Telling Our Stories," an award-winning CD-ROM for grades 5 and up, is among the excellent items. Voice interviews, interactive experiments, multimedia field trips, and photos introduce women working in astronomy, biology, chemistry, animal communication, geology, and physics. A 120-page teacher's guide with helpful background information, lesson ideas, and reproducible activity sheets is also available.

"Women in Science and Mathematics," a full-color poster, features 20 women from a wide variety of fields; *From Indian Corn to Outer Space is* packed with stories of women inventors for grades 4-9; *Science is Women's Work* presents 26 American women in 18 different fields through full-page photos and one-page biographies for grades 4-8.

To request a free Women's History Catalog, write to the National Women's History Project, 7738 Bell Road, Dept. P, Windsor, CA 95492-8518, or call (707)838-6000 between 8:00 a.m. and 5:00 p.m., Pacific Time.

Let's Celebrate Today: Calendars, Events, and Holidays

For grades K-12, lists holidays and multicultural events from around the world for every day of the year. The book mentions historical happenings, birthdays, and inventions and provides ideas for at least three activities based on the events of each day. Teachers and librarians can use this book year after year as a daily activity guide, rainy day resource, or idea source for bulletin boards. The author, Diana F. Marks, has taught grades 1-8 for 20 years. The 350-page book costs $35 ($42 outside North America).

MORE INEXPENSIVE RESOURCES

Subscriptions to Human Genome News

Newsletter that details the progress of the Human Genome Project. Contact the Human Genome Management Information System, Oak Ridge National Laboratory, 1060 Commerce Park, MS 6480, Oak Ridge, TN 37830; 423-576-6669; fax 423-574-9888;
email: bkq@ornl.gov
http://www.ornl.gov/hgmis

A New Universe to Explore: Careers in Astronomy

Booklet that provides career guidance information for students and teachers. It offers preparation tips for careers in astronomy; sections for high school, college, and graduate students; and a special section called "Where Astronomers Work/" Write to The American Astronomical Society, 2000 Florida Ave., Suite 400, Washington, DC 20009, or see the AAS web page: http://www.aas.org/education/career.html

Assessing Hands-On Science: A Teacher's Guide to Performance Assessment

This has been published by Corwin Press. The book tells how to use performance assessments to measure learning with hands-on curricula for grades K-12. It describes how traditional and performance assessments work with the same materials. It also discusses both analytic and holistic scoring systems. You can order the book for $25 by contacting he publisher at 2455 Teller Rd., Thousand Oaks, CA 91320-2218; 805-499-0774; e-mail order @corwin.sagepub.com

Comprehensive Models for School Improvement: Finding the Right Match and Making it Work

This shows school administrators and other education decision-makers how the movement toward comprehensive school reform can benefit their students. It provides an overview of the factors that have led to widespread support for comprehensive school reform, including a discussion of the newly available federal funding. It also includes profiles of 17 school reform models that represent many of the best-known and most widely used options for comprehensive school improvements. In addition, the book contains a discussion of the essential components to look for in choosing a program that will work best in a particular school or district. The cost for the 144-page publication is $30 plus 10 percent of S/h with a $3.50 minimum. To order, contact Educational Research Service, Publication Orders, 2000 Clarendon Blvd., Arlington, VA 22201-2908; 1-800-791-9308.

Girls & Technology: An Idea Book for Educators and Parents

This includes classroom strategies by and for teachers, projects for girls to do at home or in class, tips for parents on encouraging daughters to learn about science, and the locations of on-line clubs in which girls can learn about science and technology. This 64-page book for teachers and parents of girls in grades 1-12 costs $15 including s/h. *Expect the Best,* a video compiled from conference workshops, and a companion resource guide can be included with the book as a package for $35 including s/h. To order, call the National Coalition for Girls Schools at 978-287-4485 or see http://www.ncgs.org

Science Alive!

This is a five-volume, award-winning, multicultural, English-Spanish science and environmental education curriculum. The guides sell for $25 each or $115 for a complete set: Energy Flow, Cycles, Communities, Interdependence, and Change. Send a purchase order to check to Science Oriented Learning, 1324 Derby St., Berkeley, CA 94702 (include sales tax in California and 10 percent s/h). For more information, call 510-644-2054.

Shaping Your Thinking in Science

This offers topic-specific graphic organizers where students in grades 3-6 can organize and record scientific information. Graphics help to clarify important elements and relationships among concepts. Each set of 16 reproducible organizers supports science inquiry, reading, and research. Sets come with teacher editions with lessons and answers. The following topics are available: The Earth, Water, Animals, and Plants. To order copies, send $11.95 for each to Chameleon Publishing, 277 Green St., North Borough, MA 01532. For more information, 508-393-5470
or send e-mail to champubl@aol.com

Science Adventures with Children's Literature: A Thematic Approach

For grades 1-6, offers projects, strategies, and tips for teaching the life, physical, and space sciences. The book also features ideas for authentic assessment, a variety of language arts extensions and techniques, lists of technology resources and websites, and annotated bibliographies of more than 400 tradebooks. The author, Anthony D. Frederick, is associate professor of education at York College in Pennsylvania. The 233-page book costs $24.50 ($29.50 outside North America).

The Celebrate the Century™ Education Kit Series from the U.S. Postal Service

Supported by NSTA, the U.S. Department of Education, and other education associations, this two-year program will provide teachers with free curriculum covering the decades from the 1900s. Designed primarily for students in grades 3-6, the curriculum kit features hands-on activities that integrate history with science, math, art, geography, language arts, social studies, and computer technology. Each kit contains a teachers guide, student activity magazine, computer activities and links to websites, interactive classroom visuals, educational games, and take-home projects to involve and inform parents. For information or to receive kits, contact Celebrate the Century, U.S. Postal Service, PO Box 44342, Washington, DC 20026-4342; 1-800-450-INFO. The curriculum also can be viewed online at http://encarta.msn.com/schoolhouse. (Other websites connected with the curriculum are
http://www.usps.com
http://www.usps.gov/ctc
http://encarta,msn.com/ctc

Teacher Ideas Press brings you Exploring the World of Animals: Linking Fiction to Nonfiction

For grades K-5, this book part of the Literature Bridges to Science series, uses fictional and nonfictional works to introduce science topics to children. IT includes group and individual multidisciplinary activities and covers endangered species, loss of rainforest, and other ecology-relate topics. Order for $24.50 from the publisher at PO Box 6633, Englewood, CO 80155-6633; e-mail lu-books@lu.com
303-770-1220; 1-800-237-6235
http://www.lu.com/tip

WRITE FOR *SPECTRUM*

The quality of *The Spectrum* is directly proportional to the relevance of its contents to your classroom. This invitation is a request for you to help colleagues across the state to take advantage of your experience.

In responding to this invitation, you will get a three-fold return on the opportunity. You will: 1) obtain experience in publishing; 2) receive some "feed-back" from the teachers across the state about your idea(s), and; 3) participate in the responsibility that is key to science: The communication of ideas!

With this in mind, share with us your teaching ideas for curriculum, laboratory experiences, demonstrations, assessment, portfolios and any innovations you have found to be successful with science students. Photographs for the cover are also needed. Please send:

- a typed or printed, double-spaced copy with standard margins.
- if possible, the article on disk (IBM or Mac) saved in RTF format, in addition to a hard copy, or sent electronically as an attached RTF document. Email to: ddummitt@uiuc.edu
- a title page with the author's name and affiliations, a brief biographical sketch ofthree or four sentences, home address, home telephone number (If there is more than one author, send all information for each), and e-mai address (if applicable).
- black and white photographs that are of good composition and high contrast.
- sketches, figures, and tables when appropriate.
- references if necessary—format is your choice.
- indicate whether or not the article has been published or submitted elsewhere.

Spectrum is published 3 times a year. Materials submitted must reach the editor by the following dates: June 15, October 1, February 15. Materials, including photographs, will be returned only if accompanied by a request in writing and a self-addressed stamped envelope.

BENEFITS AND ACTIVITIES FOR ISTA MEMBERS

SPECTRUM—*Spectrum* is the ISTA journal published in April, August, and December. The Spectrum provides ISTA members with association news and updates from ISTA officers, a column on state initiatives, articles, teaching techniques, exciting classroom ideas and information regarding upcoming meetings, conferences and educational opportunities, as well as listings of free or inexpensive educational materials.

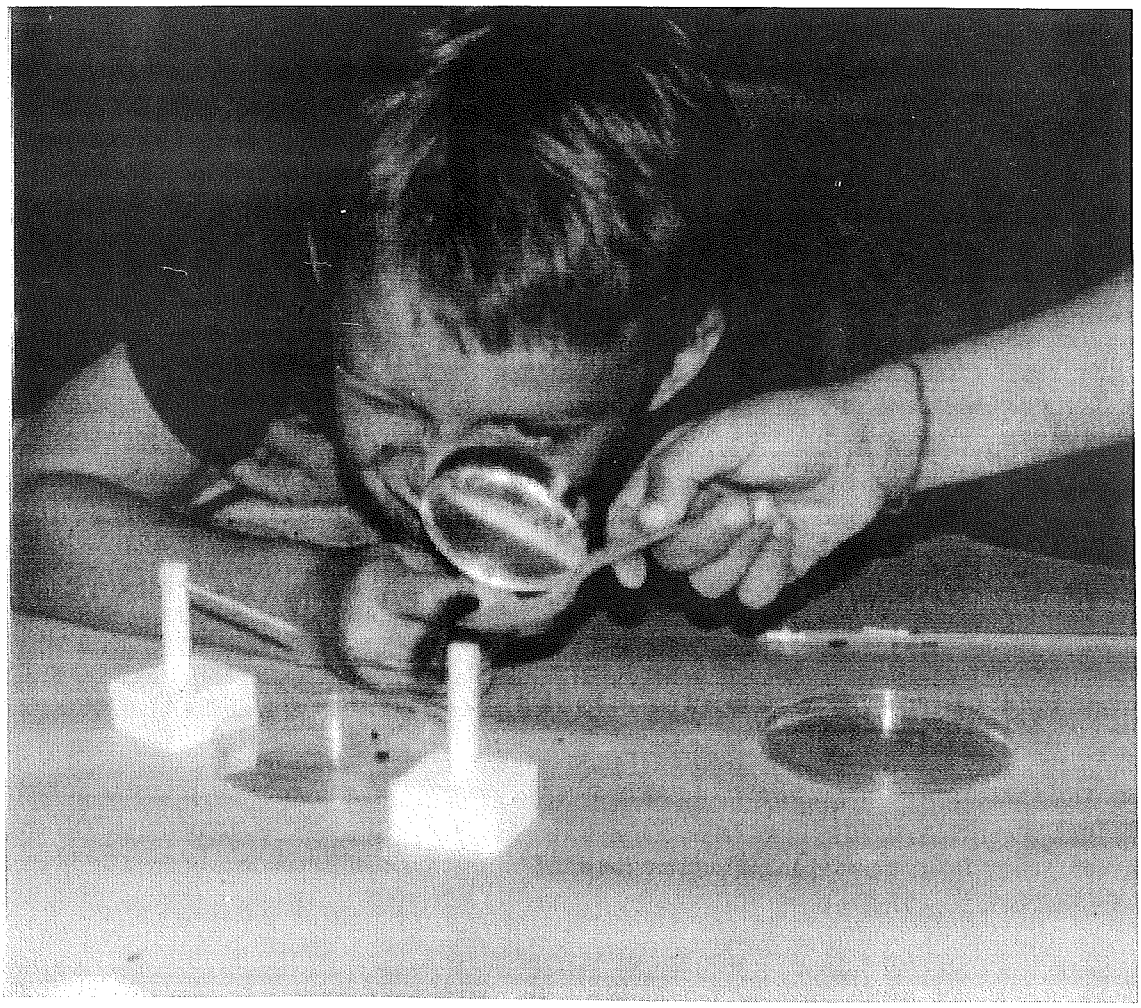
THE ISTA CONVENTION—For over twenty-five years this annual conference has brought together educators and administrator through the state. Major speakers; nearly 200 group sessions, hands-on workshops, microcomputer labs; and more than 150 commercial and noncommerical exhibits are a few highlights of this outstanding program of renewal for science teachers.

LEGISLATIVE REPRESENTATION FOR SCIENCE EDUCATION—ISTA provides a direct line of communication between science educators and state officials. Our organization voices concerns and recommends programs and funding for science education. In addition ISTA is an active member of the Illinois Education Alliance which impacts directly state mandates concerning the quality of education.

ISTA HIGH SCHOOL AWARDS—This honor is awarded annually to high school students who excel in science. Awards are available to all high schools.

TEACHER AWARDS—ISTA sponsers a variety of awards for elementary, high school, and preservice teachers.

WEBSITE—Visit our website at: http://www.ista-il.org



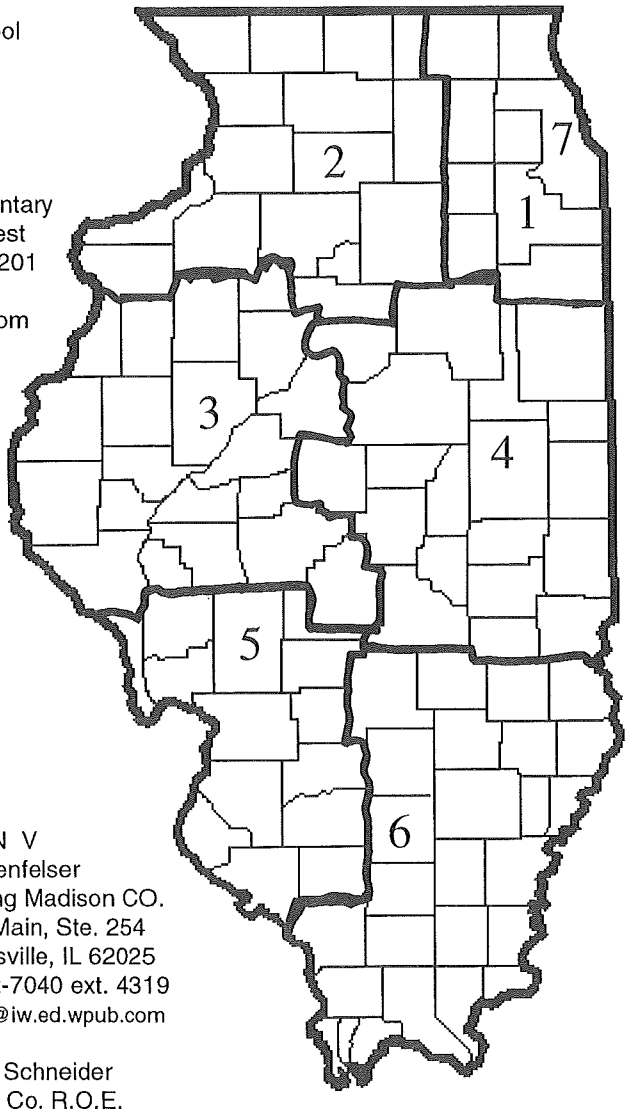
ISTA REGIONAL DIRECTORS

REGION II
Steve Chelstrom
Orion Middle School
800 12th Avenue
Orion, IL 61273
309-526-3392

Karen Meyer
Ridgewood Elementary
9607-14 Street West
Rock Island, IL 61201
(309)793-5980
MsKMeyer@aol.com

REGION III
Tracy Trimpe
Havana CUSD #126
801 E. Laurel
Havana, IL 62644
(309)543-6678
MrsTT68@aol.com

Linda Hall
Two Rivers Professional Dev. Center
200 W. Broadway
Monmouth, IL 61426
309-734-6822
lhall@peoria.k12.il.us



REGION V
Ann Linenfelser
Recycling Madison CO.
157 N. Main, Ste. 254
Edwardsville, IL 62025
618-692-7040 ext. 4319
Recycle@iw.ed.wpub.com

Michael Schneider
St. Clair Co. R.O.E.
500 Wilshire Dr.
Belleville, IL 62223
mschneid@stclair.k12.il.us

REGION VII
Nancy Campbell
Hanson Park School
5411 W. Fullerton
Chicago, IL 60639
773-534-3100
ncampbell@aol.com

Michael Lach
Lake View High School
4015 N. Ashland Ave.
Chicago, IL 60613
MikeLach@aol.com

REGION I
Nancy Nega
Churchville Middle School
155 Victory Pkwy.
Elmhurst, IL 60126
630-832-8682

Linda O'Connor
Regional Office of Ed.
421 County Farm Road
Wheaton, IL 60187
630-682-6956
loconnor@dupage.k12.il.us

REGION IV
James E. Barr
McArthur High School
1155 N. Fairview Ave.
Decatur, IL 62522

Marylin Lisowski
Eastern Illinois University
600 Lincoln Ave.
Charleston, IL 61920
217-581-7830
cfmfl@eiu.edu

REGION VI
Max Reed
Hutsonville High School
West Clover Street
Hutsonville, IL 62433
618-563-4913

Kevin Wise
Southern Illinois University
Carbondale, IL 62901
618-453-4212
kcwise@siu.edu

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, Putnam, Marshall, Mercer
Region III	Henderson, Warren, Knox, Stark, Peoria, Hancock, McDonough, Fulton, Tazewell, Schuyler, Mason, Adams, Brown, Cass, Menard, Pike, Scott, Morgan, Sangamon, Christian
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, Jersey
Region VI	Fayette, Effingham, Jasper, Crawford, Marion, Clay, Richland, Lawrence, Wayne, Edwards, Wabash, Jefferson, Franklin, Hamilton, White, Jackson, Williamson, Saline, Gallatin, Union, Johnson, Pope, Alexander, Pulaski, Massac, Hardin
Region VII	Teachers who teach in the City of Chicago only

ILLINOIS SCIENCE TEACHERS ASSOCIATION
I.S.T.A
www.ista-il.org

CALENDAR YEAR 2000 MEMBERSHIP CATEGORIES

In an effort to fund several new initiatives to address these issues (to be announced at the 1999 convention in Springfield), the ISTA Board of Directors voted in their June 1999 meeting to raise dues, effective for the year 2000 (January Through December 2000). However, between now and January 1, 2000 we are offering special "Y2K" rates. If you have not yet paid your dues (unless the mailing label on the back of this journal says 1/2001 or later, your membership will expire at the end of this December), you can still receive a whole year of the benefits of being an ISTA member at the 1999 rates:

Option 1: Full Membership Dues- $25.00

Option 2: Two Year Full Membership Dues- $45.00

Option 3: Five Year Full Membership Dues- $100.00

Option 4: Associate Membership Dues- $15.00 (unchanged for 2000)

Option 5: Institutional Membership - $50.00

In order to take advantagve of these One-time-only rates, we must receive your check and form postmarked by Saturday January 1, 2000. Anyone who pays after the January 1 date will need to pay the higher rates listed below. Use the form on the back cover of this issue. Don't procrastinate! Join your colleagues who are on the cutting edge of excellence in science education. Avoid the Y2K crunch and renew your membership today!

Any person interested in science education is eligible for membership. All memberships include a subscription fo the SPECTRUM and a subscription to the Newsletter, the ACTION. Write the number of the option for the membership category on the Membership Form on the back cover. Join now and your 2000 dues will be in force until January 2001. Membership year runs for the calendar year January 1 through December 31.

Option 1: Full Membership Dues- $35.00

Full Membership entitles individuals interested in Illinois science education to the following benefits: a one year subscription to the SPECTRUM, and ISTA ACTION. publications of the Illinois Science Teachers Association; notification of regional conferences and meetings; invitations to science issues activities; a reduced registration fee for the Annual ISTA Conference; voting privileges; and the opportunity to hold an ISTA Officer position.

Option 2: Two Year Full Membership Dues- $60.00

Two Year Full Membership entitles member to Full Membership benefits for two years.

Option 3: Five Year Full Membership Dues- $125.00

Five Year Full Membership entitles member to Full Membership benefits for five years.

Option 4: Associate Membership Dues- $15.00

Associate Student Membership applies to full-time students who are not currently employed as professional educators (Requires the signature and institutional affiliation of the student's professor). Entitles member to Full Membership benefits, with the exception of voting privileges and the opportunity to hold an ISTA Officer position. Associate Retired Membership applies to individuals who are on retirement status. Entitles member to Full Membership benefits, with the exception of voting privileges and the opportunity to hold an ISTA Officer position

Option 5: Institutional Membership - $75.00

Institutional Membership entitles the member institution, for a period of one year, to two subscriptions to the SPECTRUM and ISTA ACTION; notification of regional conferences and meetings; invitations to science issues activities; and a reduced registration fee for the Annual ISTA Conference for a maximum of three members of the institution.

ILLINOIS SCIENCE TEACHERS ASSOCIATION
MEMBERSHIP APPLICATION

PLEASE PRINT OR TYPE AND FILL OUT COMPLETE FORM

Name	Day phone
Affiliation (School or Organization)	Home phone
Address of above organization	Home address
City, State, Zip Code	City, State, Zip Code
e-mail and/or FAX	

CHECK APPLICABLE CATEGORIES IN EACH COLUMN

o Elementary Level	o Elementary Sciences	o Teacher
o Middle Level	o Life Science/Biology	o Administrator
o Senior High School	o Physical Sciences	o Coordinator
o Community College	o Environmental Science	o Librarian
o College/University	o Earth Science/Geology	o Student
o Industry/Business/ Government	o Chemistry	o Retired
	o Physics	
o Other_____	o General Science	
	o Integrated Science	
	o Other_____	

Send form and check or money order made payable to Illinois Science Teachers Association to: Diana Dummitt, ISTA Membership, College of Education, University of Illinois, 1310 S. Sixth Street, Champaign, IL 61820

REGION (FROM INSIDE BACK COVER) _____

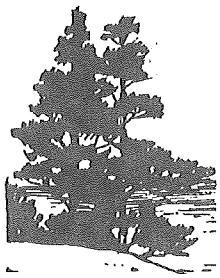
MEMBERSHIP OPTION (See page 48)_____

AMOUNT ENCLOSED_____

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

NON-PROFIT ORGANIZATION
U.S. POSTAGE PAID
CHAMPAIGN, IL 61820
PERMIT #75

*******AUTO**3-DIGIT 625 169 25
DUES TO 1/2000
GARY L. BUTLER
420 S TOWER RD
DAWSON IL 62520-3392



FALL 1999