

# SPECTRUM

THE JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION



SUMMER 1996

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

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# ISTA NEWS



## NSTA'S FUTURE CONVENTIONS

### National Conventions

New Orleans, Louisiana  
April 3-6, 1997

Las Vegas, Nevada  
April 16-19, 1998

Boston, Massachusetts  
March 25-28, 1999

### International Convention

San Francisco, California  
December 27-30, 1996

### 1996 Area Conventions

Phoenix, Arizona  
October 17-19

Atlanta, Georgia  
October 31-November 2

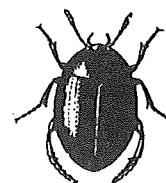
Toronto, Ontario  
November 21-23

### 1997 Area Conventions

Pittsburgh, Pennsylvania  
October 30-November 1

Denver, Colorado  
November 20-22

Nashville, Tennessee  
December 4-6



**MARK YOUR  
CALENDARS!  
1996 ISTA CONVENTION  
MERCHANDISE MART  
CHICAGO**

**OCTOBER 10-12  
ADVANCE PROGRAMS  
COMING SOON  
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GREAT OPPORTUNITY!**

**THIS YEAR'S  
CONVENTION  
PROMISES TO BE  
THE BIGGEST AND  
BEST EVER!**

## CALL FOR PAPERS!!

The editor of the Spectrum invites all interested persons to submit manuscripts for thematic issues of the journal. The first such issue has been scheduled for the winter 1996 edition. Subsequent thematic issues will be scheduled for next year. Following are the themes for each issue and due dates for submissions.

Please let us hear from you!

**Winter 1996 — Gender Education/Equity Issues in Science Education/Science**

**Submission Deadline: August 1, 1996**

**1997 (TBA) — Inclusion Issues in Science Teaching**

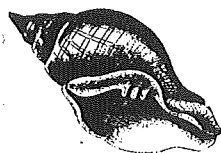
**Submission Deadline: January 2, 1997**

**1997/1998 (TBA) — Environmental Issues in Science/ Science Teaching**

**Submission Deadline: June 1, 1997**

Submissions can be made directly to the editor, Kevin Finson via U.S. mail (at Department of Elementary Education and Reading, Western Illinois University, Macomb, IL 61455) or by e-mail (Kevin\_Finson@CCMAIL.WIU.edu), OR to Diana Dummitt (U.S. mail at 110 Education Building, 1310 S. 6th Street, University of Illinois, Champaign, IL 61820 orddummitt@uiuc.edu ).

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## LETTER FROM THE EDITOR WHAT'S GOING ON?

Here we are in summer, hopefully enjoying the weather and some relaxation time (maybe not as much as we really want, but more than we get during the school year!). This past academic year was quite an active time in Illinois, and the fall portends to be no different. So much is going on that we can easily lose sight of important issues being considered by ISBE, the state legislature, and other entities. If your life has slowed a bit during these summer months, I recommend you take some quiet time to reflect on some of the things already thrust upon you and those looming on the horizon. Here are just a few to get you started:

The state superintendent is working toward changing the way people become teachers. Discussion has revolved around completing bachelor's degrees in liberal arts and then moving into one year of professional development followed by one year internships prior to obtaining full license to teach. Do you know the details of this proposal, and how it might affect you and your colleagues? It will impact teachers presently certified and endorsed as well as newcomers to the profession.

Among other things the legislature and the governor have considered are charter schools, vouchers, and privatization of schools. What would this mean to your school, the way you teach, and what you teach?

Science teacher certification is being examined, and proposed changes have been forwarded to ISBE by the ISTA task force which has been working on the issue for over two years now. The task force sent out numerous mailings containing the proposed changes and requests for feedback. Did you receive one? Did you respond? Do you know what the proposed changes are and whether and how they might impact you?

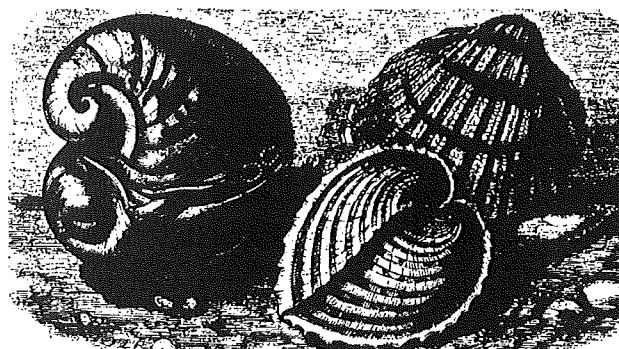
The federal government has hopefully (at the time of this writing) settled on a budget for 1996. From the information I've seen thus far, the 1997 budget seems to be in better shape. But what is in that budget for education? Congress, in its zeal to cut spending, has offered many education programs for the chopping block. How do these actions, or lack thereof, impact science teaching? How will you be impacted? How will your colleagues, both present ones and new ones to join you in years to come, be affected? The national science education standards were released by the National Research Council (NRC) late in December, 1995. These standards address significant change on a systemic level. Do you know what the standards propose for science teaching and for science teacher preparation? How will the standards impact you and your colleagues? How will the standards likely be implemented, and when?

The American Association for the Advancement of Science (AAAS) continues to work on its Project 2061 and should publish its "Blueprint" soon. The "Blueprint" is intended to be a series of guidelines to help implement changes recommended in AAAS' Benchmarks (which were released 1993). I've already seen some new curricula which have embraced the Benchmarks and have been designed to address them. Do you know what the Benchmarks are for your teaching area?

The National Science Teachers Association is presently working with NCATE on revising teacher accreditation and certification. The effort now seems to be oriented more toward performance based standards and less toward simply counting credit hour accumulation. The proposal also includes standards for beginning teacher performance, for practice during postbaccalaureate internships, and for recognition of advanced competency and/or expertise. Are you aware of what is being proposed? How will such changes affect you, and how will they be handled by supervisory personnel? NSTA has also released (in 1993) a significant work on Scope, Sequence, and Coordination for secondary science education. Are you aware of what is contained in that document, and how it can help you?

Once you've reflected on some of these issues, visit with your colleagues about them. Then let the people in the decision-making positions know your thoughts, both pro and con. This not only includes school administrators, but those persons at ISBE, your legislative representatives, and even your representatives in congress. It really is interesting how things can be positively impacted when numerous people speak up and work together. We can, of course, sit back and let things happen to us. We can abrogate our roles as professionals. Or, we can be active and vocal for what is best for science education in particular and education in general. The time is past for being passive, uninformed, and uninvolved. Educate and update yourself on issues such as those I've noted in this column. Your students, both present and future, need your expertise now more than ever. Enter the new academic year armed with the knowledge and understanding you need that will help you have control to do the best science teaching you can.

Kevin





## Region 2 Report

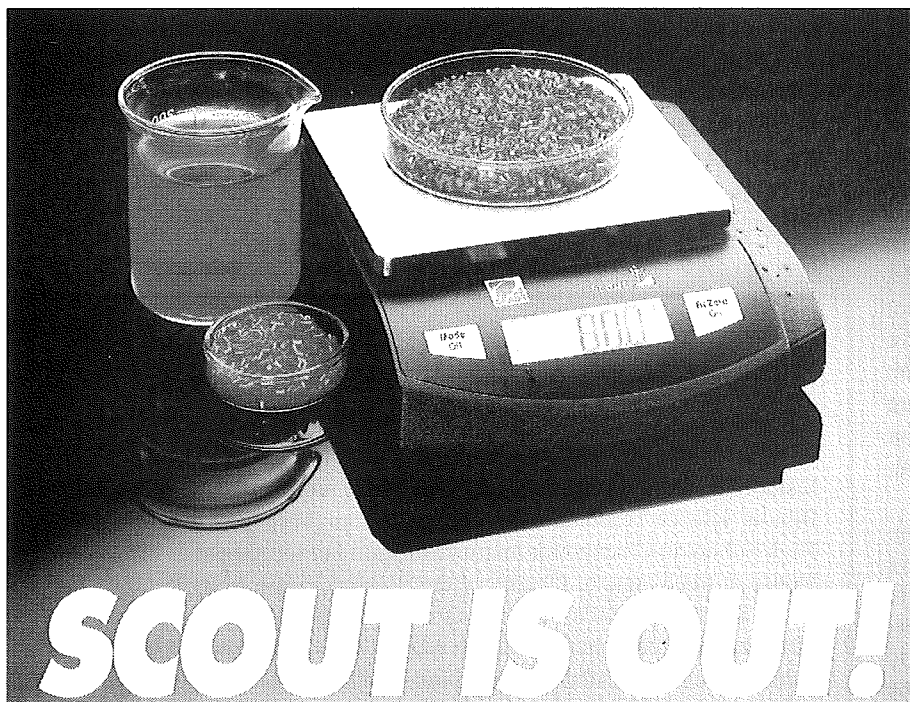
The members of Region 2 want to thank Linda Duncan, outgoing regional director, for her leadership and service. Linda plans on remaining pro-active in ISTA. Congratulations to Karen Meyer! Karen was elected once again as regional director. Region 2 had its fall science experience at the Rockford Discovery Center. We had a tour of the museum, saw the Big Bug Exhibit, and had an opportunity to get acquainted and share ideas and concerns. The spring science experience was held at Faraday Hall on the campus of Northern Illinois University. The evening started with a social hour with wonderful dessert. An update from the NSTA Convention and the ISTA Board Meeting was given. An informational meeting and sharing session was held. Astronomy was the topic for the evening and a visit to NIU's observatory/starlab was conducted. We are planning another science experience for the fall. Be alert to future meetings on the academic standards for science! Have an enjoyable summer.

Cathy Flannery and Karen Meyer  
Region 2 Directors


## Region 5 Report—Science in the South!

ISTA Directors from Southern Illinois Regions 5 and 6 met with a team of enthusiastic educators from SIU at Carbondale on May 15th. The purpose of the meeting was to develop a strategy to connect Southern Illinois science teachers in a convenient location and with a format that was inviting. The result is a proposed one-day conference which is certain to meet the needs of K-12 science educators, as well as administrators and pre-service teachers! More details will follow, but the conference will be planned to meet the need for an inexpensive conference within a reasonable driving distance and offering sessions especially targeted to elementary, middle/jr high, and high school science teachers as well as a thread just for administrators. Planning members of Science in the South include Suzanne Asaturian and Debbie Clark from Region 6, Debbie Clinebell and Dean Dittmar from Region 5, Susan Pearlman, Kathy Pericak-Spector, and Austin Winther from SIUC! To volunteer to help, contact one of the directors for Region 5 or 6 listed on the inside back cover of this issue of the Spectrum.

Debbie Clinebell  
Region 5 Director



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Springfield, IL 62777

## DID YOU KNOW?

I am so sorry that I missed the deadline for the last issue of the *Spectrum*, especially since I had promised such great news in it from my last note to you in the winter. There have been so many great things going on in Illinois for science that I will have to narrow some of the ideas down so that it can all fit into a single column.

First, the Illinois Academic Standards Project is still on the drawing boards; it is to be released soon and the review period is expected to last through early November. Please plan to be a part of the review process.

Each school is supposed to receive several copies for building reviews; I have offered a format for the ISTA regional directors and the ROE/ISC Scientific Literacy folks to use for these reviews. Your input will be most valuable. Our assignment was to study the National Science Education Standards, as well as current research to propose effective and meaningful goals, standards, and benchmarks for early and late elementary, middle and early and late high school science efforts. There are several similarities between the social sciences' and the health and physical development's proposed benchmarks. Please try to look at the whole, look at the pieces, and suggest improvements for clarity and sequence. Did we over- or under-emphasize ideas? I am proud of the work that our learning team has done and I sincerely hope that your suggestions will be able to make our work even better.

As for the National Science Education Standards, arrangements have been made so that all ROE/ISC offices will receive sets of the Annenberg materials which have been designed to promote awareness and understanding of the Standards. I hope that I will be able to share a set of the materials with the ISTA board so that they can assist in the statewide efforts.

Dr. Marilyn Lisowski has written another article for this *Spectrum* issue about the PLAN-IT Project, a spectacular project for secondary teachers incorporating very, very authentic assessment of the Illinois' ecosystems.

This project may be getting national attention very soon because of its impact for meaningful learning and applications.

The Safety Project is continuing. ISTA is working on a project to be added to the existing Guidebook for Science Safety in Illinois. They are preparing a section on K-8 science safety for distribution next fall. IABT is working on a section for life science safety; EEAI is working on a section for outdoor classroom safety. Work is continuing for seeking funding for a chemical waste pick-up for our schools. You may become actively involved in conversations with legislators, explaining the need for this sort of assistance for your school.

Another project that I am especially proud of is the Environmental Literacy for Illinois strategic plan. Proposed funding for this effort is now in the Scientific Literacy budget for FY97. This funding will include statewide efforts for inservice training, preservice enhancements and study groups which will work on several research projects including course templates and mini-grant funding, among others. A separate project to be funded under this umbrella is the Environmental Meisters and Mentors: A Watershed Internship Project. Around 35 teachers have applied to participate in this project. They will be working with scientists from several state agencies as the scientists are working in the watershed areas of their school districts. More will be shared later as we continue to progress.

I have recently received permission to release the names of the teachers nominated from Illinois for the Presidential Awards of Excellence Program. I was able to call the nominees for the national award on Monday, May 13. I can't tell you how exciting such a day was—to be able to congratulate some of the most spectacular teachers in Illinois on their special efforts for our kids. As of this writing I will be trying to contact the ISTA Awards of Excellence winners to congratulate them, as well. I have asked Diana to print the names of the winners for both the elementary and secondary categories. Please express your pride in these teachers yourselves. Thank you to those who applied; the selection process is so difficult. Each application that I read restores my enthusiasm for the science for our kids.

Thank you for taking care of our kids for science.

Gwen

### IN MEMORIAM

**Sister Mary Bertrand Wolniecnicz, BVM**

**Nov. 5, 1910 - May 19, 1995**

Sister Mary Bertrand was one of the early and most active members of the Illinois Science Teachers Association. She taught chemistry at Cathedral High School in Chicago for many years until her retirement to the Master House of the Sisters of Charity of the Blessed Virgin Mary in Dubuque, Iowa. Sister Bertrand's expertise in the ISTA was two-fold. She always arranged the meal functions which were always excellent and her skill at obtaining door prizes from the exhibitors for the raffle at the ISTA meetings was legendary. The dedication of teachers such as Sister Bertrand to her pupils, her school and the Illinois Science Teachers Association helped build ISTA's strong foundation. We are gratified for her service as an educator.

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## SUMMARY OF ISTA BOARD MEETING MARCH 23, 1996

The spring 1996 meeting of the ISTA Board was called to order in Champaign on Saturday, March 23rd at 9:10 AM by President Bernie Bradley. All officers and at least one director from each region were in attendance. Minutes of the September Board meeting were read and approved as presented.

**MEMBERSHIP REPORT** George Zahrobky reported the current total members whose dues are paid through 9/96 is 2,108. In February, 523 records were deleted from the files due to nonpayment of dues from 1993.

**SPECTRUM REPORT** The spring Spectrum was printed at a cost of \$2,200. Advertisements brought in \$1,500 in revenues to offset the journal's costs. Extra copies were printed for use at the ISTA booth at the NSTA conference in St. Louis at the end of March. Kevin and Diana would like to produce some thematic issues, and will try the first one for the winter 1996 issue which will focus on gender equity issues in science. Anyone having ideas for thematic issues is encouraged to let Kevin and Diana know. Kevin requested all Regional Director reports be submitted by April 1st so they can appear in the summer issue of the Spectrum.

**EXECUTIVE SECRETARY REPORT** Diana reported a net profit from the 1995 convention amounting to \$27,000. The convention had over 170 workshops and 150 booths. The profit will be needed to defray costs of establishing the convention at the Merchandise Mart in Chicago for the fall. Booth prices for that convention have been set and include charges assessed by the Teamsters for hauling materials. The ISTA portion of the NSTA Region hospitality social was discussed.

**REPORT ON THE ILLINOIS ACADEMIC STANDARDS PROJECT** Doug Dirks reported on the progress of the project. The present document has performance standards incorporated in it. The plan is for ISTA to convene focus groups for the purpose of reviewing the document and providing feedback to the state for revisions. The original time line for this to occur has been pushed back due to delays in the release of the standards draft.

**AWARDS and ISBE REPORT** Gwen Pollock reported that there would be a meeting in Springfield on April 11th and 12th to provide an overview of the National Science Education Standards. Annenberg kits for dissemination of the information have been ordered. The Presidential award winners were announced to the board. Gwen noted that the National Science Foundation will continue with the awards program, but NSTA has lost the contract to administer it. There was no discussion of the possible impact of this on ISTA. An update on the ISBE Safety Project was provided, as was information about the Plan-It (Earth systems) Project and the Environmental Meister-Mentors Project. ISTA will be contracting with the ISBE for the K-8 section of the state safety manual.

**NEW BUSINESS 1995 Convention:** A synopsis of receipts and expenditures was reviewed. The profit of \$27,000 will have \$4,500 transferred to the membership account for dues collected since many attendees paid registration fees which included dues payments. **1996 Convention:** The theme for the convention this year will be "Setting the Standard." State Superintendent Spagnola has been contacted about delivering the keynote address, which is tentatively scheduled for 10:00 AM on Friday of the convention. The expected costs for the exhibit hall and breakout (presentation) rooms is \$25,000. The goal this year is to register 1,500 Chicago teachers and 1,000 downstate teachers. The registration fee has been set at \$40.00. Bernie noted that registration materials should be available for members by mid-May. Eisenhower (Title II) monies can be used by teachers to defray costs of attending the convention. A motion was made and approved to set a reduced rate for registration fees for college students. Saturday only and membership would total \$15.00, and two-day registration and membership would be \$30.00.

**1996 NSTA CONVENTION:** Diana reported on plans for the ISTA co-sponsored hospitality room, the ISTA booth in the exhibit hall, and what would be displayed there.

**OTHER CONFERENCES:** Diana reported there are preliminary plans for a southern regional conference to be held in the spring of 1997 (spearheaded by Suzanne Asaturian), to compliment the ones already in place in a northern region and in a western region.

**1997 ISTA CONVENTION:** The convention will be held in Peoria. The host hotel will be the Pere Marquette, and exhibits will be in the Convention Center. The tentative theme is "Teleconferencing." Karen Zuckerman will serve as the convention chair. Other convention committee members include Don Nelson (Registration), John Beaver, Kevin Finson, and Maurice Kellogg (Program), Don Powers (Speakers), and Gail Truho (Audio-visuals). Work has already started on putting together this convention, and calls for papers are expected to be made during the Chicago convention at the Merchandise Mart.

**1998 ISTA CONVENTION:** Diana reported on contracts with Pheasant Run, which were accepted by action of the Board. The 1998 convention dates will be October 8-10, 1998. Volunteers to work on the convention committee are needed.

**1999 ISTA CONVENTION:** Diana proposed the convention be held in Springfield from September 29 - October 2, 1999. The Board approved the proposal.

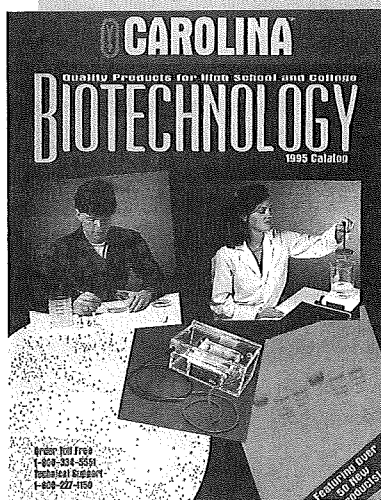
**The meeting was adjourned at 2:30 PM. The next Board meeting will be at Champaign on June 22-23, 1996.**

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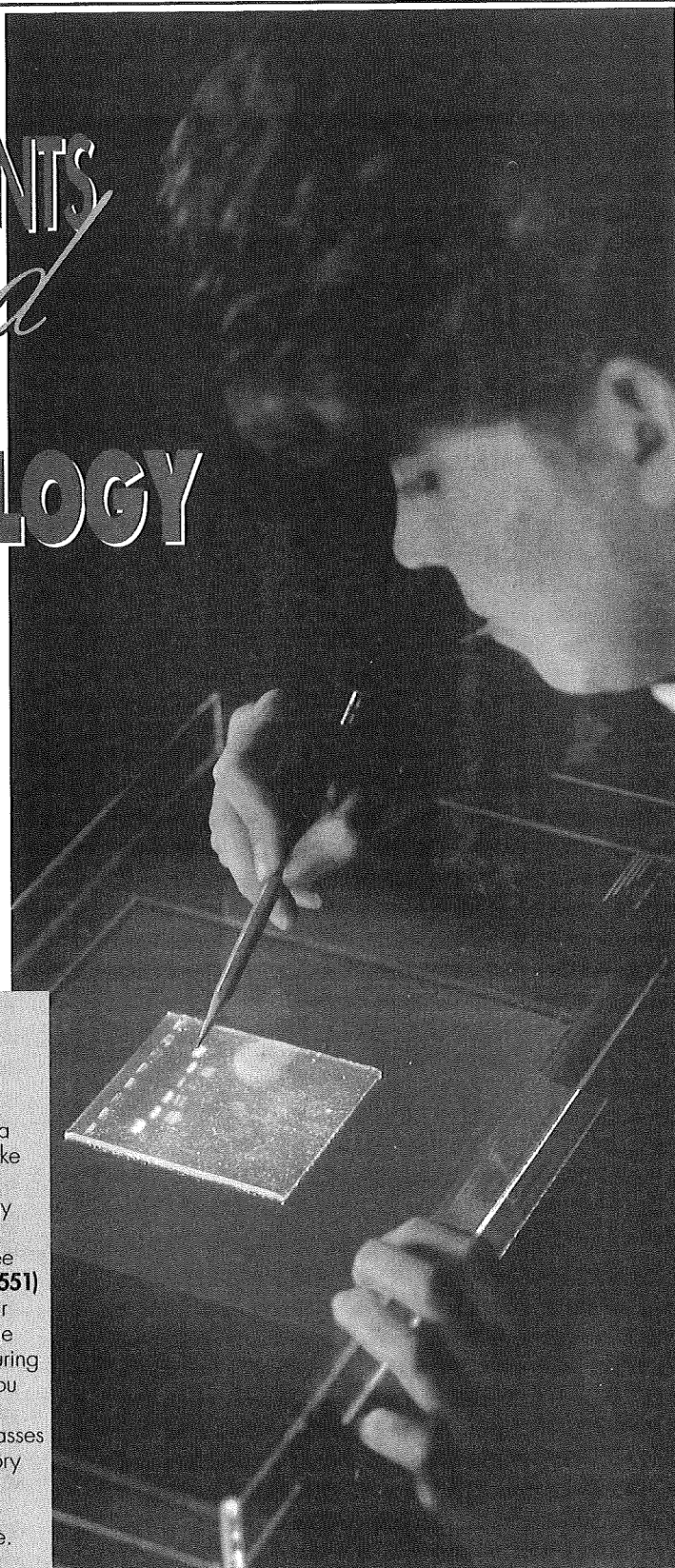
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# COMPUTER SPECTRUM

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## ONLINE RESOURCES FOR SCIENCE EDUCATION

If you are like many science teachers in the state, you are in the process of getting connected to the Internet, and its popular sub-set, the World Wide Web (WWW). Now you may be wondering, "Now that I'm on-line, what resources are available to help me in the science classroom?" This article will provide you with information to get you started accessing valuable resources on the World Wide Web.

To access WWW, you need at least a computer with a modem, communications software, a WWW browser program, and access to a telephone line with dial-up Internet service. If your school has a routed connection (with high speed and high capacity services), you won't need the modem and you'll have far greater capacity to access educational resources.

Once connected, you use a web browser program such as Lynx (a text-based browser) or a graphical browser such as Netscape. Using a browser with a graphical interface requires two things: 1) a relatively high-end personal computer on your desk (either Macintosh or IBM compatible will work), and 2) a high-speed, high capacity connection from your service provider. If you don't have the right type of connection, it doesn't matter how many Megahertz your PC has, you'll still be limited to a text-based system!

To find a resource on WWW, you may either use a search engine to search for keywords, or you can use a Uniform Resource Locator (URL). One of the URLs you should probably know belongs to the National Science Teachers Association (NSTA). You can check out the NSTA Homepage at: <http://www.nsta.org>. You'll find lots of information about the organization and about science teachers and teaching across the country. A new feature is a bulletin board where teachers can post their science curricula questions and/or comments to other educators.

Another site of interest is **The Knowledge, Integration, Environment (KIE) Internet Education Project**, which promises to pioneer the use of the Internet and WWW for K-12 science instruction. Their web site offers ready-to-use classroom projects, favorite education sites, and a forum for connecting teachers and students to scientists. The site is maintained by the Graduate School of Education, University of California at Berkeley, and funded by the National Science Foundation and Pacific Bell. The URL is: <http://www.kie.berkeley.edu/KIE.html>

Looking for earth/space science resources? Check out **The Observatory**, NASA's public access site for earth and space data. At the site, you'll find images and up-to-date information on the Earth and solar system and a variety of material, related sites, and education resources on earth and space science, remote sensing, and information technology. Find it at: <http://www.rspac.iovv.nasa.gov>

## SOME COOL CHEMISTRY WEB SITES

### University of California-Berkeley

<http://www.cchem.berkeley.edu/Table/index.html>

<http://www.cchem.berkeley.edu/ChemResources/index.html>

### Boston College

<http://www.chemserv.bc.edu/web-elements/web-elements-home.html>

## AIR QUALITY EDUCATION ON-LINE!

Air pollution is a subject that is often difficult to teach in the classroom because it doesn't lend itself easily to hands-on activities. The Texas Natural Resource Conservation Commission has begun providing on-line access to Texas air quality data and classroom teaching materials via the Internet. The URL is [http://www.tnrcc.state.tx.us/air/lesson\\_plans.html](http://www.tnrcc.state.tx.us/air/lesson_plans.html). For more information, contact Kim Sanders at (512) 239-2173 or [ksander@smtpgate.tnrcc.state.tx.us](mailto:ksander@smtpgate.tnrcc.state.tx.us)

### Illinois State University

Center for Mathematics, Science, and Technology

Campus Box 5960

Normal, IL 61790-5960

## WHAT IS IMaST-L?

The IMaST-L listserv is a mailing list for discussing the ideals of integration of mathematics, science, and technology. The goal of the IMaST curriculum is to develop a yearlong course of work for seventh grade students that reflects the strong connections among mathematics, science, and technology. The IMaST project is housed at Illinois State University's Center for Mathematics, Science, and Technology.

The IMaST-L listserv is intended to enhance the knowledge of persons and groups interested in mathematics, science, and technology; integration; authentic assessment; and other pertinent topics. This discussion area is accessible as a listserv under the name IMaST-L at [acadcomp.cmp.ilstu.edu](mailto:acadcomp.cmp.ilstu.edu).

### How to subscribe to IMaST-L

To subscribe you may send the following E-mail to [listserv@acadcomp.cmp.ilstu.edu](mailto:listserv@acadcomp.cmp.ilstu.edu).

On the first line of the body of the text write  
Subscribe IMaST-L (your name)

Do not include a signature or any other information. You should receive a welcome letter about the list within a day or two. The moderator for this list is Scott Shook of the Center for Mathematics, Science, and Technology at Illinois State to whom inquiries may be directed by E-mail at [sashook@ilstu.edu](mailto:sashook@ilstu.edu); by voice telephone at (309) 438-8023; or by regular mail at Illinois State University, Center for Mathematics, Science, and Technology, Campus Box 5960, Normal, IL 61790-5960.



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## REDISCOVERING SCIENCE BAKKEN IN CYBERSPACE

Over the summer of 1995, research assistant Eric Boyles created a Bakken world wide web (WWW) site on the Internet. Our web pagers have information about The Bakken's activities and programs, an on-line Books and Manuscripts of the Bakken, and high-resolution color images of instruments. We have also installed links to resources outside the Bakken Library and Museum. These web pages are currently viewable 24 hours a day by any computer operating anywhere in the world, using widely available world wide web browsing software. Our WWW address is:  
<http://www.umm.edu/nlhome/m557/rhees001/blm/welcome.htm>

### FREEBEE

Free memberships in Ait.net, the online service of the Agency for Instructional Technology, are now available for those wishing to discuss classroom concerns in forums with other teachers, share classroom tips, and exchange lesson plans.  
Visit <http://www.ait.net/>

### Science Teacher's Web Site

Possibilities! Integrating the Internet into the Secondary Science Classroom, a Web site created by a longtime Seattle, Washington area science and math teacher, attempts to help secondary science teachers exploit the Internet for teaching purposes. The site is a selective list of pointers to resources, as well as suggestions for activities organized by function. It includes inter-personal projects, information collection and exchange, problem solving projects, and miscellaneous projects. There are pointers to email, listserv, and news groups, conferencing utilities, field trips, museum tours, virtual science fairs, database creation, and many others. There are also sections on evaluating sites, pointers to other k-12 education sites, and a highlight page of the month. Possibilities!, while not comprehensive, is a good place to start for secondary science educators.  
<http://kendaco.telebyte.com:80/billband/Possibilities.html>

## NATIONAL SPACE SOCIETY

The National Space Society (NSS) recently announced the creation of their new web pages on the Internet's world wide web. Go to **URL:**<http://www.nss.org/> to find information about becoming a member of NSS, locating a local chapter, downloading teacher and student resources, and following NSS activities (coming soon! — LIVE coverage of NSS events, such as The Race For Space). The site also features links to other current NSS web projects:

Ask An Astronaut <**URL:**<http://www.nss.org/askastro/>>

Mission HOME<**URL:**[http://www.nss.org/mission\\_home/](http://www.nss.org/mission_home/)>

The Space, Planetary, & Astronomical Cyber-Experience (SPACE)  
<**URL:**<http://www.nss.org/space/>>

For more information, contact David Brandt 202-543-1900, x 177  
E-mail: [prospace@aol.com](mailto:prospace@aol.com).

### More Sites for Science Teachers

National Science Education Standards:  
<http://www.nap.edu/nap/online/nses/contents.html>

Science Education Resources:  
<http://www.teleport.com/~vincer/science.html>

K-6 Hurricane Activities:  
[http://stripe.colorado.edu/~kgshtml/Hurricane\\_Lesson.html](http://stripe.colorado.edu/~kgshtml/Hurricane_Lesson.html)

Leon M. Lederman Science Education Center (Fermilab):  
[http://www-ed.fnal.gov/programs/ed\\_mat\\_trc.html](http://www-ed.fnal.gov/programs/ed_mat_trc.html)

The Hub: <http://hub.terc.edu/>

Quest! (NASA's K-12 Internet Initiative): <http://quest.arc.nasa.gov/>

Interactive Frog Dissection:  
<http://curry.edschool.Virginia.EDU/go/frog/menu.html>

Microbe Zoo: <http://commtechlab.msu.edu/CTLprojects/dlc-me/zoo/>

The Yuckiest site on the Internet": <http://www.nj.com/yucky/about.html>

Chicago Academy of Sciences: <http://www.chias.org/>

NREL's Center of Science and Education:  
<http://www.nrel.gov/business/education.html>

Science Teachers' Pot of Gold: <http://www.ozemail.com.au/~chip/home.htm>



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One East Hazelwood Drive  
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### SURFIN' THE NET? VISIT HWRIC!

HWRIC has jumped onto the information superhighway with a Homepage on the Internet. Our address is <http://denr1.igis.uiuc.edu/hwr/hmlhome.html>. The site will continue to be upgraded and additional environmental links provided. Currently, staff members' e-mail addresses are available from this site as is information on HWRIC programs and services. Stop by and check it out!



# ARTICLES

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## SUPERCELLS — NATURE'S MOST VIOLENT THUNDERSTORMS

### Introduction

What do the disasters listed above have in common? All were caused by a dangerous yet infrequent type of thunderstorm known as a **supercell**. More than 100,000 thunderstorms occur every year in the US. Meteorologists estimate that 2000 to 3000 are supercell thunderstorms.

Although less than 5% of all thunderstorms are supercells, they cause a disproportionate amount of deaths, injuries, and property damage associated with severe weather. While less than 50% of supercells produce tornadoes, virtually all strong and violent tornadoes (Table 1) are spawned by supercell thunderstorms. Supercells can also produce large hail, damaging winds, and torrential rains that may lead to flash flooding.

Supercells are rarely mentioned in middle or high school textbooks and teaching materials, or by the media. But supercell thunderstorms pose a significant threat to life and

**March 27, 1994, Piedmont, Alabama:** A tornado struck a church on Palm Sunday morning. More than 90 people were injured and 20 were killed.

**July 11, 1990, Denver, Colorado:** The worst hailstorm in United States history injured 60 people at an amusement park. Hail up to baseball size caused over \$600 million in damage.

**July 1, 1985, Cheyenne, Wyoming:** A slow-moving supercell brought 8 inches (20 cm) of rain that resulted in a flash flood, and hail one foot (30 cm) deep. Sixteen people were killed and damage was \$67 million.

property, particularly east of the Rocky Mountains. This paper is intended as a resource for science teachers and their students to become better informed about supercell storms. Atmospheric processes capable of producing supercells are described, as well as how meteorologists identify supercells on radar. Information is also provided on visual clues for identification of supercells, and how to react to National Weather Service warnings. Such education and preparedness can minimize the impact of severe weather on activities at school.

The authors have prepared a series of papers for educators covering the topics of lightning (Vavrek et al., 1993a,b; 1994a,b), lightning education (Holle et al., 1995a,b,c), and forecast terms (Allsopp et al., 1995), as well as posters on avoiding trees at the time of nearby lightning (Howard and Holle, 1994, 1995).

### Supercell Thunderstorms

A supercell is a thunderstorm with a main updraft region that is **persistent** and **rotating**. While all thunderstorms are composed of updrafts and downdrafts, a supercell has a dominant updraft region that can persist for hours. The term

"cell" refers to an individual cumulus cloud tower or a thunderstorm with an updraft and downdraft near each other.

Some supercells persist for several hours and track over 100 miles (160 km) while producing severe weather. In contrast, ordinary thunderstorms last less than one hour over shorter distances.

Due to its rotation and "balanced" structure, a supercell updraft can resist interference from surrounding downdrafts. The result is that supercells become stronger and last longer than common thunderstorms. Some supercell storms consist of a series of updrafts and downdrafts rather than one updraft, so the cell lasts longer and tracks farther. Some strong convective

Fujita (F) Scale	Miles per hour	Meters per second	Category	Damage description
F-0	40- 72	18- 32	Weak	Light
F-1	73-112	33- 50	Weak	Moderate
F-2	113-157	51- 70	Strong	Considerable
F-3	158-206	71- 92	Strong	Severe
F-4	207-260	93-116	Violent	Devastating
F-5	261-318	117-142	Violent	Incredible

Table 1. Tornado F-scale intensity (after Fujita, 1987).

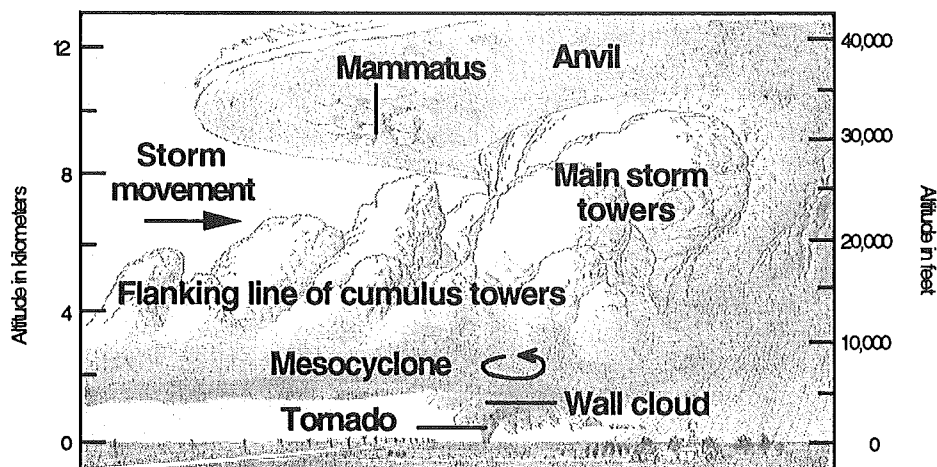
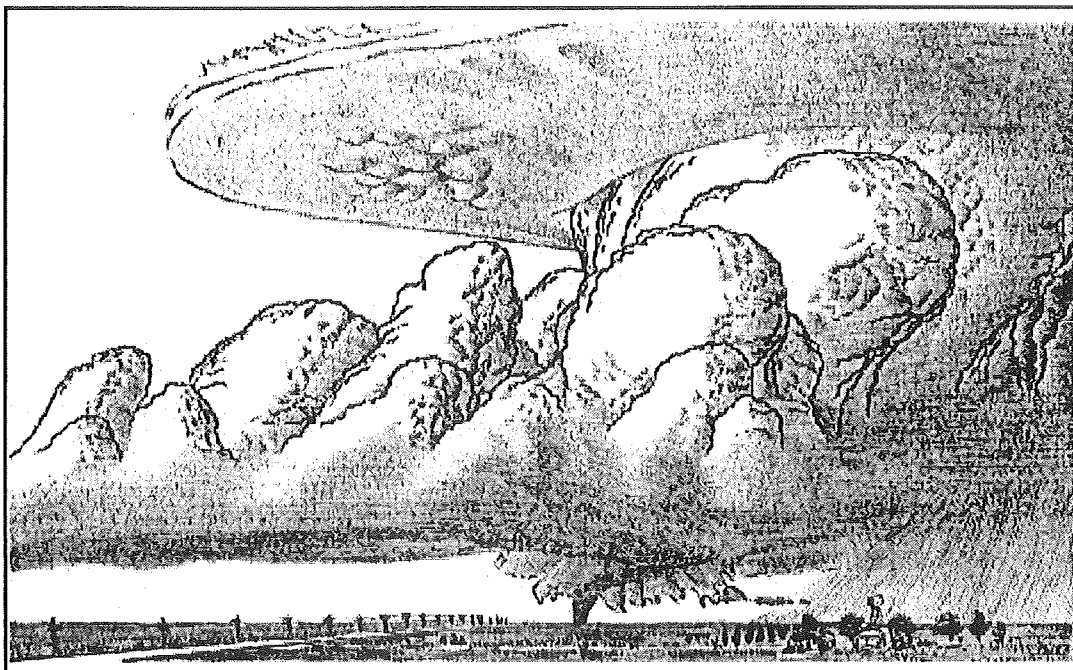


Figure 1. Drawing of a classic supercell (top). Cloud features are identified in lower panel. Direction of view is toward the northwest.

storms intensify into a supercell just after the arrival of cold air outflow near the ground from another storm to the north or west. But a supercell tends to dissipate when cold low-level outflow from another storm to the south or east reaches it. Such interactions with nearby storms affect whether a supercell grows, maintains its intensity, or dissipates.

Several types of severe weather can occur with supercells:

- Tornadoes
- Winds exceeding 57 mph (25 meters per second)
- Hail 3/4 inch (2 cm) in diameter or larger
- Intense rainfall that can lead to flash floods
- Dangerous lightning.

Supercell thunderstorms are often large and tall, extending in height up to 65,000 ft (20 km), particularly during late spring and summer. However, other supercells can be smaller (height of less than 40,000 ft, or 12 km) and still produce significant severe weather. These smaller storms tend to occur more during the cooler months when vertical instability is not as intense as in the summer, but the vertical lifting and wind shear is strong.

East of the Rocky Mountains, supercells are most frequent in spring and summer during the late afternoon and early evening. Here, weather systems with favorable wind conditions have access to warmth and moisture from the Gulf of Mexico.

Supercells sometimes occur during other months and times of day. For example, along the Gulf and in the southeastern states, conditions that can lead to supercells occur most frequently during winter and early spring in the late night or early morning hours.

Supercells can develop over a variety of terrain. A rare supercell near Yellowstone National Park in Wyoming during July 1987 produced a tornado and damaging straight-line winds across rugged terrain at elevations of 10,000 ft (3 km). Contrary to local legends and myths, it is important to remember that valleys, hills, rivers, lakes, and streams have no significant effect on severe weather produced by supercell thunderstorms.

## Supercell Development

Supercell thunderstorms begin much like any other thunderstorm:

- Rising motion is started by the sun heating the ground or by upward lifting due to large-scale weather systems such as fronts or upper-level low pressure systems.
- A rising column of warm, moist, and unstable air cools and condenses into cloud and precipitation droplets.
- As this updraft builds to greater heights, lightning flashes begin and a thunderstorm develops.

Supercells need strong updrafts that develop in a very unstable environment where warm, moist air near the ground is overlain by cold, dry air in middle levels of the atmosphere. The moist air is needed to fuel the updraft, while dry air aids in downdraft development. However, the main difference between supercells and most thunderstorms is the surrounding **wind profile** that is made up of wind speeds and directions at different levels of the atmosphere around the storm.

When the wind profile is arranged in certain ways, it is hypothesized to cause a thunderstorm updraft to rotate. The best wind profile for producing this rotation starts with wind from the south or southeast at the ground in the northern hemisphere. With greater height, winds increase in speed and become more westerly, especially in the first 6000 to 9000 ft (2 to 3 km). If it were possible to suspend a huge football

horizontally in this layer, it would begin to spin (or spiral) similar to a football thrown by a quarterback. So we can say this wind profile contains rotation or spin.

If a thunderstorm develops and builds in this wind environment, some of this spin is thought to be fed and tilted into the updraft of the thunderstorm, and may cause the updraft itself to start rotating (defined as a mesocyclone). Visualize a spiraling football thrown downfield that is suddenly pulled up into a rapidly rising column of air—the football will be tilted from a horizontal to a vertical direction while it continues to spin. In the same way, the thunderstorm updraft is thought to start spinning around a vertical axis as air with spin from the surrounding wind profile is tilted upward into the updraft. A rotating updraft can readily withstand diffusion and other forces that destroy non-rotating thunderstorm updrafts, unless the cool surface air arrives from the south or southeast.

The profile of winds at middle levels between about 10,000 and 30,000 ft (3 to 9 km) above the ground is important. Near supercells, winds at these levels are often strong from a westerly direction. Such winds can carry precipitation and rain-cooled downdraft air away from the main updraft, so it doesn't fall through the updraft core and end the storm growth. When wind profiles are correct, the rotating main updraft grows stronger and lasts longer. This is

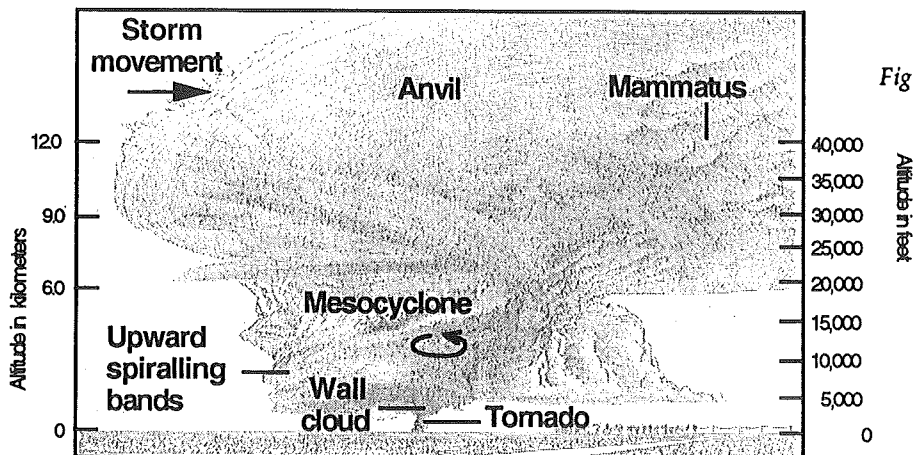
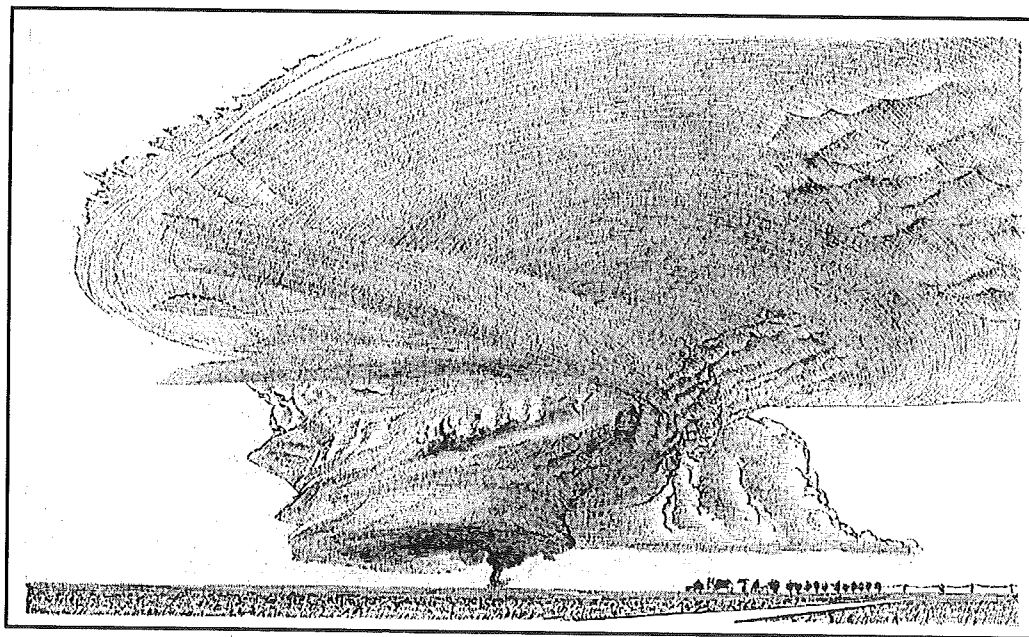


Figure 2. Drawing of a low precipitation (LP) supercell (top); vertical perspective is exaggerated.

Cloud features are identified in lower panel.  
Direction of view is toward the northwest.

one possible reason why supercell thunderstorms tend to occur with weather systems in close proximity to jet stream winds aloft that are between 50 and 150 mph (22-67 mps).

As a result of these wind profiles at low, middle, and high levels, combined with an unstable atmosphere, some supercells develop updrafts and downdrafts with vertical speeds over 100 mph (45 mps). Storms with such strong updrafts predominantly produce severe weather, sometimes including tornadoes.

### Types of Supercells

Supercells vary in appearance, both visually and on radar. For example, some supercells can be isolated, while others may be embedded in a line or cluster of thunderstorms. Many supercells show a transition from one appearance to another during their life cycle. The following general types have been identified by meteorologists:

#### •Classic supercells

These supercells (Figure 1) typically have a well-defined area of precipitation just northeast of the cloud tower or main updraft. Beneath the main updraft, and a short distance southwest of the precipitation, is a rain-free cloud base. A lowering or rotating wall cloud is evident beneath this base. The classic supercell is usually isolated.

#### •LP (Low-precipitation) supercells

On the High Plains, where moist air coming northward from the Gulf of Mexico often meets dry air from the desert and higher ground to the west, some isolated supercells produce little rain and are rather small (Figure 2). Although they look less threatening than other supercells, they can produce severe weather.

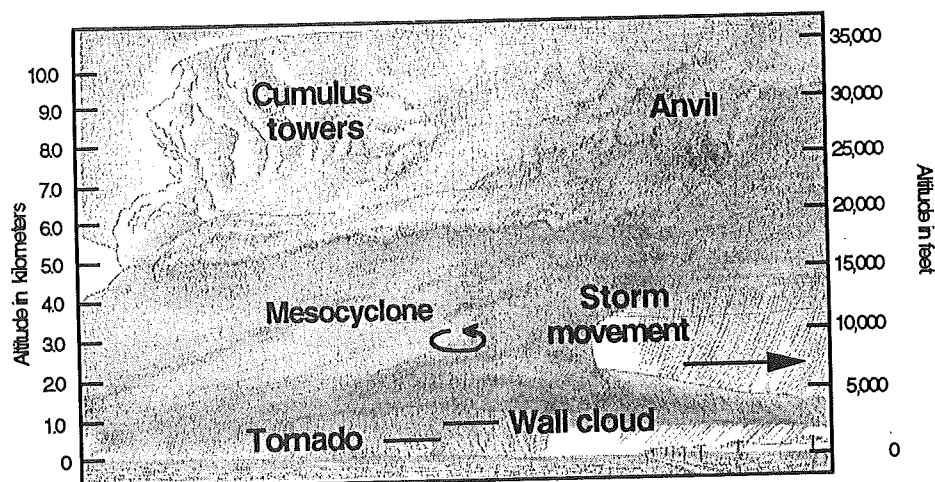
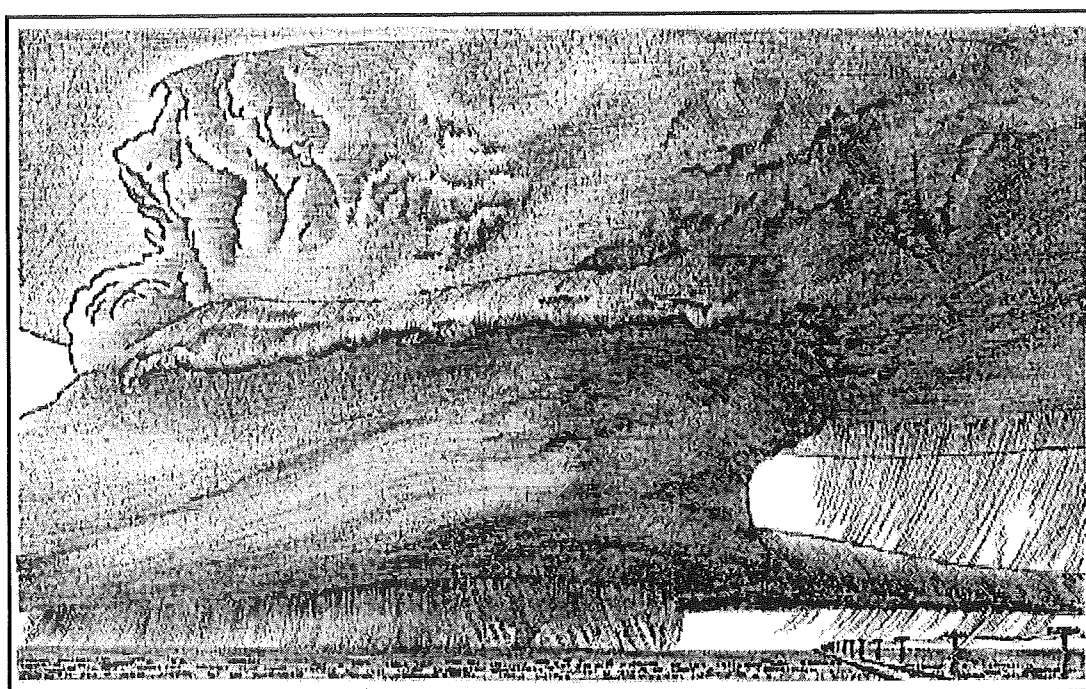


Figure 3. Drawing of a high precipitation (HP) supercell (top). Cloud features are identified in lower panel. Direction of view is toward the northwest.



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- **HP (High-precipitation) supercells**

HP supercells produce more precipitation than classic or LP types. Rain and hail can obscure much of the rain-free base beneath the main updraft. Cloud-base features are less evident and tornadoes are difficult or impossible to see when rain is in and around the wall cloud and updraft (Figure 3). The deadly storms that produced tornadoes at Plainfield, Illinois on August 28, 1990 and Catoosa, Oklahoma on April 24, 1993 were HP supercells with tornadoes obscured by rain. HP supercells are more often embedded in lines or clusters of thunderstorms (Figure 4) than they are isolated. Recent data from WSR-88D radars have shown HP supercells to be more prevalent than previously thought. In most of the US, HP storms are now considered the most frequent type of supercell. Flash flooding is associated with HP more than other types of supercells.

- **Hybrid supercells**

Many supercells show features of more than one of the above types at some stage of their life cycle and do not fit neatly into one category. Such hybrid storms are a reminder that supercells in progress are constantly evolving, and are part of a continuous range of thunderstorm types, including single-cell, multicell, and squall lines.

### **Supercells on Radar**

Radar is an indispensable tool for detecting and observing supercells. Radar detects precipitation by sending short bursts of electromagnetic energy into the atmosphere. A very small portion of this energy is reflected back to the radar by precipitation particles. The energy returned, called **reflectivity**, is shown on displays as maps of the location and strength of precipitation in storms. In the past, reflectivity was used indirectly to identify supercells by the shapes or patterns of hooks and backward commas representing circulations which occasionally accompany supercells.



## Mesocyclones

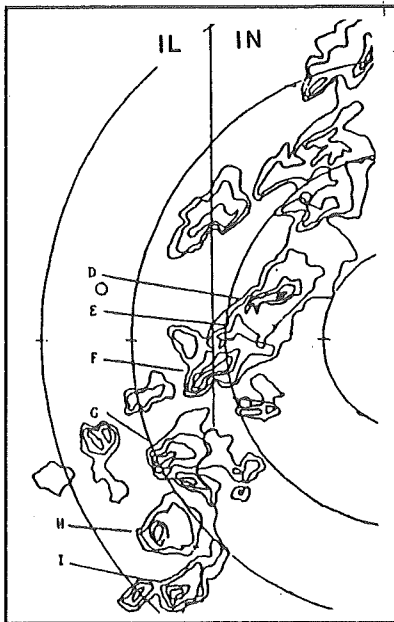


Figure 4. A line of thunderstorms with embedded supercells produced tornadoes labeled D through I in Indiana and Illinois as viewed by the Indianapolis radar at 6:28 p.m. on June 2, 1990. Lines are contours of equal reflectivity from levels 1 to 5 (after Przybylinski et al., 1993).

A new generation of 160 radars with Doppler capability, the WSR-88D, will be installed by 1996 across the US by NOAA's National Weather Service, the Department of Defense, and the Federal Aviation Administration of the Department of Transportation. This WSR-88D Doppler is a much improved tool for detecting storm intensity and supercells. The WSR-88D is sometimes called the NEXRAD radar. Doppler radar not only measures reflectivity, but also the radial component of motion of precipitation particles within a storm. The radars detect Doppler frequency shifts in the energy reflected back to the radar from moving raindrops or other precipitation particles. Although not directly measuring speed and direction of the air, the patterns of Doppler velocity signatures are used to deduce the basic storm features. As a result, Doppler radar detects the rotating updraft signature as it develops within a supercell.

The rotating updraft circulation within a supercell as detected by Doppler radar is called a **mesocyclone**. A mesocyclone usually begins at middle levels of the atmosphere within a storm's main updraft between 15,000 and 20,000 ft (4.6 to 6 km) above ground.

While some thunderstorms may develop brief, shallow circulations, the key to identifying a supercell thunderstorm is *the persistence of rotation through a deep layer*. Radar meteorologists look for the rotation to be at least 10,000 ft (3 km) deep and persist for at least 10 minutes before identifying it as a true mesocyclone, and the storm as a supercell. During cooler months, supercells sometimes originate at lower levels than during the warm months.

A typical supercell mesocyclone on radar has a diameter of 2 to 5 miles (3 to 8 km). Mesocyclones that form during the warm season can be detected and tracked within 140 miles (225 km) from a radar. During the cool season, mesocyclones are shallower in depth and may not be detectable beyond about 100 miles (160 km).

It is estimated that 30 to 40% of all mesocyclones produce tornadoes, and over 95% of all mesocyclones produce some type of severe weather. This ratio may be higher in the southern and central plains, Gulf coast, and Upper Mississippi River Valley states. A supercell's mesocyclone may spawn a tornado if:

- The mesocyclone circulation extends downward toward the ground from its origin at middle levels of the atmosphere, or develops in lower levels of the atmosphere, and
- Other processes exist that involve the interaction of downdrafts with the rotating updraft or mesocyclone.

If a tornado develops, the time between forming a mesocyclone and tornado averages 20 minutes and may be as long as 30 minutes. This interval provides valuable lead time for warnings to be issued.

Unfortunately, it is not yet possible to predict which mesocyclones will produce tornadoes and which ones will not. Not all tornadoes are spawned by supercells, and some tornadoes, especially weaker ones, may not be detectable by the WSR-88D radar. The complex factors involved are not well understood by meteorologists. However, the Doppler capabilities of the new generation of radars are a great improvement over using only reflectivity for issuing tornado warnings. Even if tornadoes do not develop, the presence of a mesocyclone marks the storm as a supercell - and indicates a high probability of other severe weather.

### Visible Supercell Features

When it comes to actually seeing the supercell itself, most sightings and photos of supercells come from the Great Plains of the US and Canada. Supercells are more frequent on the plains. Also, these storms are visually outstanding on the horizon because of the lack of large, dense tree cover and the abundance of dry, clear air flowing from higher terrain to the west.

Visual observations tend to focus on isolated supercells; they are easier to observe because fewer thunderstorms are nearby. Particularly in the eastern half of the United States, many features of supercells are obscured due to haze, cloud cover, trees, or precipitation from nearby or adjacent storms. Doppler radar is of great value in such situations.

The following features of a classic isolated supercell are apparent (Figure 1) under the best viewing conditions:

- **Towers:** Sharply outlined cloud towers are above the south or west flank of the storm.
- **Anvil:** An anvil tops the cloud tower. The anvil shows where rising air has reached the stable stratosphere and further upward growth stops. The anvil is typically blown downwind toward the east or northeast. When viewed



from a distance, an anvil or updraft may overshoot the top of a relatively flat anvil. Sometimes, an anvil will build upwind a short distance behind the cloud towers on the west or southwest side of a storm; these are called back-sheared anvils. The farther the anvil builds against the westerly upper-level winds, the more likely this storm is severe.

- **Flanking line:** A flanking line of towering cumulus clouds with rain-free bases may be southwest of the main storm tower and produce a stair-step effect. In some situations, the flanking line may pivot around the south or southeast part of the supercell's updraft.
- **Wall cloud:** A wall cloud is a lowered cloud base under the main tower. It is close to precipitation and has a diameter of 1 to 3 miles (1.6 to 5 km). It may appear laminar or fragmented, display slow rotation, and have intense winds beneath it. Wall clouds can produce tornadoes, so this area should be watched carefully.
- **Rotation:** A mesocyclone can only be confirmed by radar. But there may be visual evidence of rotation in and around the wall cloud such as rainbands or cloud elements moving around that cloud base, or cloud bands spiraling up and around the cloud tower. Winds beneath and near the wall cloud may be extreme. Hail may fall near or north of the wall cloud and close to the main updraft. Farther west or southwest a downdraft may clear out clouds immediately behind the storm, wall cloud, and flanking line. This clearing may result in sun or blue sky near the violent part of the storm.

• **Lightning:** While frequent lightning may be present in and near the supercell, severe weather and tornadoes can also occur without cloud-to-ground lightning. Occasionally, lightning will reveal features at the storm's base such as a wall cloud or tornado, especially at night.

• **Updraft:** In summary, the updraft comprises the main storm tower. Where the updraft extends above the anvil, it produces an overshooting top. The updraft may be visible at cloud base as a wall cloud.

The National Weather Service provides training classes on identifying and spotting severe weather. These classes are available to law enforcement officials, firefighters, emergency management personnel, amateur radio operators, and others. Timely detailed reports of severe weather and cloud features from these "Skywarn spotters" are used in conjunction with Doppler radar by National Weather Service forecasters to issue severe weather warnings. Spotter training can benefit teachers, coaches, bus drivers, and other school personnel, as well as officials from hospitals, churches, nursing homes, and business and industrial facilities. By posting a lookout or spotter with a good view of the sky when severe weather threatens, staff and students can be quickly alerted to an approaching tornado or other severe weather. Contact your local National Weather Service office, county emergency management office, or local amateur radio club for more information.

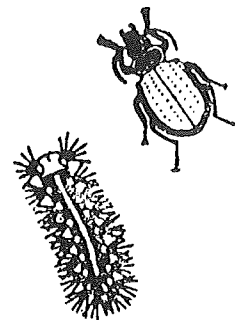
### Safety Precautions

When severe weather is expected in your area, the best mode of awareness is to listen to NOAA Weather Radio or a

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commercial radio or television station that provides full coverage of severe weather statements and warnings. If electrical interference from nearby storms prevents AM radio reception, switch to FM for possible warnings or bulletins. Determining whether an approaching thunderstorm is severe can be difficult from visual clues alone, especially in a Heavy Precipitation (HP) storm and at night. By the time precursor severe weather events occur, it may be too late to seek shelter. Do the following:

- Have ready a predetermined preparedness plan that has been practiced by everyone, and follow it *immediately* if a severe weather *warning* is issued.
- React quickly and properly to warnings from broadcasts, community or school sirens, or other alerting systems in your area. Sirens are outdoor warning systems and may not be heard indoors, or could fail if windborne debris cuts power lines. A siren should not be relied upon as the primary method of tornado or flash flood alert.
- When a severe windstorm approaches, go to the interior part of a strong building on the lowest floor, such as a basement. Avoid auditoriums and similar enclosures with large free-standing roofs. When there is no basement, go to an interior room against the strongest wall. Put as many walls as possible between you and the outside and avoid corners.
- Cover your head with a heavy blanket or pillow to protect against broken glass and other flying debris that can kill or injure people.
- Mobile homes and automobiles are vulnerable to high winds and tornadoes, and should be abandoned for a sturdy shelter. If none is available, seek shelter in a ditch. About 40% of tornado deaths occur in mobile homes.
- Take special precautions for the young, old, and those with physical or mental impairment.
- After the storm, if it is absolutely necessary to be moving through damaged areas, don't step on downed utility lines and avoid nearby puddles that can carry a charge from live electric wires.

Despite great advances in meteorology and instruments for supercell identification during the last decade, severe weather can develop so rapidly that warnings may not reach you in time. Or you may be in a location where you are not able to hear a warning. In such cases, use common sense and pay attention to the visual clues of potentially dangerous thunderstorms. Severe weather from supercells or other strong thunderstorms may threaten when the following are visible, especially to the north-west, west, or southwest of you:

- Large thunderstorm towers
- Well-defined anvils
- Cloud bases that are dark, low-hanging, and sometimes tinged with green
- Rotating clouds
- Hail
- Frequent lightning
- Torrential rain.

For additional safety information, contact your local National Weather Service, American Red Cross, Emergency Management Center, or Civil Defense office.

## Conclusions

Supercell thunderstorms pose a significant threat to lives and property in the United States. While they represent a small percentage of thunderstorms, supercells are responsible for a large percentage of injuries, deaths, and property damage from thunderstorms.

Supercells begin, as other thunderstorms, in a warm, moist, and unstable environment. The key difference is that supercell thunderstorms develop a *persistent* and *rotating* main updraft region. These storms occur in environments where the winds veer from south to west and increase in speed with increasing altitude. Supercells are most common east of the Rocky Mountains during spring and summer, but can occur anywhere that warm moist air and the proper environmental winds are associated with a weather system.

Supercells produce severe weather, and an estimated 30 to 40% of them spawn tornadoes.

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- Jennifer Vavrek, Science Teacher, Spohn School, School City of Hammond, IN.

## References

- Allsopp, J., J. Vavrek, and R. L. Holle, 1995: Is it going to rain today? Understanding the weather forecast. *The Earth Scientist*, National Earth Science Teachers Association [this issue].
- Atlas, D., Editor, 1990: *Radar in Meteorology*. American Meteorological Society, Boston, 806 pp.
- Brown, R. A., 1992: Severe thunderstorms. *Encyclopedia of Physical Science and Technology*, Second Edition, 15, Academic Press, 107-125.
- Chappell, C. F., and D. M. Rodgers, 1988: Meteorological analysis of the Cheyenne, Wyoming, flash flood and hailstorm of 1 August 1985. NOAA Technical Report ERL 435-FSL-1, 51 pp.
- Davies, J. M., 1990: Midget supercell spawns tornadoes. *Weatherwise*, Heldref Publications, Washington, DC, 45, 260-261.
- , 1993: Small tornadic supercells in the central plains. *Preprints, 17th Conference on Severe Local Storms*, St. Louis, American Meteorological Society, 305-309.

- Doswell III, C. A., 1985: The operational meteorology of convective weather. Volume II: Storm scale analysis. NOAA Technical Memorandum ERLESG-15, 240 pp.
- , and D. W. Burgess, 1993: Tornadoes and tornadic storms: A review of conceptual models. *The Tornado: Its Structure, Dynamics, Prediction and Hazards*, Geophysical Monograph 79, C. Church, D. Burgess, C. Doswell, and R. Davies-Jones, Editors, American Geophysical Union, Washington, DC, 161-172.
- , A. R. Moller, and R. W. Przybylinski, 1990: A unified set of conceptual models for variations on the supercell theme. *Preprints, 16th Conference on Severe Local Storms*, Kananaskis Provincial Park, Alberta, Canada, American Meteorological Society, Boston, 40-45.
- Fujita, T. T., 1987: *U. S. Tornadoes: Part 1, 70-Year Statistics*. University of Chicago Press, SMRP Research Paper #228, 122 pp.
- Grazulis, T. P., 1993: *Significant Tornadoes 1680-1991*. Environmental Films, St. Johnsbury, VT, 1326 pp.
- Holle, R. L., R. E. López, K. W. Howard, R. J. Vavrek, and J. Allsopp, 1995a: Lightning hazard education. *Preprints, 4th Symposium on Education*, 15-20 January, Dallas, TX, American Meteorological Society, Boston, 96-99.
- , -, -, and -, 1995b: Lightning hazard education. *The Earth Scientist*, National Earth Science Teachers Association.
- , -, -, and -, 1995c: Lightning hazard education. *The Hoosier Science Teacher*, Hoosier Association of Science Teachers, Inc., Terre Haute, IN, 20, 112-118.
- Howard, K. W., and R. L. Holle, 1994: *Lightning Danger!* National Oceanic and Atmospheric Administration, Environmental Research Laboratories, National Severe Storms Laboratory, Norman, OK, 1 pp. poster.
- , and -, 1995: *¡Peligro de rayos!* National Oceanic and Atmospheric Administration, Environmental Research Laboratories, National Severe Storms Laboratory, Norman, OK, 1 pp. poster.
- Kessler, E., Editor, 1986: Thunderstorm Morphology and Dynamics. Volume 2 of *Thunderstorms: A Social, Scientific, and Technological Documentary*, Second Edition, University of Oklahoma Press, Norman, OK, 411 pp.
- Moller, A. R., and C. A. Doswell III, 1988: Advanced Meteorologist/Spotter Training Slide Series. NOAA, National Weather Service, Warning and Forecast Branch, Silver Spring, MD, slides and 44-page commentary.
- Przybylinski, R. W., J. T. Snow, E. M. Agee, and J. T. Curran, 1993: The use of volumetric radar data to identify supercells: A case study of June 2, 1990. *The Tornado: Its Structure, Dynamics, Prediction and Hazards*, Geophysical Monograph 79, C. Church, D. Burgess, C. Doswell, and R. Davies-Jones, Editors, American Geophysical Union, Washington, DC, 241-250.
- , T. J. Shea, D. L. Ferry, E. H. Goetsch, R. R. Czys, and N. E. Westcott, 1994: Doppler radar observations of high-precipitation supercells over the Mid-Mississippi Valley region. *Preprints, 17th Conference on Severe Local Storms*, St. Louis, MO, American Meteorological Society, 158-163.
- Ray, P. S., 1986: *Mesoscale Meteorology and Forecasting*. American Meteorological Society, Boston, 793 pp.
- Rust, W. E., W. L. Taylor, D. R. MacGorman, and R. T. Arnold, 1981: Research on electrical properties of severe thunderstorms in the Great Plains. *Bulletin of the American Meteorological Society*, 62, 1286-1293.
- Vavrek, J., R. L. Holle, and J. Allsopp, 1993a: Flash to bang. *The Earth Scientist*, National Earth Science Teachers Association, 10, 3-8.
- , -, and -, 1993b: Flash to bang. *Spectrum*, Illinois Science Teachers Association, 19, 21-26.
- , -, and -, 1994a: Flash to bang. Reading 10 in *Project Earth Science: Meteorology*, P. S. Smith and B. A. Ford, Editors, National Science Teachers Association, Arlington, VA, 210-219.
- , -, and -, 1994b: Flash to bang—5 seconds per mile. *Hoosier Science Teacher*, Hoosier Association of Science Teachers, Inc., Terre Haute, IN, 19, 101-110.



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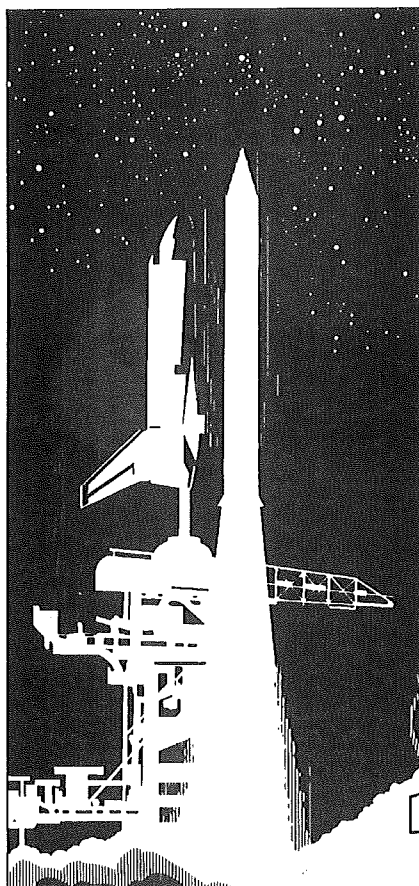
## NAVIGATING THROUGH THE SCIENCE IGAP

Science learning was recently defined by the *National Science Education Standards* (National Research Council, 1996) in the following way:

The *Standards* call for more than "science as process," in which students learn such skills as observing, inferring, and experimenting. Inquiry is central to science learning. When engaging in inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others. They identify their assumptions, use critical and logical thinking, and consider alternative explanations. In this way, students actively develop their understanding of science by combining scientific knowledge with reasoning and thinking skills.

Teachers, administrators, students, and parents in Community Consolidated District 15 have long endorsed this vision of science literacy for students that centers upon the importance of helping students engage in real-world science inquiry. In addition, the District 15 school community embraces the following important elements of science literacy for our students.

- Science instruction is an **active** process that should engage all students in real-world activities that help them understand the natural world.
- Science instruction should help students **use** important science ideas, science processes, and science inquiry to solve problems that are relevant and interesting to student lives and are socially relevant.
- Science instruction should help students understand the relationships and limitations between science, technology, and society.
- Science instruction should help students experience and appreciate knowing about and understanding the natural world. (National Research Council, 1996).
- Science instruction should help students dialogue intelligently about technological and scientific issues. (National Research Council, 1996).
- Science instruction should help students understand the diverse career opportunities that are available in science and science-related fields.



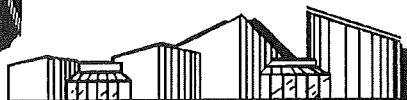
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The District 15 community has worked long and hard to develop a diverse and articulated science curriculum to help students achieve this vision of science literacy. We have developed a wide-variety of complex authentic assessments to help gauge student achievement toward these goals.

The State of Illinois has also developed a set of science goals for the state of Illinois that resonate well with the vision of science literacy endorsed by District 15. (Illinois State Board of Education, 1992). The Illinois Goals Assessment Plan uses a statewide assessment of fourth and seventh grade students. The state science assessment is a forced choice assessment. Developers of the state science test admit that the Science IGAP is an assessment of student achievement **about** science literacy rather than an assessment of actual student science literacy. The state science test falls far short of assessing student achievement toward authentic science literacy for the following reasons.

- It emphasizes one-right answer to out of context problems.
- It does not assess student processes in solving real-world science problems but only the answer that they get.
- It does not provide opportunity for students to actually conduct authentic science inquiry or science process and thus does not authentically assess these critical elements of science literacy.
- It favors students who have strong reading and vocabulary abilities.

The idea that the IGAP science test favored students with strong reading abilities resonates well with Thomas Huxley's (1899) statement regarding the tremendous emphasis on reading about science at the end of the 19th century:

If scientific education is to be dealt with as mere bookwork, it will be better not to attempt it but stick to the Latin Grammar which makes no pretence to be anything but bookwork.

The recognition of the "bookwork" nature of the IGAP science test created a tremendous cognitive challenge for the fourth and seventh grade teachers within our district who were committed to teaching science through inquiry approaches but at the same time were under the pressure to help their students perform well on the high stakes IGAP Science Test. The 4th grade teachers suggested a very creative way to resolve this dilemma when they proposed that the District recognize the importance of this test **not** as a science test but rather as a reading in the science content area test.

In response to the tremendous need to help students do well on this science reading test, our district developed two documents that are a direct response to the breakthrough thinking of the teachers in our District. These documents provide our fourth and seventh grade teachers with reading in the content area strategies that they can use to help their students prepare for the State Science IGAP test. Each school selects a classroom set of science tradebooks that they can use with students to help them practice their reading in the content area strategies. The documents also provide teachers with specific multiple choice questions that are similar to questions used on the IGAP Science Test and that are also

closely related to important science ideas that students are studying in our fourth grade Electricity Unit and our seventh grade Human Body Unit. Additionally, these questions are written to help students decode words used in relation to all four of the State Science Goals.

Teachers interested in obtaining copies of either the fourth or seventh grade *IGAP NAVIGATOR* should contact Bill Conrad at the address given above. Of course, we will only charge for printing and mailing. Teachers may duplicate the documents as needed to help students prepare for "State Reading in the Science Area" IGAP test.

#### References

- Bybee, Rodger, W. (1993). *Reforming Science Education*. New York: Teachers College, Columbia University.
- Illinois State Board of Education (1992). *Sample Tests of Illinois Goals in Science Grades 3, 6, 8, 11*. Springfield: Illinois State Board of Education.
- Huxley, T. (1899). *Science and Education*. New York: Appleton.
- National Research Council. (1996). *National Science Standards*. Washington, D.C., National Academy Press.

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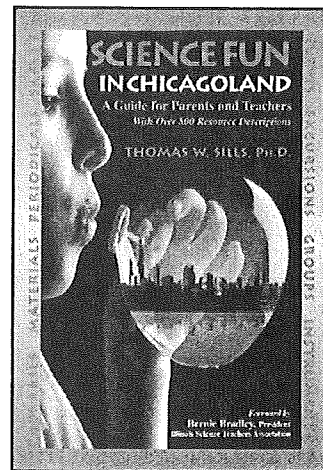
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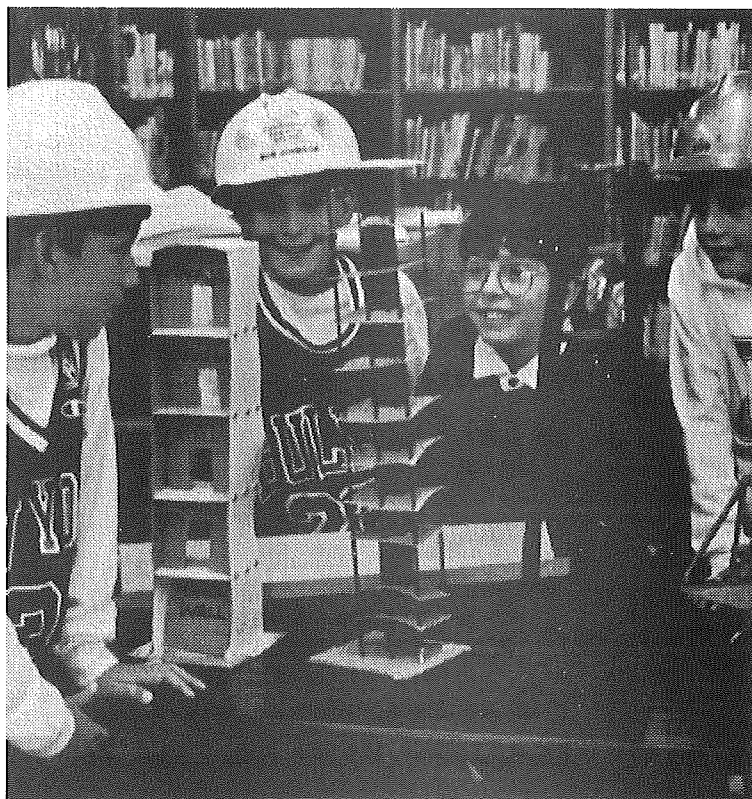
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## ENGINEER LECTURES TO STUDENTS

Throughout the year engineers are providing much needed math and science education to students. An estimated 35,000 engineers lectured in schools last year. Locally, Robert B. Johnson, Communications Director for the 1996 Engineers Week-Chicago observance, Public Relations Chairman for the Structural Engineers Association of Illinois (SEAOI), and member of the American Society of Civil Engineers (ASCE) recently lectured to 3rd through 8th grade classes at Plato Academy, Chicago. Johnson began his lectures to students in 1989, when he was asked by his daughter's 1st grade teacher at Longfellow School, Buffalo Grove to talk to the children as to what engineers do. Since 1993, he has presented his lecture, "Uncloning the Invisible Engineer" to students and adults annually at IIT's/Rice Campus Open House. He estimates he has spoken to over 1500 people on the work of engineers. In 1994 portions of his lecture were featured on the BBC, London.

Johnson states that math and science are the underpinnings of engineering education, yet recent testing of American students shows that they lag far behind their counterparts in other countries. "If the United States is to continue to be an advanced technological society, warns Johnson, efforts must be made to attract our brightest students to engineering."



Longfellow School, Buffalo Grove. Cardboard Models of Chicago Skyscrapers.

## Students Polled

Prior to beginning his lecture to the students, Johnson asked the children what they wanted to be when they grew up. Most answered "doctor or lawyer." Several boys wanted to be sports stars ala Michael Jordan. When asked by Johnson how many wanted to be an engineer, few children raised their hands. Johnson asked the class for more perceptions about engineers, and the class answered, engineers are those people who drive trains. The response was not unusual, for the general public has much the same perception. Johnson explained that part of the problem is the spelling of the word 'ENGINEER'. In the English language, 'Engineer' is spelled with an "E" so its association with engines is logical. However in many of the European languages the word for engineer begins with an 'I'. Johnson noted that Engineer in French is 'ingenieur', and as in many other languages, is derived from the word 'ingenious' (e.g., Spanish—'ingeniero', Italian—'ingegnere', Polish—'inzynier', and German—'ingenieur'). In the lecture to the students, he explained that engineers turn ideas into reality and are really 'ingenious'. He told them that mechanical, civil, structural, chemical, environmental and aerospace engineers are just some of the disciplines of engineering which make our modern society possible. Johnson then took the children on a short tour of how engineers touch all of our lives.

When the class was asked where the water goes after they take a bath or flush a toilet, a student replies, "Into a sewer." "Then where does it go", queries Johnson. He explains from the sewer the water goes to a water treatment facility where it is made clean again and then put in rivers. He astounds the class by telling them the water they drink was once used by the dinosaurs. "Engineers are great recyclers", says Johnson. "If we don't recycle our water and keep it clean we will use it all up. "Think of a world without electrical power plants," said Johnson. "There would be no T.V., no microwave ovens, no VCR's. Clean water, electricity, airplanes, highways, bridges and buildings are all made possible by the work of engineers. Think of how different our world would be without the engineer's contributions. Computers, the space program, the telecommunications systems and, of course, our extensive transportation systems, including highways and airplanes, are just a few examples of how engineering touches all of our lives.





Robert Johnson explains how skyscrapers stand to 4th grade students at Longellow School.

### The Stealth Profession

According to Johnson, the engineering profession is sometimes referred to as the 'invisible profession' or the '*stealth profession*', like the stealth-B2 bomber. "How many of you have seen an engineer on television or in the movies," asks Johnson. The class was silent. None of you want to become engineers because you know virtually nothing about the engineering profession, yet engineering and the work of famous engineers are all around you!

### Naming Engineers

"How many of you can give me the name of an engineer?" "A student responds "Mr. Eiffel." Correct! Johnson then informed the student that Mr. Gustave Eiffel was the famous French bridge engineer who not only designed the tower in Paris, France which bears his name, but also designed the structural support system for the Statue of Liberty. How about some names of other engineers, he queried. The class was silent. "How about Rudolph Diesel," asks Johnson. A student responds, "diesel fuel." "Well, sort of," retorts Johnson. Mr. Diesel invented the famous engine which now carries his name and uses that special fuel. Dixie is a slang expression for the southern states, but what is the origin of the word "Dixie?" Johnson remarked. "It comes from the Mason-Dixon line named after the engineers (surveyors) who surveyed this important boundary line. The class was asked too if they knew what Mr. Marvin Camras is famous for? The class was again silent. "Mr. Camras is an electrical engineer and most of you I suspect have at least one of his devices in

your home." The class knew the names of famous inventors such as Edison, Orville and Wilbur Wright and Alexander Graham Bell. Mr. Camras is an inventor and an electrical engineer who pioneered the development of electrical devices that today we all take for granted, yet, not one student could identify this giant of the engineering profession. Even the teachers were dumbfounded! "See class I told you we engineers are invisible!", said Johnson. "Now class what electrical device do you think Mr. Camras helped develop?" After several erroneous answers such as television and the camera, Johnson managed to get a student to say VCR. "Close enough," he said. "Mr. Camras, although he did not invent the VCR that we have in our homes today, he is widely referred to as '*The Father of Magnetic Recording*'. Camras' engineering wizardry made possible numerous magnetic tape applications which over the years evolved into both the audio and video cassette recorders, stereo motion picture soundtracks, computer disks and magnetic strips on credit cards. "Now class tonight you can stump your parents on who participated in the development of the tape recorder for I suspect none of your parents can identify this engineering giant who passed away in June 1995." Johnson noted that there was little mention of his death in the local papers though through his 500 patents technology has greatly advanced. Several of our presidents were engineers including George Washington, (surveyor, agricultural and military engineer), Thomas Jefferson (surveyor), Herbert Hoover (mining Engineer) and James Earl (Jimmy) Carter (nuclear engineer).

Even Abraham Lincoln did surveying when he worked as a rail splitter constructing the first railroads. "Class, three surveyors are depicted on Mount Rushmore," notes Johnson. He reinforced his theme of the unsung heroes of the engineering profession, mentioning Fazlur Rahman Khan, the relatively unknown genius of the structural engineering profession who designed the Sears Tower and the John Hancock Center and then went on to explain how these buildings withstand windstorms.

### **Cardboard Models Explain Basic Engineering Principles**

As visual teaching aids, Johnson brought with him a collection of cardboard models and photographs. He used them to demonstrate how engineering marvels such as suspension bridges and skyscrapers function. Johnson also showed photographs of other structural engineering triumphs, including a picture of the original Ferris wheel for the 1893 World Columbian Exposition. The Ferris wheel was named after George Washington Gale Ferris, the Pittsburgh bridge engineer, who designed the famous wheel as America's answer to the Eiffel Tower. Many of the students have already visited Chicago's remodeled Navy Pier and rode on the new Ferris wheel. Johnson commented the Ferris wheels at today's amusement parks and even Navy Pier are nothing more than toys in comparison to the original Ferris wheel which could hold an astounding 2100 people. A cardboard model of the John Hancock Building was reinforced with string, representing the diagonal bracing. When a student pushed on the sides of the cardboard model to represent a wind storm the class could easily see how the strings (diagonals) helped strengthen the building. Johnson's model of the Sears Tower was nothing more than a collection of nine tubes. A floor plan for the structural system of Sears Tower was shown to the class. "Can you identify the nine tubes on this plan" said Johnson.

### **Structural Materials Explained**

Johnson continued with a discussion of the building blocks of his profession. He showed the class a very small piece of a steel beam. At the climax of Johnson's short discussion on materials engineering, he brought out a model of a cement truck, or so the class thought! Questioned by Johnson, almost all the students agreed this truck with a big, circular, rotating drum was a 'cement truck.' But Johnson astounded them by stating it was not a cement truck nor was it a cement mixer. This was not surprising because the children's parents, and most of the general public, do not use the proper name. "This is a concrete truck or a concrete mixer," explained Johnson. "This is not, I repeat, not a cement mixer'." The lecture continued with a description of how engineers create concrete. Rocks (which engineers refer to as coarse aggregate), sand, clean water and cement go into the making of concrete. Samples of concrete were passed around for the children to examine. A steel reinforcing bar was also shown to the class which Johnson explained is used to strengthen concrete.

### **Conclusion**

"When I was going to school in the 1950's we had no color TV, no VCR's, no cellular phones, no CD players." A student interrupts; "What about NINTENDO." "No Nintendo" and no SEGA Genesis either," replies Johnson. All of these devices were made possible by the work of engineers, creators of our modern technological society. Class, you are participants in an ever changing world. Some day one of you might devise some new device which will alter civilization. I know one fact is for sure. Years from now when you are my age, many of the devices we take for granted such as CD players and VCR's, will have been replaced with new wonders of the technological age, many of which will have been created by engineers." A student questions that CD's will not disappear at which time Johnson interrupts to note his LP record collection is now obsolete. Putting away his collection of teaching aids he commented, "When I was in school, I wanted to be an architect. I thought architects were the sole designers of buildings. Today, these children learned a lot about engineering. I wouldn't be surprised if in my short lecture these children learned more about engineering than their parents received in all of their formal educational training."

### **Student Comments**

What did the students get out of this lecture? 8th grade student, Katherine Maniatis says, "When someone says, oh look at that cement truck, and I'll say, well, your wrong. It is not a cement truck. It is a concrete truck! Than I'll explain." Renee Nomikos says, "I never knew some presidents of the United States were engineers." Nicole Milionis said, "I really liked the model of the Sears Tower and finding out why it is strong and won't blow down. "One thing is for certain, these children now know that engineers do more than drive trains," Johnson concludes.

As a remembrance of Johnson's lecture, token gifts were presented to the school for distribution to the children, including engineering coloring books, pens, pencils and key chains. Special acknowledgment to the Structural Engineers Association of Illinois (SEAOI), Metropolitan Water Reclamation District of Greater Chicago, and OZINGA for their generous contributions.

As a structural engineer for the Alfred Benesch & Company, Consulting Engineers, Chicago, Johnson was the project manager for the Chicago Mercantile Exchange Center and project engineer for the 900 North Michigan Building, commonly called the Bloomingdale Building, and as project engineer on the new McCormick Place expansion project. He is currently serving as resident engineer for the new Blue Cross -Blue Shield corporate headquarters, Chicago.

For Information/Comments from the teachers at Plato Academy, contact Vicky Marin, 312-626-1728, 601 South Central, Chicago, IL 60644.

For information on volunteer activities of engineers contact: American Association of Engineering Societies  
Engineers' Precollege Education Council  
Attention: Tish Agos, (202-296-AAES)

Marvin Mondy and Robert Williams

## GROUNDWATER EDUCATION COMES TO SOUTHERN ILLINOIS

The focus of thousands of down state Illinois' students in ten counties is currently centered on groundwater issues. This all is happening as a result of the implementation of the Illinois Middle School Groundwater Project. Middle school teachers from Bond, Calhoun, Clinton, Green, Jersey, Macoupin, Madison, Monroe, Randolph, and St. Clair counties recently received training and materials to bring groundwater education into their classrooms. The Illinois Middle School Project is sponsored through a grant by the W. K. Kellogg Foundation. The project is a joint educational effort by the Illinois Farm Bureau, and the Illinois Department of Natural Resources, County Departments of Public, and Regional Offices of Education. The project is administered by Southern Illinois University at Edwardsville. Goals of the project are to produce:

1. A cadre of concerned and knowledgeable educators, students, and families who will work to maintain or improve water quality in their priority area.
2. A community based education program in a partnership towards understanding groundwater issues and concerns.
3. A training model that can be used for disseminating groundwater materials and information through cooperative community based efforts.



Teachers in the project utilize the H2O Below curriculum and its instructional kit. Water testing looks at iron, nitrates, pH, chlorine, and hardness. More difficult tests are conducted by the cooperating public health laboratories. Groundwater flow models are used in presenting groundwater issues to their students. The models are available from the Groundwater Project for \$145. Eighty schools, so far, have found local donors to provide this important piece of groundwater training equipment.

The project began in northern Illinois two years ago under the leadership of Bill Donato, Woodstock High School biology teacher. In 1995, the project moved into the central part of the state under the guidance of Bill Beckman, East Peoria High School biology teacher. This year, the southern portion of the project is being coordinated by Marvin Mondy out of the Rivers Project Office at SIUE. Dr. Robert Williams is the project director. The program is anticipated to impact over 100,000 students during its five years of operation.

**For information contact the Rivers Project Office at SIUE at 618-692-3788 for details on how you can become a partner in the project.**

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## TEACHER AS SCROUNGER

A teaching certificate, I tell my undergraduate students, is a license to scrounge. This license alleviates one of the major reasons elementary school teachers do not instruct science...lack of materials.

One can understand how the lack of materials seems to be a very valid excuse for not teaching hands-on science and why science lessons become, in fact, reading lessons. Most elementary classrooms are not equipped with all the paraphernalia needed to instruct discovery science, and there is just so much that teachers are willing to expend out of pocket.

For these reasons, I, and my colleagues (building on the original list developed by SIUE's Bob Williams), have

amassed a scrounge list for the elementary classroom. This is a list of normal, everyday items which can be collected from various sources. The main source can be the students themselves. Take the first item listed...aquarium.

There are probably few households in the United States that do not have an aquarium, pump, gravel, tubing, etc., sitting in the basement or attic. The kids wanted one, let the fish die, and mom and dad put the equipment up to save further finny creatures.

Most parents are only too glad to reclaim the storage space. In fact, teacher storage may become a problem. The first time I sent home my scrounge list, I received six aquaria the next day. There are just so many terrarias, pet cages, wave boxes, and soil profiles that a teacher can utilize.

While on the subject of aquariums, scrounge the tank's inhabitants also. Tropical fish are expensive. Some pet stores will donate fish if you say the magic words: "I'm a teacher and this is for the good of boys and girls." Offer to put a sign on the aquarium stating the store owners generosity.

Even better is a wildlife tank with aquatic fauna indigenous to your area. Older students can collect the small specimens for you. Don't forget such pupil pleasers as crayfish, mussels, leeches, etc. Or, go to your local bait shop. The price differential between it and a pet store is phenomenal.

On a developmental note, pre-operational and early concrete students are experiential children. Personal experience is believing to them. Many of these students perceive that all fish are tropical fish because that is all they have seen or experienced. They are often amazed that the fish they catch in a local lake is not an angel fish or a tetra.

A few items on the list might seem a little way-out, such as microscopes and telescopes. But, it doesn't hurt to ask. I was astounded at the number of microscopes I received. True, they were the little ones found in Christmas science kits that parents buy and are used once or twice and then forgotten. But, they work, and are a lot cheaper than the \$250.00 student scopes in the catalogue.

The graphic features a stylized illustration of a LEGO Dacta robotic arm on the left, holding a computer monitor. The monitor displays the text: "Your local LEGO DACTA Representative: Philip Ciano (414) 521-1733". To the right of the monitor is a list of services. At the bottom right is the LEGO Dacta logo, with the tagline "The educational division of the LEGO Group." below it.

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Buy nothing or very little from scientific supply houses. A pulley purchased at a hardware store is 200 percent cheaper than from a supply house. You are paying for shipping, handling, and profit margin. Dissecting specimens can be obtained from your local butcher, often free.

I learned my lesson about supply houses when I was teaching fifth graders about static electricity and needed an electroscope. The catalogue wanted \$125.00 for one. I found out I could construct one out of an old, clear pill container, a bobby pin, and tin foil from a gum wrapper. Cost...the price of the gum.

Get on the mailing list of the supply house, though. They have great newsletters, and their catalogues contain superb pictures that your students can utilize.

There are few caveats to using the scrounge list:

- First, let your principal know what you are doing. She will probably receive a few phone calls about her teachers begging.
- Second, make sure that parents know that any donated items will not affect their child's grade one iota. I often explained this at a beginning of the year meeting where I also presented my discipline plan, grading policy, etc.
- Third, all items must be recycled or used. No new items will be accepted.
- Fourth, make sure the parents spread the word. Aunts, uncles, grandparents and neighbors have been some of my best sources for classroom materials.

One of the most poignant examples of this was a grandmother of a student who donated two reflecting telescopes to the class. Her husband, who had recently passed away, had as a hobby astronomy and the grinding of lenses to make telescopes. What better way, according to the grandmother, to pass on his delight and wonder for the night sky than to give his legacy to his granddaughter and her friends.

Happy Scrounging.

## SCROUNGE LIST

Aquarium	Funnels
Felt	Small bags (paper)
Toy cars	Shoe boxes
Toy boats	Electric skillet
Dominoes	Blender
Eye dropper	Trays
Nails	Muffin tins
Filing box (5 x 8 cards)	Pot holders
Play money	Biscuit and cookie cutters
Toy cash register	Compass
Empty boxes and cans	Prism
Two liter plastic soda bottles	Scales, balances, kitchen, spring
Pulleys	Coffee cans
Tape measure	Screen wire
Hour glass	Tuning forks
Sundial	Screws
Thermometer (indoor-outdoor)	Planes and pendulums
Metric measuring set for liquids	Mirrors
Rubber bands	Electric bell
Candles	Egg timer
Rope	Kite
Rocks and minerals	Iron filings
Beans	Slinky
Wool	Telescope
Fur	Geoboards
Sandpaper	Egg cartons for sorting
Spools	Sponges
Magnifying glasses	Coal
Cigar boxes	Bluing
See-through containers	Rubber tubing
Paper punch	Ping pong balls
Old magazines	Wood
Student microscope	Soil
Binoculars	Bottles
Eyeglasses	Batteries
Rain gauge	Bolts
Large tub	Switches
Watering can	Levers
Flashlight	Wheels and axles
Globe	Pendulum frame
Magnets	Lenses
Pictures (animals, plants, tools & machines)	Clocks
Chick incubator	Dry measuring containers
Stethoscope	Locks and keys
Hand garden tools	Mechanical junk
Garden seeds	Barometer
Small animal cage	Trundle wheel
Margarine tubs	Cuisenaire rods
Yarn	Glass
Marbles	Household chemicals—vinegar, baking soda, table salt, baking powder, sugar, cream of tartar, rubbing alcohol, epsom salts, iodine, ammonia, hydrogen peroxide
Popsicle Sticks	
Pitcher	



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If your district, university, company, non-profit, or other organization is offering a summer professional development course, institute, or seminar in instructional technology, simply use the online form at the U.S. Department of Education's web site to enter the information. The URL is:

<http://www.ed.gov/Technology/Summer96>

If you're interested in finding out "what's out there," stay tuned. New opportunities are being added daily. Soon, you'll be able to browse offerings in your state & search by topic.

Note: Descriptions of these professional development opportunities include information about the content area, grade level, delivery method, sessions, dates, credit, cost, location, contact, & addresses where online materials can be found.

For additional information, please contact Gwen Solomon (gwen\_solomon@ed.gov).

## BREEDING BETTER TEACHERS

What better way to calm fears about killer tomatoes and other biotech Hollywood monsters than to provide a great Web site for high-school biology teachers? Access Excellence, sponsored by biotech giant Genentech, is a collection of resources that all science teachers should visit. On one of its pages - Access Excellence Collection - you can get see what students and teachers are doing in areas such as acid rain research, beaker babies, biospheres, designer seeds, dinosaur paleontology, and DNA jewelry. The "Classic Collection" is a nice bit of science history. Message boards let teachers and scientists connect. All in all, this is a place of enlightenment. <URL:<http://www.gene.com/ae/>>

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## ILLINOIS ENGINEERS WEEK 1996 ESSAY/POSTER COMPETITION FINALISTS

**Engineers Week: Illinois '96** sponsored an essay/poster competition for primary grades 3 through 8. Students were asked to write a 200 to 500 word essay and to provide a poster illustrating the work of an engineer and aspects of Engineers Week. Seven prizes were awarded this year. In the third and fourth grade category, Tom Stecich, a fourth grade student at St. Christina School, Chicago, won first place for his entry entitled, "Jack Stecich" along with a poster depicting several areas of his work. In the fifth and sixth grade category, Nicole Hall, a sixth grade student at Infant Jesus of Prague School, Flossmoor, won first place for her entry entitled, "Elijah McCoy," and a poster portraying the various accomplishments of this historic African-American engineer. (The expression 'The Real McCoy' is thought to have been derived from the work of this celebrated engineer-inventor.) Honorable mentions will be granted to Nasser Grainawi of Gray M. Sanborn School, Palatine, for his entry on Christian Menn, and to Megan Wijas and Christina Kowalski of Lincoln Junior High School, Naperville, for their joint entry on George Westinghouse. In the seventh and eighth grade category, first place honors will be conferred upon Arturo Fenandez, Basel Khatib and David Figuero, eighth grade students at Eberhart School, Chicago, for their joint entry entitled, "John William Mauchly." (Mauchly along with his associate John Presper Eckert built what is widely recognized as the first successful electronic computer, the ENIAC.) Honorable mentions will be awarded to Christopher Canali, Kevin Burt and Peter McKeigue of Infant Jesus of Prague School for their entry on Robert Sherman and to Ravi Kasi of Hubble Middle School, Wheaton, for his entry on Harold Sandberg. All of these students were to be honored at the Engineers Week luncheon and receive E-Week T-shirts, hot chocolate mugs and certificates of merit. For more information and details for the 1997 competition contact:

Larry Meyers  
% Wiss Janney and Elstner  
29 North Wacker Drive  
Chicago, IL 60606  
TEL: 312-372-0555

## HOW MUCH HAS BEEN ACHIEVED? THE NATIONAL EDUCATION GOALS

### • Goal Number One: Ready to Learn

By the year 2000, all children in America will start school ready to learn.

### • Goal Number Two: School Completion

By the year 2000, the high school graduation rate will increase to at least 90 percent.

### • Goal Number Three: Student Achievement and Citizenship

By the year 2000, all students will leave grade 4, 8, and 12 having demonstrated competency over challenging subject matter, including English, mathematics, science, foreign languages, civics and government, economics, arts, history, and geography, and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our nation's modern economy.

### • Goal Number Four: Teacher Education and Professional Development

By the year 2000, the nation's teaching force will have access to programs for the continued improvement of their professional skills and the opportunity to acquire the knowledge and skills needed to instruct and prepare all American students for the next century.

### • Goal Number Five: Mathematics and Science

By the year 2000, U.S. students will be first in the world in mathematics and science achievement.

### • Goal Number Six: Adult Literacy and Lifelong Learning

By the year 2000, every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.

### • Goal Number Seven: Safe, Disciplined, and Alcohol- and Drug-Free Schools

By the year 2000, every school in the United States will be free of drugs, violence, and the unauthorized presence of firearms and alcohol and will offer a disciplined environment conducive to learning.

### • Goal Number Eight: Parental Participation

By the year 2000, every school will promote partnerships that will increase parental involvement and participation in promoting the social, emotional, and academic growth of children.

## ESCONI ANNUAL FLEA MARKET

ESCONI, [Earth Science Club of Northern Illinois] is having its annual flea market and auction Sat. Oct. 5th, 1996, 10 a.m. to 4 p.m. with all kinds of rocks, minerals, fossils and crystals at 25¢ each. In addition there will be a silent and live auction. This event is located at the College of DuPage in Glen Ellyn, Lambert Rd. and 22nd St., Room 1024 A-B, Student Resource Center. For more information call Don Auler, 708-832-0479.

Money raised at event helps keep 2 students at COD for 1 yr.

# The Groundwater GAZETTE

## A HARD RAIN'S GONNA FALL

### Background

According to the NCDC (National Climate Data Center) the precipitation trend for the United States is towards a decrease of days of rainfall with an increase in the total amount of precipitation per event. Climate issues are not limited to individual states. Climate, by its nature is global. The impact of climatic events can, however, be measured on a more regionalized basis. Large-scale changes in climate variability that are taking place have, and will continue to impact Illinois. Shifts in the patterns of the hydrologic cycle affect everyone from consumers to water managers. **In an area bounded by Maine, North Carolina, Texas and Montana, the following impacts and challenges are foreseen:**

- Precipitation events will become more infrequent and more extreme
- From 1910 - 1994; there has been a 2% increase in total annual precipitation from downpours of two inches or more in one day
- The size of summer storms has increased substantially

### Challenges to Water Managers:

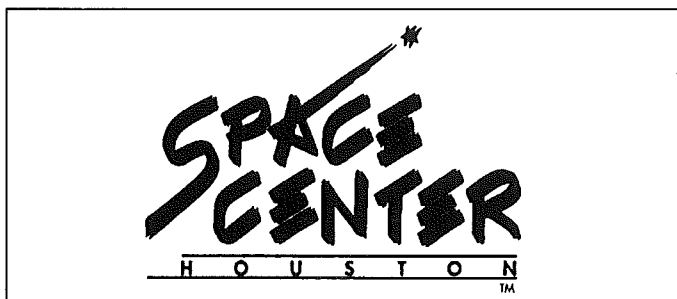
- Surface sources will receive the greatest impact, requiring more extensive storage systems and the need to turn more to groundwater sources for a dependable supply.
- Increased rates of erosion will continue to decrease the available storage capacity of lakes and impoundments, which could, in turn, increase the use of groundwater.
- Overflowing sewers, storm sewers and combined sewer overflows will increase with the growth of heavy rain events.
- Population growth increases demand: nation-wide, as the population rose from 150,000,000 in 1950 to 217,500,000 in 1975, groundwater withdrawals increased 141%. Currently the population exceeds 280,000,000 and demand has increased accordingly.
- As water table levels decline, or deeper wells are needed due to contamination or the need for increased capacity, pumps will need to work harder to reach further, which increase energy costs. Concomitant water conservation efforts could offset the economic impact. (Material adapted from U.S. Water News December, 1995)

## HOW MUCH GASOLINE WILL YOU DRINK IN YOUR LIFETIME?

Before football season gets underway, you may have some free time to ponder over a few of those nagging questions that seem to pop into your head from time to time, such as....**Just how much gasoline can I drink over my lifetime?**

- Benzene,  $C_6H_6$ , is somewhat soluble in water (1.8g/l).
- Benzene is a known carcinogen.
- The maximum contamination level for benzene in drinking water is 5p.p.b. (parts per billion)
- Gasoline is about 2% benzene.
- **There is enough benzene in one gallon of gasoline to contaminate four million gallons of water to the maximum contamination level.**

Typically, an American uses 100 gallons of water per day. At this rate, one gallon of gasoline can contaminate one person's supply for 109 years. With 4,000,000 gallons of water equaling 19,804 cubic yards, this would fill a football field (120 yards by 53.5 yards) up to the height of 3 yards, which is about the reach of a charging defensive lineman with his hands raised to block a pass or kick.



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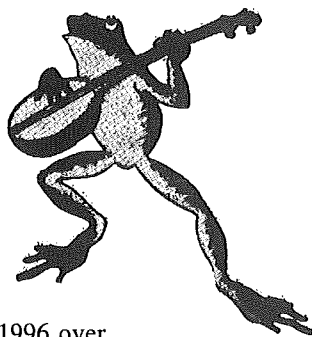
## UPCOMING EVENTS

**SpaceWeek '96:** July 20 - 27, 1996. Celebrating the triumph of man's landing on the moon, the week-long series of spectacular events and presentations focuses on the achievements and future goals of human spaceflight.

**Ballunar Lifftoff '96:** August 23 - 25, 1996. The fourth annual ballooning event that has become the premiere balloon festival in Houston. Over 75 balloons will participate in the festivities including the spectacular "more-than-life-size" high-fidelity replica of the Space Shuttle. The three day event features colorful balloon glows, dynamic balloon competitions, record-setting sky-diving exhibitions, exciting games, live entertainment, exceptional arts and crafts and scrumptious food selections.

**Space Expo '96:** October 29 - 31. The NASA Alumni League has selected Space Center Houston, as the backdrop for the Space Exploration '96 conference. The conference will include booths and exhibits from all realms of aerospace, science and technology relating to spaceflight. Technical briefings and panel discussions will highlight the awesome present and the awe-inspiring future of America's space program.

## CLEAN WATER CELEBRATION IN NATIONAL SPOTLIGHT



On Monday March 19th, 1996 over three thousand three hundred participants were busy constructing knowledge about the environment at the third annual **Clean Water Celebration** at the Peoria Civic Center.

The '96 Celebration has gained national attention via the Coalition On Educational Initiatives, which is sponsored by Apple Computers, Inc., Proctor & Gamble's Crest & Tide, Sallie Mae, State Farm Insurance Co. and Subaru of America.

The Celebration is listed in USA Today, May 1, 1996 as one of the **Top 50 1995 Community Solutions for Education in America**.

According to the Coalition Advisory Council, the 1996 Clean Water Celebration demonstrates excellence in meeting the program criteria:

- Unites the community in support of education to meet an identified critical need
- Encourages the sustained cooperation of the community
- Shows tangible evidence of success
- Demonstrates effective use of resources
- Can serve as a model for other communities

The Celebration is a unique event organized by the RIVER PROJECT at SIU- Edwardsville and the SUN FOUNDATION at Washburn, IL.

What makes this multidisciplinary environmental education celebration so special is the cooperation and participation of every state agency working with water issues, businesses and organization like Waste Management Inc. and the Illinois Farm Bureau, which are also dealing with statewide water issues.

Increased knowledge and awareness of water issues at the Celebration are evident in statements like the following: "It concerns our generation more because we have to live with the consequences..." said student Matt Shekelton, age 16, of Peoria Notre Dame High School, who also dressed as a water drop character. Linda Calvert, a teacher from Rankin School, had this to say about the Celebration, "I think it's a good opportunity...The kids are learning when they don't even *realize* they are learning...They (students) are asking a lot of questions!"

The '96 Celebration had something for everyone. For example, every student received a blue spruce tree seedling to take home and plant. Mrs. Henrichs, a teacher from Columbia Middle School said, "This is our second

year here. We bring our seventh grade classes because *it is just fantastic!*" New events this year included **pHun (Fun) Chemistry** and the **Haug Trough**, 7000 gal. glass fishing tank.

Thirty-five high schools and forty organizations staffed booths. The vast majority of the booths provided hands-on learning opportunities for the students. Forty-eight middle schools received scholarships in order to defray travel and substitute costs. A total of eighty-five schools attended from Illinois, Iowa and Missouri. Of these schools thirty schools are **Illinois River Project** schools and twenty-two schools in attendance are members of the **Illinois Middle School Groundwater Project**. A total of eighty-seven schools attended. Invited guests of honor receiving the '96 Celebration MAKING WAVES Award included U.S. Senator Paul Simon, senior senator from Illinois; William Rutherford, founder of Wildlife Prairie Park Illinois; and the Illinois Water Survey, celebrating its 100th year.

The Navigation Committee is working already to form plans for the '97 Celebration. The dates for the Illinois River Project Student Congress are Sunday March 9th and the 1997 Clean Water Celebration is on Monday March 10th, 1997.

For additional information contact:

Sue Atherton  
Illinois-American Water Co.  
309-671-3701 ext 124  
Bill Beckman  
East Peoria Comm. H.S.  
1401 E. Washington St.  
East Peoria, IL 61611  
email: wbeckman@cedar.cic.net  
Pat Welch  
Tazewell Co. Environmental Health  
309-925-5511



Chem West  
Lee R. Marek

**14th BCCE  
August 4-8**

**Clemson University, S.C.**

(Immediately following the Olympic games in Atlanta (only 2 hours away).

Over 30 workshops are scheduled. Around 1000 people are expected many college types, BUT THERE IS A BIG PUSH FOR HIGH SCHOOL TEACHERS THIS YEAR. WEIRD SCIENCE WILL BE THERE, DOING SHOWS & WORK SHOPS. WOODROW WILSON INSTITUTES WILL BE DOING MINI TORCH PROGRAMS. THE PEOPLE FROM SOUTH CAROLINA ARE A GREAT GROUP AND ARE WORKING HARD TO MAKE THIS THE BEST BIENNIAL EVER FOR HIGH SCHOOL TEACHERS. For more information and registration materials write: 14th BCCE, DeWitt B. Stone, Jr., 206 Sikes Hall, Clemson University, Clemson, SC 29634, phone: 803-656-2344 or send your name & mailing address via e-mail to [dbstone@clemson.edu].

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# MINI IDEAS

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Thomas O. Jewett  
Southern Illinois University-Edwardsville  
Bldg. II  
Edwardsville, IL 62026-1122

## STUDENT ELECTROSCOPE

An electroscope is an instrument which shows the presence of static electricity in a charged object. To purchase one from a supply house costs approximately \$125.00. I came across an alternative several years ago which allows each student to have an individual device, and during its manufacture, permits the instruction of a number of concepts concerning electricity.

### Materials:

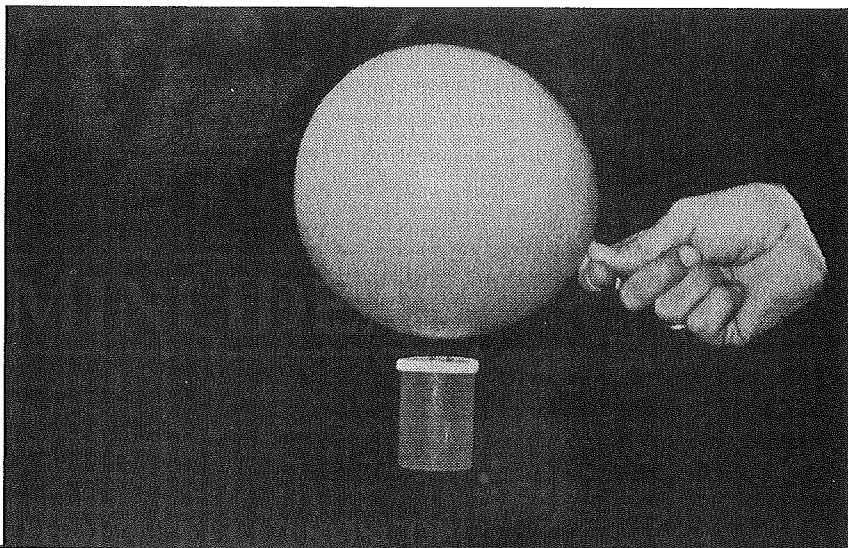
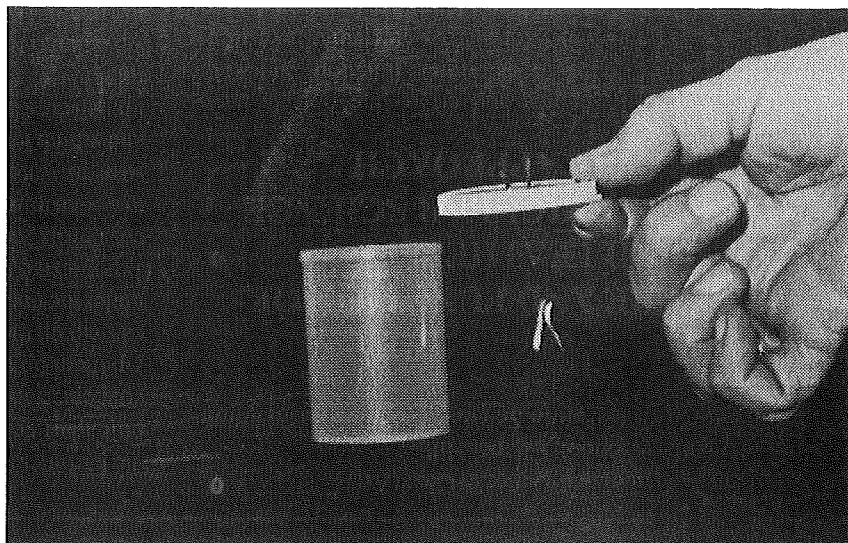
1. A clear plastic medicine bottle with a soft plastic or rubber, non-child proof cap. (My pharmacist was more than happy to give me boxes of these, since most prescriptions have child proof tops.) The bottles should be at least 6 cm tall and 4 cm wide.
2. Aluminum foil from a chewing gum wrapper.
3. Bobby pins.

### Procedure:

1. Punch two holes into the top of the bottle cap about 1 cm apart with an ice pick or math compass.
2. Scrape the plastic ends off the two tines of the bobby pin. (This is a good time to talk about insulators.)
3. Insert the ends of the bobby pins through the holes in the lid so the bobby pin will be hanging down into the pill bottle.
4. Cut a very thin strip of the aluminum gum wrapper about 2 cm. long.
5. Drape the foil through the "U" of the bobby pin so that each side of the foil is equal.
6. Place the cap on top of the pill bottle.

The electroscope is now ready. Charge an object. An inflated balloon rubbed on hair works well. Place the balloon close to or touching the tines of the bobby pin sticking through the cap. The aluminum foil should move or dance around, showing the presence of static electricity.

What causes this phenomenon? When you charge an object, it becomes either positive or negative electrically. When the charged object is put near the tines of the bobby pin, it repels the like ions down the pin to the foil leafs. The leafs each contain the same charge, so they push against each other causing the movement.



## STRUCTURE AND FUNCTION OF BIRD FEATHERS: A CROSS-CURRICULAR SCIENCE AND ART APPROACH

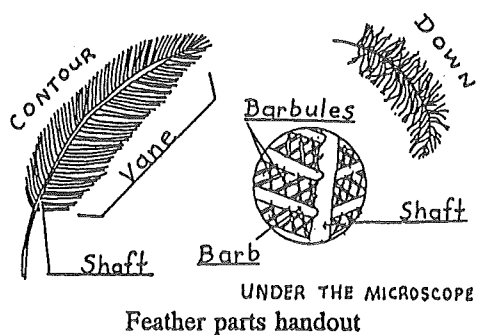
A major concept in science and art is that objects have structure and structure helps to determine function. Studying feathers provides an opportunity for a cross-curricular investigation of structure and how structure translates into function. Using science and art observations, demonstrations, and procedures, students learn the parts, structure, and functions of feathers and use their discoveries to create visual images. They also discover how pollutants like oil can inhibit these functions.

### Materials:

Microscope and hand lenses; bioscope optional  
Zip-lock bags with a contour feather, down feather, and velcro  
Water in plastic containers  
Dry paper towel strips soaked in mineral oil clipped to clothespins  
Heavy motor oil  
Drawing paper and pencils

### Procedure

- Observe contour and down feathers with hand lenses. Move them up and down to see which encounters more air resistance. Discuss similarities and differences in structure between contour and down feathers. Hypothesize how each feather functions based upon structure. Observe the parts of the contour feather: the shaft, the van (parallel rows of barbs) off the shaft, and the barbules (hooks) on the barbs.



- The barbules “hook” or “zip” together. Have students pull apart velcro and zip it up again to illustrate this concept. Separate the barbules on a feather and try to zip them up again. Observe whether people’s hands can zip up the barbules. Observe the contour feather under the microscope. Label the parts on the handout.
- Hypothesize what protects feathers from water. Discuss birds’ oil glands and preening. Dip a dry paper towel strip in water. Dip an oil-soaked paper towel strip in water. Compare which strip absorbs water and which lets the water run off when you hold them up. Discuss how the birds’ oil might help them in the rain.
- Dip a demo feather into heavy motor oil and observe the result. Hypothesize how an oil spill on a body of water might affect the functions of a feather.
- Discuss and observe scientific drawings. Have students make a careful scientific drawing of the portion of a feather they observe under a microscope (optional - use bioscope to project the microscope image on the wall).
- Extension: Discuss and observe abstract art based on realistic images. Have students make an abstract drawing based upon their scientific drawing.
- Partially adapted from *Ranger Rick’s NatureScope: Birds! Birds! Birds!*, National Wildlife Federation, 1989.

### Explanation

The rigidity of the contour feather’s shaft, combined with how the barbules zip together to keep the barbs joined, yields a structure which provides air resistance and lift for flight. The structure of open spaces in the down feather traps air which insulates and helps keep the bird warm. Birds’ beaks are structured so that they can spread oil from an oil gland onto the feathers during preening and can zip the barbules back together if they are separated. The bird’s natural oil on its feathers repels water and keeps the bird dry; however, a large amount of heavy motor oil can make the feathers become too heavy, stick together, and keep the barbules from zipping.

### Relevant Goals and Objectives

- Use Science Process Skills (observe, ability to communicate, infer, predict, formulate hypotheses)
- Develop ability to use science manipulative skills (use microscope for investigating)
- Understanding of science concepts through analyzing systems (Compare and contrast adaptations of different animal groups to their environment, such as shape and body structures)

### References

David Burnie, *Eyewitness Books: Bird*, Alfred A. Knopf, 1988.  
Ellen Doris, *Ornithology* (Children’s School of Science, Woods Hole), Thames and Hudson, 1994.



## **MEALWORMS: YUM! YUM!**

### **WHAT DO *TENEBRIO* PREFER?**

#### **Using Mealworms to Develop Science Skills**

The life cycle of *Tenebrio*, the mealworm is exciting. These little beasts can create an endless number of interdisciplinary opportunities in the classroom. For example, math applications involving linear measurement and mass help students quantify their observations. A journal can be used for descriptive writing as well as recording charts, graphs, and other data. Consider the historical aspects of the mealworm as an introductory set. Reading to your class about early settlers finding mealworms in flour and other grains is fascinating to most students. If the historical aspects do not evoke a few smiles, maybe even a few wiggles, try a multicultural slant. Some people in Mexico consider the mealworm to be an excellent food low in cholesterol and packed with protein. you might even want to try eating some yourself! Just wash, freeze overnight, and pan fry. They make an interesting addition to trail mix.

#### **Background Information**

There are four stages in the life cycle of *Tenebrio*, the mealworm (Figure 1). They begin life as a small white egg. Although a number of eggs are laid together, the eggs are so small, they are usually not seen because they are hidden by the food.

As early as seven days, a tiny larvae hatches from the egg. These too are difficult to see but a highly observant student will find them. They newly emerging larvae are small versions of the larger larvae. During this phase of the life cycle the mealworm will molt many times as this is the growth stage. A mealworm that has just molted will appear white. However, its exoskeleton will soon harden and the characteristic light brown coloration will soon become evident. The larval stage is the longest stage of the life cycle and lasts between four and six months.

After the last molt, the mealworm becomes a pupae. The pupae is still responsive to touch and will twitch when handled. It is during this stage that major changes both internally and externally occur. In approximately two to three weeks the pupae will undergo metamorphosis and change from a mealworm into a beetle.

The newly emerging beetle is white but will eventually become black. Although the beetles have wings, they are nonfunctional and the beetle cannot fly. Before she dies, the female will lay hundreds of eggs during this phase which lasts about one month. Her life is over, and the cycle repeats.

#### **How to Get Started**

*Tenebrio* larvae can be obtained from any biological supply company or local pet store. Containers such as glass, plastic jars, or coffee cans are suitable for housing. I personally prefer glass quart canning jars. Large pails or aquaria will house hundreds of larvae and can be used to establish a parent

colony. The important constraint with regard to housing the mealworms is to use a container which cannot be eaten through. Shoe boxes and various paper or cardboard containers would *NOT* be suitable.

Mealworms will eat just about any type of grain. My students investigated food preference and used grains such as corn flakes, rice crispies, and oatmeal. However, at school, each student's colony feeds off bran. About six centimeters of bran in a quart canning jar will sustain ten mealworms for six to eight weeks. Bran can be purchased in 50 pound bags from a feed store and is very inexpensive.

Mealworms are highly efficient at conserving water. They secrete a solid dropping about the size of a pepper flake, so only a small amount of moisture is needed. Water can be supplied to the colony by adding a piece of vegetable such as a potato or carrot. Even a piece of wet paper towel will work. In fact, too much moisture will cause the food source to mold and the colony will have to be transferred to a fresh food source.

After a few months skins from molting and droppings will accumulate. For this reason mealworms should be transferred to fresh food every four to six months.

#### **Conducting Original Investigations**

My favorite activities with the mealworm involve experimentation to discover how they respond to various stimuli such as touch, sound, light, gravity, and temperature. By allowing students an opportunity to go on a creative binge, everyone can not only conduct an investigation born out of their own interest, but can become an expert on some aspect of the mealworm. There are countless experiments which can be done. During the process of experimentation the student engages in a number of skills such as:

- observation
- distinguishing inferences from facts
- sequencing procedures
- analyzing data
- drawing conclusions

Teachers cannot emphasize enough the importance of these skills as foundations of science, and inclusion of these skills positively affects the problem solving capabilities of the student as a future citizen.

There is also a social component. As the students interact with one another to solve problems or work with peers to review their written product they learn from one another, build social relationships, and feel cared for by others. Thus, investigations can facilitate the socialization process.

Let me share a couple of personal experiences to get you started. Aaron immediately noticed the mealworms were living in oatmeal. With one of the critters crawling on the back of his hand he asked, "Would they eat anything else?" I told him that would be a great thing to investigate. I asked him, "What else do you think they might eat?" He thought of crackers, corn flakes, sugar, corn pops, potato chips, and a number of other things. He finally selected the corn flakes and corn pops. After some discussion, he decided to place

three adjacent layers of oatmeal, corn flakes, and corn pops in a Tupperware-type container. He placed five worms on each type of food. Every two or three days for three weeks Aaron counted and recorded the number of worms burrowed in each type of food. At the end of the third week he analyzed his data table and graphed the results of the experiment. His conclusion? "The mealworms prefer corn flakes."

Alexander noticed the worms always ran for cover when he dumped them on the wax paper to observe them. He wanted to find out at what depth the mealworms would most likely be found. We talked about how this question could be approached experimentally. The major problem was how to allow the worms access to various levels of food cover and still be able to ascertain the location of each worm for data collection purposes. Alexander approached his classmates for help. Finally, one boy volunteered, "Why don't you use window screen?" Alexander seized the suggestion. His dad purchased screen with large enough holes for the mealworms to navigate through. Together, Alexander and his dad constructed a four level mealworm parking garage and filled it with corn flakes. At the end of the week the garage was disassembled one level at a time and Alexander recorded his information in the form of a chart. Later he made colorful graphs of his results. These charts and graphs enabled Alexander to support his inferences as he wrote the results and conclusions to his experiment. What was the outcome of the experiment? According to Alexander, "The mealworms liked the basement best."

As a preliminary activity allow the student to spent time and observe the morphology and behavior of the mealworms and beetles. Ask the student to record in a journal observations, changes, inferences, charts, graphs, drawings, and questions which come from an inquiring mind. As a beginning activity chart the growth of the mealworms using a data table.

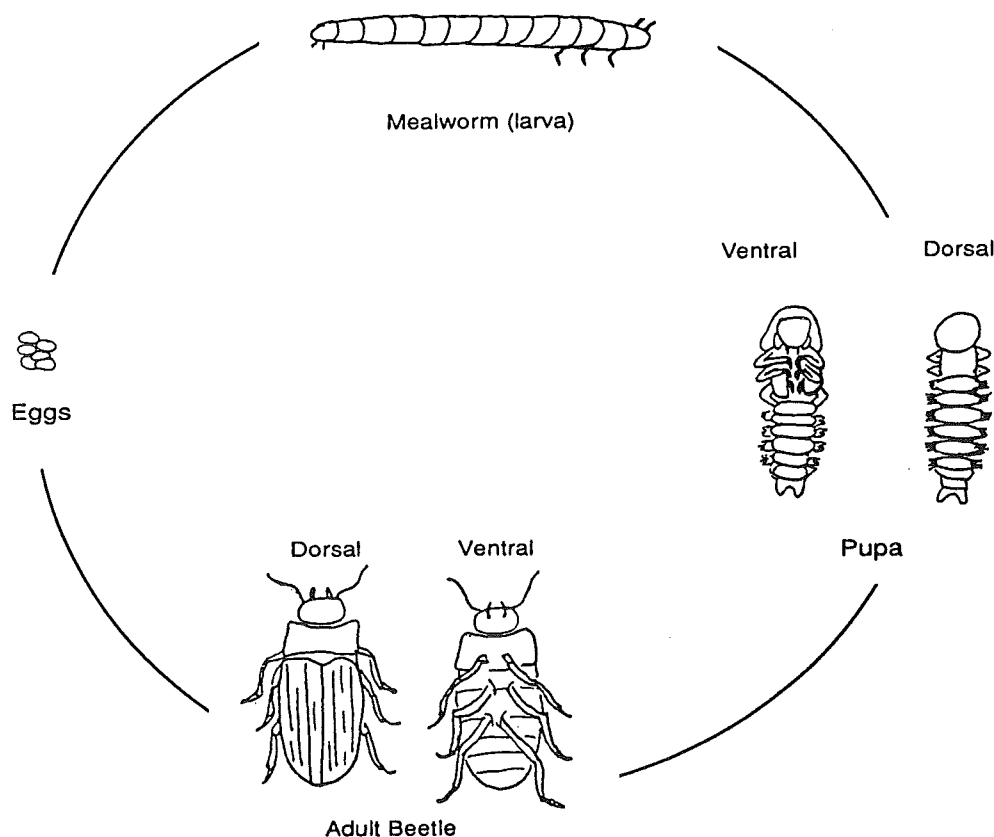


Figure 1. Stages of *Tenebrio* Life Cycle

As the students become familiar with recording qualitative and quantitative information they can begin to devise and try simple experiments such as the ones previously described. My students have investigated temperature preference, what type of container will produce the most offspring, what surfaces are most conducive to locomotion, and many other topics. The students have no problem thinking of experiments they would like to conduct.

### Conclusion

Using *Tenebrio* offers a wonderful opportunity to develop an interdisciplinary approach to science. In addition to using measurement to quantify observations of the mealworms the concept of error in measurement and the importance of repetition to obtain valid results becomes apparent. Writing and organizational skills can be honed using journals which include charts, graphs, drawings, photographs, and descriptive writing about the mealworm. A journal also helps the student to systematically organize data and serves as a record of what the student is seeing and thinking about.

The students will be challenged to learn for themselves, daring to proclaim their discoveries based on their results. Their written work reflects many of the labors and joys which have accompanied discovery. The student has also learned about other things such as the synergism of teaming, and building new relationships with peers.

We as teachers can persuade our student to inquire about nature by helping them to develop a framework to order and make sense of their experiences. If we do this, then they will be able to not only acquire knowledge, but to attack problems systematically as they reflect and reorganize their thoughts and create meaning out of their experiences.

### References

- Kepler, L. (1992). "Hands-on whole science: pass the beetles, please." *Instructor*, 101, 81-82.
- Kramer, D. (1985). "the classroom animal: Mealworms." *Science and Children*, 22, 25-26.
- Hackett, E. (1982). *Raising beetles in a classroom*. ERIC Document Reproduction Service No. ED239838.

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# MEETINGS AND WORKSHOPS

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Fermilab  
Lederman Science Center  
P.O. Box 500, MS 777  
Batavia, IL 60510

## FROM BENEATH THE ASHES

**Grades 3-5**

**August 12, 1996**

**9:00 am - 3:30 pm or**

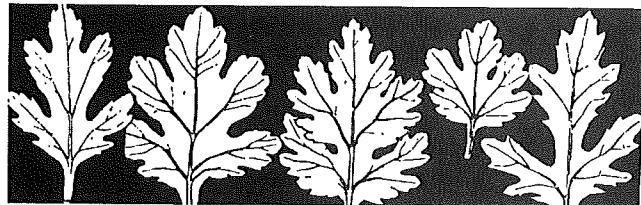
**August 17, 1996**

**9:00 am - 3:30 pm**

This adventure will introduce you to a 10 day integrated teaching unit about the prairie. You will receive the instructional unit including transparencies, video tape, audio tape and supporting materials. This unit of study will allow you to share the prairie with your students in such a way that it will truly come to life. You will be able to teach a whole language learning experience using alternative student assessment to determine mastery of concepts. This unit works well with cooperative grouping or with a more traditional approach. Imagine walking into a room filled with 3 dimensional plants, animals (bison, insects and birds) while listening to the sounds of the prairie. The culminating activity could be a half day field trip to the Lederman Science Center at Fermilab to explore an actual prairie, forest and live bison herd. Be prepared to spend most of the workshop out of doors.

**Instructors: William Fraccaro, Johnson School, District 200 and Bernie Jokiel, Washington Middle School, District 129**

**Fee: \$65.00/teacher**



## LOOKING FOR SOMETHING TO DO THIS SUMMER?

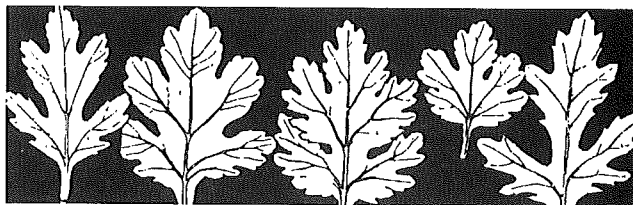
Looking for something stimulating, hands-on, and innovative? Join Sargent-Welch for a professional two-day science workshop this summer. Located in Buffalo Grove, Illinois, these workshops will be presented by nationally recognized educators. Workshops include: Safety in the Classroom, Microchemistry, Computer Interfacing, Middle School Biotechnology, SEPUP, CHEM, AP Biology, and Tech-Prep. Eisenhower grants can be used for a training materials package so you can implement these programs in your school. To get more information on these summer workshops, contact Dorothy Smith at 1-800-SARGENT or E-Mail Sargent-Welch at [sarwel@sargentwelch.com](mailto:sarwel@sargentwelch.com).

## RIVERS PROJECT SUMMER TRAINING

**August 4-9, 1996**

The Rivers Curriculum Project is conducting its fifth annual summer training on the campus of Southern Illinois University, across the Mississippi River from St. Louis. Teachers will focus on one of six curriculum areas while receiving interdisciplinary training in the study of rivers. The six units, being prepared for publication by Addison Wesley, are: biology, chemistry, earth science, geography, language arts and mathematics. The units were developed under a grant from the National Science Foundation. Trainers for the week-long session are teachers who have used and developed the units. Participating teachers will attend a training session scheduled for August 4-9, 1996 in Edwardsville, IL. Tuition for three semester hours credit (Fall, 96) and curricular materials will be provided. A non credit option is available. Lodging and food will be available at a low cost. Interdisciplinary teams from the same school are encouraged.

**Interested teachers can call for more information at the Rivers Project. 618-692-3788, FAX 618-692-3359, by e-mail at [rivers@siue.edu](mailto:rivers@siue.edu), or via the World Wide Web at URL <http://www.siue.edu/OSME/river>**



## FAMS Program

Preparing high school juniors and seniors to pursue manufacturing, engineering, and skilled trade careers is a driving force behind Coalition member Ford Motor Company's creation - **Ford Academy of Manufacturing Sciences (FAMS)**. The program teaches students to understand, work with, and manage modern manufacturing. FAMS-trained business, science technology, and mathematics teachers offer courses that stress problem solving, teamwork, communications, and critical thinking. In FAMS students receive:

- Training in math, science, and state-of-the-art technology
- real-life exercises in problem solving, organization, communication, and team building
- preparation for post-secondary and university programs
- awareness of career opportunities in the automotive industry and all manufacturing

Participating schools form business advisory councils to run the program. **Contact:** Larry Bruno, FAMS program manager, Ford Motor Company, The American Road, P.O. Box 1899, RM 307, Dearborn, MI 48121-1899; Tel. (313) 845-3052; Fax (313) 845-5765.

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## SUMMER AGRICULTURAL INSTITUTES

Sponsored by: Illinois Farm Bureau, Illinois State University, Southern Illinois University and Western Illinois University, this course is designed for teachers, K-8th grade, who wish to expand their curriculum to include topics related to agriculture—the world's food and fiber system. Five courses will be offered in 1996.

**July 8-12, 1996, ISU, Normal**

**July 15-19, 1996, SIU, Carbondale**

**July 22-26, 1996  
Cook County Farm Bureau  
Countryside**

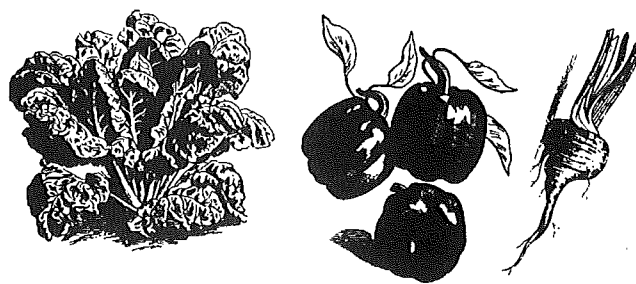
**July 24-31, 1996, WIU, Macomb**

**August 5-9, 1996, ISU, Kankakee**

The focus of the course will be how to integrate materials and key concepts about agriculture into existing curriculum. The course is limited to 20 educators at ISU, 18 at SIU, and 20 at WIU. Three hours of graduate credit can be earned upon successful completion of the course.

### Highlights of the 1996 Institute

- **IN-CLASS INSTRUCTION** on agriculture and the entire food and fiber system, agricultural issues, teaching innovations and resources available.
- **FIELD TRIPS** which may include food science labs, farms, orchards, and other production enterprises, agribusinesses such as food processors, research facilities, retailers, and horticultural operations.
- **LAB ACTIVITIES** relating to science and agriculture in the classroom.
- **REQUIRED** individual development of instructional materials to integrate agricultural concepts into the present curriculum. These units will then be available to other teachers who also wish to integrate agriculture into their curriculum.
- **FREE INSTRUCTIONAL MATERIALS** for classroom use from agribusinesses, organizations, and educational agencies.



### Objectives of the Institute

At the completion of the week-long session, the student will:

1. Demonstrate a greater understanding of the complexity, scope, and scale of Illinois agriculture, its impact upon each person's life and on the economy of Illinois and the nation.
2. Be equipped to successfully integrate agricultural concepts into the curriculum of his or her local school.

### Scholarship Sponsors

Illinois Farm Bureau has committed many resources and materials to the institute. Additionally, scholarship pledges have been received from some County Farm Bureaus to help defray housing, meals, and tuition costs of some participants.

### Contributors

Agribusinesses and agriculture organizations have contributed funds and in-kind services to show support for the institute and its activities. A detailed list of contributors will be available at the institute.

### How To Apply for the Institute

SAI is open to all Illinois educators, grades K-8. Application forms are available from the Department of Agriculture at ISU, SIU, WIU or any county Farm Bureau office. Applications will be accepted until Institutes are filled. During the selection process, preference will be given to applicants with minimal background in agriculture and those who show interest in integrating agricultural concepts into existing curriculum.

### How To Apply for Scholarships

Scholarships may be available to some participants. Scholarship Application forms are available from the Department of Agriculture at ISU, SIU, WIU or any county Farm Bureau office. Applications must be submitted to the county Farm Bureau office in which a teacher's school is located and a duplicate copy to the University of the applicant's choice.

For more information contact one of the following:

Jeff Wood, Professor  
Dept. of Agriculture  
Illinois State Univ.  
152A Turner Hall  
Normal, IL 61761  
309-438-3496

Len Harzman, Professor  
Dept. of Agriculture  
Western Illinois Univ.  
Knoblouch Hall  
Macomb, IL 61455  
309-298-1202  
309-298-1080

Amy Boren, Instructor  
Jim Legacy, Professor  
College of Agriculture  
Mail Code 4414  
Southern Illinois University  
Carbondale, Illinois 62901  
618-536-7733

Stacy Shane  
Education Manager  
Field Services Division  
Illinois Farm Bureau  
1701 Towanda Avenue  
Bloomington, Illinois 61701  
309-557-3334

Joseph Kerke  
Hillcrest H.S.

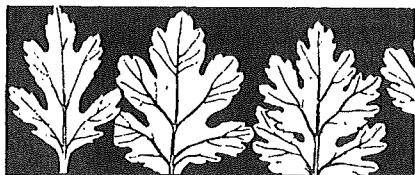
## HIGH SCHOOL SCIENCE TEACHER'S WORKSHOP AT PITTCON '96

Twenty-eight Chicago-area high school science teachers attended the Teacher's Workshop held in conjunction with the 47th Pittsburgh Conference and Exposition on Analytical Chemistry and Applied Spectroscopy (PittCon '96), held at McCormick Place on March 4. The workshop was sponsored by the Pittsburgh Conference Science Week Committee to encourage science education by inspiring teachers and students, bringing new approaches to teaching and learning, and cultivating science literacy through the schools in the city hosting PittCon.

In the "hands-on" workshop, high school teachers assembled and took back to their schools a pressure sensor suitable for use in Boyle's Law experiments and for making vapor pressure measurements. They also built a bb-board, constructed of plexi-glas and bb's, that can be used to demonstrate atomic structure in metals.

In addition, the high school science teachers built a hand-held semi-quantitative conductivity tester and constructed a water sampling bottle capable of collecting samples at any depth for measuring dissolved oxygen and temperature.

The high school teachers were provided all workshop materials, an LCD digital multimeter, a voucher good for up to \$200 worth of computer interfacing equipment from Vernier Software Company, Portland OR, information on obtaining free Project SERAPHIM computer software and free copies of the "World of Chemistry" videotape series, and a Pittsburgh Conference laboratory coat.



The PittCon '96 Exposition is the largest technical exposition of its kind in the world. Over 1,150 exhibitors and 1,800 technical presentations highlight four focus areas in food analysis, environmental analysis, pharmaceuticals/biopharmaceuticals, and quality control, attended by over 30,000 conferees.

According to Pittsburgh Conference Science Week Committee Chairman Dr. Robert E. Witkowski, "The objective of the Science Week activities, coinciding with the occurrence of the Exposition, is to raise awareness of science at work in everyday activities and stimulate an interest in science on the part of students."

The high school science teacher workshop leaders are Richard Crilley, Conneaut School District, Conneaut PA; William Vitori, Elizabeth-Forward High School, Elizabeth PA; John Varine, Kiski Area School District, Vandegrift PA, and Susan Zawacky, Sewickly Academy, Pittsburgh PA.

Chicago-area high school science teachers participating in the workshop are: Chris Brandstedt, Maine South HS; Charlane Anderson, Maine South HS; Jeanette Earlandson, Whitney Young Magnet HS; Carol Widegrin, Lincoln Park HS; Larry Perez, Amundsen HS; Jennifer Schiavo, St. Barbara HS; John Brodemus, Richards HS; Leland Yee, Lake Forest Academy; Susan Rhoads, Wheaton Academy; John Regan, Lake Park HS; Theresa Wong, Mather HS; David Olszak, Clemente Community Academy; J. Alvarez, Amundsen HS; Steve Woods, Tilden HS; Kathleen Dombrink, McCluer North HS; Sr. Maureen Fallon, Mother Guerin HS; Kimberly Turnbull, Lourdes HS; Dolph Michael, Jones HS; Christine Smith, Hubbard HS; Allen Franklin, Near North Career Metro HS; Janina DeLema, Steinmetz HS; Edwin Metzl, Lincoln Park HS; Steve Samuels, Curie HS; Stan Cebzynski, Marian Central HS; Kathryn McHugh, Amundsen HS; Katie Nash, Cary-Grove HS; Joseph Kerke, Hillcrest HS; and Julius Kish, Morton HS, Hammond IN.

For further information on The Pittsburgh Conference, call 800-325-3221

## WORKSHOP ON TEACHING WITH FOSSILS

Fossils are fascinating! They are a natural topic to get even the youngest students interested and involved in doing science, and they can be used in higher grades to increase students' interest and understanding of biology, earth science, and even physical sciences. To help K-12 teachers make good use of paleontology in their classrooms, the workshop "Learning from the Fossil Record" will be given on Sunday, October 27, 1996, from 8:00 am to 5:00 pm, in Denver, Colorado. The workshop will be part of the annual meeting of the Geological Society of America and will be presented by the Paleontological Society, the Society for Vertebrate Paleontology, the Cushman Foundation, the Berkeley Museum of Paleontology, the Denver Museum of Natural History, and the University of Wyoming Museum of Geology.

Presenters of the workshop come from across the U.S. and include paleontologists and education specialists from museums and universities, and award-winning K-12 teachers. The general session in the morning applies to teachers of all grade levels, followed in the afternoon by break-out groups, based on grade level, for further discussion and hands-on activities.

Each activity or focused topic will be related to the National Standards for Science Education.

Registration fee is \$35.00, which includes registration for all sessions of the annual meeting of the Geological Society of America, and \$10.00 fee that includes the workshop's resource book. Complimentary admission to the Prehistoric Journey exhibit at the Denver Museum of Natural History will be provided for the first 200 registrants. Registration materials may be obtained by writing:

1996 Annual Meeting  
Geological Society of America  
P.O. Box 9140  
Boulder, CO 80301





Lisa C. Brogdon, Information-Education Coordinator  
2520 Main Street,  
Springfield, Illinois 62702-1262  
(217) 744-3414 FAX (217) 744-3420

### ILLINOIS' FIRST ENVIROTHON COMPETITION SCHEDULED

Schools from all over Illinois will compete in the first statewide Envirothon Competition to be held June 14 & 15 at the Western Illinois 4-H Campgrounds on Lake Jacksonville. The Envirothon Program is being coordinated by the Association of Illinois Soil and Water Conservation Districts (AISWCD).

The Envirothon was established as a competitive problem-solving, natural resource event for high school students to challenge them about the environment. Thousands of high school students have met the challenge and have come away wiser and more concerned about the natural world and their environment.

Five-member teams of 9th and 12th grade students are trained and tested in five natural resource areas: soils, aquatics, wildlife, forestry, plus a fifth environmental issue that embraces a current problem such as recycling or land-use management. This year's environmental issue focuses on the impact of greenways and buffer strips in Illinois.

The Envirothon began in one county in Pennsylvania in 1979. By 1995, over 30 states including Canada and Australia had initiated the program and competed in the National Envirothon. In every state the Envirothon is sponsored by the conservation districts and their state association.

During the spring, Illinois Soil and Water Conservation Districts will be holding county competitions for local schools, with winning teams advancing on to the state competition. Illinois' winning team will compete at the National Envirothon Competition during July at the Eugene T. Mahoney and Platte River State Parks in east central Nebraska, along one of the most hotly contested stretches of surface water in North America, the Platte River.

AISWCD volunteers and partnership agencies will be serving as group leaders, presenters, judges, assisting with activities and writing curriculum for the state competition that will host 80+ high school finalists. Entertainment will consist of a cook-out, a Wild Bird Call-In and Native American Story Telling around a bonfire to celebrate the great outdoors. There will be swimming, canoeing and nature hiking.

For more information on the Envirothon Program, please contact your local soil and water conservation district or the AISWCD at 217/744-3414.

### PLAN-IT

Would you like to explore the wonders of Illinois woods and waters this summer or fall so that you can help your students do the same? If so, join us for **Plan-it** (Paired Learners and Nature with Innovative Technology)!

#### Some of the special features include:

- a specific focus on Illinois ecosystems
- a set of scientifically developed monitoring activities that will have students collecting data that will be used by scientists in a state report
- curriculum modules that have been developed by teachers that are interdisciplinary and address the National Science Education Standards
- authentic assessment opportunities
- state of the art technology component

#### In addition you will be provided with:

- learning experiences with colleagues, university and DNR personnel during the weekend sessions
- continued networking throughout the school year
- curriculum modules
- equipment, materials, and software to conduct the suggested activities
- a stipend of \$400 for your participation
- option to receive graduate credit
- opportunities to lead your students in meaningful science experiences

#### Locations and dates:

- University of Illinois, Champaign-Urbana  
July 28-August 9, 1996
- Northeastern Illinois University  
August 5-16, 1996
- Western Illinois University  
September 6-7, 13-14, and 20-21, 1996
- Rend Lake Community College  
September 27-28, 1996

You are invited to participate in these special sessions and to be a part of this statewide collaborative venture that will link you, your students, and the Department of Natural Resources together in discovering more about Illinois environment. For more information, contact Dr. Marylin Lisowski at 217-581-5728 or email CFMFL@EIU.EDU



**SUMMER  
OPPORTUNITIES AT  
TOUCH OF NATURE  
ENVIRONMENTAL  
CENTER  
ENVIRONMENTAL  
ED-VENTURES  
Summer programs for  
high school students**

**Ozark Riverway  
Backpacking Expedition  
July 7-13**

Backpack into the heart of the oldest mountain range in North America, as we explore the ridges, hollows and streams of the Missouri Ozarks. The heartlands dramatic backcountry will be home for a week while we challenge ourselves and build our skills in orienteering, caving and wilderness camping. Ecological awareness and environmental ethics will be a focus as we discover our human connection to the natural world. This exciting ed-venture will culminate on the waters of a crystal blue ozark stream as we canoe back to civilization.

Cost: \$340.00

**Ozark Canoeing Expedition  
July 21-26  
July 28-Aug. 2  
(6th-8th grade)**

Experience the spirit of a national scenic river, as we glide through clear pools and race the rapids. Explore the region's wildlife, springs and caves as we practice minimum impact camping and develop outdoor living skills. Ozark sunsets, star filled nights and morning mist on the river have made this expedition a traditional favorite:

Cost: \$290.00

For More Information Contact the Environmental Ed-Venture Program at 618-453-1121. A 20% deposit is due two weeks prior to start date of program.

**NSTA TEACHER CENTER  
SUMMER INSTITUTE  
Teacher Enhancement in  
Support of Higher Standards**

**Topic: Energy Transfer  
Univ. Wisconsin- Madison  
June 30-July 26**

This institute will include a discussion of the various forms of energy: mechanical, electrical, chemical, thermal, and nuclear. There will be a thorough examination, both in the classroom and in the laboratory, of processes by which energy is transformed from one form to another, with special attention to the laws that tell us that in transformations total energy is conserved but less and less is available for doing work. Participating teachers will also become familiar with instructional materials designed for teaching these topics in grades 6-9.

**CRITERIA**

Eligible to apply are classroom teachers of science, grades six through nine, who meet the following criteria:

- is currently teaching science
- has an assignment to teach science during the 1996-97 school year
- is certified to teach grades six through nine
- is committed to a program consistent with the National Science Education Standards

Selection will be based on the applicant's commitment to science teaching and a curriculum that is consistent with the vision of the Standards. The course content must be relevant to the applicant's teaching assignment and fill a gap in his/her formal education.

**HOW TO APPLY**

The applicant should submit a letter that includes:

- Complete address and telephone number.
- Identification of the institute of interest and a brief statement of why this topic is of special interest.
- A discussion of the applicant's educational philosophy, and some evidence that the applicant has been successful with under-achieving students and has used hands-on methods routinely.

- A listing of leadership roles played by the applicant in the science education community.
- A list of science and math courses taken at the college level. For each course related to the institute topic, the applicant should add a statement about the depth of treatment.

The applicant should arrange to have his/her principal submit a letter that:

- affirms that the applicant has an appointment to teach science at the grade 6-9 level for 1996-1997
- expresses the school's commitment to taking immediate steps toward meeting the National Science Education Standards
- agrees to provide the applicant with opportunities to share what he/she learns at the institute with teacher colleagues during 1996-1997.]
- Deadline for Application: Until Filled

**BENEFITS**

1. College credit will be available for the portion of the Program that is equivalent to college-level work on the local campus. How much credit and the cost of this credit has yet to be negotiated with each campus.

2. A stipend of \$60 will be paid to each participant for each full day of participation in the institute program. (20 is the maximum number of full days.)

3. Room and board will be paid. The allowance for food will take the form of meal tickets good at campus food services, cash that can be used to purchase food, or some combination of these.

4. Interactions with teaching staff members and fellow participants will be initiated that can and will be extended through the academic year following the institute and beyond.

**INFORMATION**

**National Science Teachers Association  
Teacher Center  
1840 Wilson Boulevard  
Arlington, VA 22201-3000**

**Or call 703-312-9256  
or e-mail Erma\_A@NTSA.org**

**EXTENSION'S ROLE IN  
BIOTECHNOLOGY  
EDUCATION  
A LEARN-BY-DOING  
CONFERENCE  
FOR YOUTH AND ADULT  
EDUCATORS**

**October 20-23, 1996  
Iowa State University  
Ames, Iowa**

**CONFERENCE GOALS:**

- Experience model educational activities designed by Extension and other professionals
- Gain knowledge in program content, delivery methods, resources, and networks
- Better understand the role of technology in addressing societal problems
- Learn to help consumers understand the potential benefits and risks of new products
- Learn ways to facilitate discussions about biotechnology products and issues, bioethics, and controversies

**WHO SHOULD ATTEND:**

All youth and adult educators, regardless of their level of biotechnology expertise, will benefit from the conference. Building biotechnology skills and confidence for those who may not be comfortable with the new science is an important goal of the conference. Activities during the conference will provide a basic background for those with little or no biotechnology experience.

**CONFERENCE  
HIGHLIGHTS:**

**Reviewing the Basics of the Science of Biotechnology**

For those with little or no experience in biotechnology, a workshop will cover the basics of DNA science. Participants will have an opportunity to view DNA and solve a mystery by DNA fingerprinting. For those with some experience in biotechnology, a workshop will cover the DNA fingerprinting experience. Participants will be introduced to equipment resources, experience laboratory preparation techniques, and participate in a DNA fingerprinting laboratory, including video and other hands-on activities.

**Extension's Role in Biotechnology**

Tom Zinnen, Biotechnology Education Specialist, University of Wisconsin-Madison Biotechnology Center and UW-Extension

**The Future of Biotechnology**

Donald Weeks, Director of the Center for Biotechnology, University of Nebraska-Lincoln

**Influences of Public Attitudes on Biotechnology Education**

Thomas Hoban, North Carolina State University

**Biotechnology Education: Teaching Young People to Make Their Own Decisions**

Eric Austin, National 4-H Council

**Internet Teaching of Biotechnology**

Tom Ingebritsen, Iowa State University

**A School Enrichment Unit That Uses a Policy Education Model to Inform Students About Biotechnology and Plant Food Production**

J. Lynne Brown, Elisabeth Hildebrand, and Tim Rollins, Penn State University  
**Teaching a Practical Bacterial Transformation Unit**

Mike Zeller, Woodward-Granger High School, Woodward, Iowa, and Jay Staker, Ballard High School, Huxley, Iowa

**Cell—ebrate Cells!**

Sue Delaney, Iowa State University and Jennifer Tometich, SE Iowa School Enrichment Coordinator/Biotechnology, Albia, Iowa

**Food Biotechnology Education in the Classroom and in Cyberspace**

Mary Stein, Montana State University Food and Nutrition Extension, and Pat Kendall and Carrie Puck, Colorado State University Cooperative Extension

**Early Intervention for**

**Biotechnology Education:**

**Experiential Learning for Attitude Formation**

Joe Heimlich, Ohio State University Extension

**Texas Biotechnology Teacher Enhancement Project**

Jeannine Kantz, Texas A&M University

**Teaching Biotechnology Using Transgenic Potatoes**

David Mitchell, University of Idaho Cooperative Extension System,

**Development of Case Studies for Bioethics Education**

Mark Honeyman, Palmer Holden, and Clark Ford, Iowa State University

**Finding Resources: An Electronic Travelogue**

Joe Heimlich, Ohio State University

**Putting on a Biotechnology Fair**

Jo Bodeker, Linn-Mar High School, Marion, Iowa

**Forming Partnerships Between Extension and Schools for Biotechnology Programming**

Beverly Berna, Iowa State University Bob Buelow and Larry Clement, Master Gardeners, Jean Schulz and Bev Wagner, 4-H Program Assistants; Bob Steinhauer, Washington Junior High; Marian Wittine, Science Substitute Teacher, Dubuque County, Iowa

**Cross-Disciplinary Integration of Biotechnology Education**

Terry Brase, Hawkeye Community College

**REGISTRATION**

The registration fee is \$195 for registrations postmarked by September 20, 1996. The fee after that date is \$225. The fee includes three breakfasts, two lunches, two dinners, breaks, and hand-out materials. A free set of the Iowa State University Biotechnology Information Series will be sent to all registrants before the conference.

**For further information contact:**

Debbie Curry  
ISU Extension - E-SET  
32 Curtiss Hall  
Iowa State University  
Ames, Iowa 50011-1050

(515) 294-8417

FAX (515) 294-1047

E-mail: x1curry@exnet.iastate.edu

Descriptions of the concurrent workshops will be placed on an Internet homepage at:

[http://biotech.zool.iastate.edu/Biotech\\_Public\\_Ed.html](http://biotech.zool.iastate.edu/Biotech_Public_Ed.html)

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Announcing: *Science in the Mainstream: Retooling Science Activities*

Do you have students with learning disabilities or behavioral disorders in your classroom? Do you find it difficult to teach them science, or to find science activities and assessments that are appropriate for both special needs and typically achieving students? The Science Activities Retooling for Special Education Project (funded through ISBE) has worked with teachers of grades 3-8 to develop a handbook useful for teachers wishing to retool science activities, making them more suitable for special needs students as well as for typically achieving students. The first handbook is now available at cost (including shipping and handling), and the second is scheduled to be available by the July, 1996 and will be free as long as supplies last. After supplies are exhausted, copies of the second handbook will be available on the same basis as the first handbook: at cost. If you are interested in obtaining copies, or just want more information, please contact me at:

Dr. Kevin D. Finson  
Department of Elementary Education and Reading  
Western Illinois University  
1 University Circle  
Macomb, IL 61455  
(309)-298-2101 (office)  
(309)-298-1961 (messages)  
(309)-298-2222 (FAX)  
Kevin\_Finson@CCMAIL.WIU.edu (internet)



photo by Marlene Gregor

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# REVIEWS

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Dean Dittmar  
Region 5 Director

## **Environmental Science and Technology**

Providing environmental education is a major opportunity and challenge facing educators. Many school systems are moving towards classes on the environment that stress the roles of science and technology. Students need a combination of basic and applied sciences (technology) to understand more fully basic concepts and principles.

Stressing science and technology in environmental courses provides a unique opportunity. Through an understanding of basic science concepts and their applications, students learn how to sustain the environment to meet the food and fiber needs of future generations. They gain an understanding of how science and technology can influence the ability to meet the needs of an ever increasing population.

Using the "science and technology" approach provides science educators with the opportunity to serve as a major force in promoting awareness and stewardship of the environment. Emphasis on these concepts allows students to become good environmental citizens.

Today's educators must prepare their students for the challenges of tomorrow. These challenges include maintaining a good environment that insures a reasonable quality of life. At the same time, the world's population remains dependent on the environment to meet basic food, clothing, and shelter needs.

Interstate's *Environmental Science and Technology* takes a brand new approach to teaching students about their environment. Emphasizing an understanding of science and technology in the environment, the textbook and accompanying materials provide students with the tools needed to become effective environmental stewards. The materials focus on the responsible use of the world's resources. Conservation practices are demonstrated to assure that the world is able to sustain a vibrant, healthy population.

In addition to the textbook, the following supplementary teaching materials are available. Used together, they provide educators with powerful tools in teaching students about maintaining their environment.

**Text:** \$38.95, 10 or more: \$31.16

### **Supplementary Materials**

**Instructor's Resource Guide** - Contains lesson plans by chapter, transparency masters, chapter tests, and further investigations.

**Activity Manual** - Parallels the textbook's chapters. The manual containing hands-on activities that reinforce concepts presented in the text: \$15.95, 10 or more: \$12.76.

**Transparency Set** - Contains mostly color transparencies that illustrate concepts that are presented in the text and activity manual: \$59.95.

**For More Information Contact:** Dan Pentony, Vice President- Marketing, Interstate Publishers, Inc., P.O. Box 50, Danville, IL 61834, (800) 843-4774, FAX (217) 446-9706, Email: dpentony@IPPINC.com

## **Sample Curriculum Sequence** **ENVIRONMENTAL SCIENCE AND TECHNOLOGY** **Units and Problem Areas for a High School Class**

### **Unit One—Importance of the Environment**

#### **Problem Areas:**

- 1—Natural Resources and the Environment
- 2—Sustaining the Environment
- 3—Resource Conservation
- 4—Human Population Growth
- 5—Human Population Demands

### **Unit Two—Science and Technology in the Environment**

#### **Problem Areas:**

- 1—Biology and the Environment
- 2—Organisms and the Environment
- 3—Earth Science and the Environment
- 4—Weather and the Climate in the Environment
- 5—Chemistry and the Environment
- 6—Applying Ecology
- 7—Biotechnology Applications in the Environment

### **Unit Three—Using Natural Resources**

#### **Problem Areas:**

- 1—Soil
- 2—Water Supply and Management
- 3—Water Quality
- 4—Wildlife: Plants
- 5—Wildlife: Animals
- 6—Minerals
- 7—Air Quality

### **Unit Four—Disposing of Waste and Recycling**

#### **Problem Areas:**

- 1—Waste Water Treatment and Disposal
- 2—Solid Waste Disposal
- 3—Hazardous Waste Disposal



Curtis Gentry  
Horticultural Educator  
Fernbank Science Center  
Atlanta, Georgia

### ***Insect-Eating Plants***

**L. Patricia Kite**

**ISBN 1-56294-562-9, 1995**

**The Millbrook Press,  
Brookfield, CT**

Children are naturally fascinated by carnivorous plants. *Insect-Eating Plants* by L. Patricia Kite captures this fascination well with action photographs and intriguing tone used to explain the various methods employed by these plants to capture their prey.

The initial chapter presents a good overview of the carnivorous habit in plants. This serves as a base to the succeeding chapters that explore the various groups of carnivorous plants along with their specific adaptations for capturing supplemental nutrients. A chapter is included that discusses insects and other animals that use carnivorous plants as homes in order to take advantage of the plant's attractiveness to insects. These animals use the plants to facilitate their capture of prey. A further chapter provides information on the dual forces of habitat destruction and over collecting that threaten the survival of many carnivorous plants. The final chapter is a guide to growing these plants.

The book encourages further exploration of the subject and supports this by providing suggestions and avenues to pursue. These are primarily included in an appendix along with a glossary. The glossary is succinct, though unfortunately incompletely or misdefines several entries. "Nutrients" encompass a range of substances beyond minerals and vitamins given in the entry. "Pupate" is to change from the larval form to the pupal form, both immature stages in an insect life cycle. The adult form follows the pupal stage. "Peat" is more commonly produced in bogs, not swamps.

A couple of things are particularly commendable in a book targeted toward an early elementary audience. These include the use of scientific names and the use of metric measurements, albeit the latter are given in parentheses after the English measurements instead of vice versa.

The balance between simplification for a young audience and scientifically precise terminology is an ongoing compromise for an author. In several cases, precision is lost in a needless compromise. On occasion, the author refers to ant or insect "skeletons." The general level of the book would have allowed the more correct term "exoskeleton." Reference is also made to "sugary nectar" and "sweet-smelling nectar." These are redundant, as nectar by definition is a sugary substance. The euphemism "makes soup out of" instead of or parenthetically with "digests" gives a technical reader pause. A caption in reference to the Venus flytrap implies that these plants are native to areas far beyond North Carolina; whereas, the native range of these plants is restricted to the coastal plain of the Carolinas.

Overall, the book is visually stimulating and the content is solid. It is an appealing package for young readers on this fascinating group of plants. *Insect-Eating Plants* is worthy of consideration for a teacher planning an exciting botany lesson or for inclusion in a library collection.

For grades 2-4, 64 pages, \$15.90

***Water: Simple Experiments for Young Scientists* (ISBN 1-56294-472-X) *Air: Simple Experiments for Young Scientists* (ISBN 1-56294-471-1) *Gravity: Simple Experiments for Young Scientists* (ISBN 1-56294-470-3) Larry White, illus. Laurie Hamilton. Millbrook Press, 1995 Brookfield, CT, 06804, 48 pages each. \$13.90 each.**

All kids are born scientists—just watch a toddler examine a glass of water. All that splashing, pouring, dribbling and soaking are a child's way of exploring the natural world. These three books are guides for helping your kids experiment in an easy-to-follow format. The illustrations are colorful and most of the time helpful.

In "Water: Simple Experiments for Young Scientists" you can find experiments on surface tension, solutions, meteorology, and evaporation and condensation. In "Air: Simple Experiments for Young Scientists" they explore meteorology in depth, air pressure and paper gliders. In "Gravity: Simple Experiments for Young Scientists" there is a great discussion on weight and gravity, and a wonderful activity on finding your weight on other planets.

The suggested grade levels for these books are grades 2-4. Some of the explanations are simplistic and not appropriate for older children but the books could be a good guide for enrichment projects in an elementary classroom.

***Making Things Float and Sink*, Gary Gibson, illus. Tony Kenyon. Copper Beech Books, an imprint of The Millbrook Press, Brookfield, CT, 06804, 1995, 32 pages, ISBN 1-56294-617-X.**

This is a book from the series "Science For Fun." All the activities in this book are given in an easy to understand step-by-step guide. The illustrations are delightful and each of the experiments discussed in the book is well explained for early primary grades.

There is a photograph for each experiment showing exactly what the completed device should look like. The experiments are progressive, each building on the concepts developed in previous sections. This book would be great for early grades. It's a delightful book and a great addition for any home or school library.



Edee Norman Wiziecki  
Science Coordinator-Champaign Unit #4 Schools  
Franklin Science Center  
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Champaign, IL 61820  
217-351-3709

**A REVIEW OF VIDEOS FROM  
FILM IDEAS, INC.  
3710 Commercial Ave.  
Suite 13  
Northbrook, IL 60062**

**Story of Dinosaurs**

This eight minute video for primary grade students features many facts about dinosaurs based upon the Troll "Now I Know Library" series. The differences in the way dinosaurs look, eat, and move are discussed. It is presented in an interesting cartoon format with music and narration. Students may read, watch and listen to the story of dinosaurs.

**Earth Science Video Library**

Fossil Fuels is a 19 minute videotape that used live action footage to help students understand what are the Earth's

renewable and nonrenewable resources, how they are formed and how we can conserve them. A 2-page teacher's guide accompanies the video and includes discussion questions, suggested activities and a vocabulary of related terms. There are several topics in the earth science library including: Plate Tectonics, The Rock Cycle, The Greenhouse Effect, Faulting and Folding, and Physical Oceanography. This can be a good supplement to the study of Earth's resources and is targeted for intermediate to junior high level students.

**The Discovering Series**

This series features a number of topics including: Rivers, Lakes, and Oceans, Our Earth's Atmosphere, Our Universe, and Our Planet Earth. The Changing Surface of the Earth is written for the intermediate to junior high grade levels, and shows many of the geological processes with photography and computer graphics. The approach of using alien scientists to learn more about planet Earth will appeal to the younger student, but the information provided about the ways in which land is built up and worn down is good for all.

The concepts covered in these videotapes are good ones, so any of these videos may be worthwhile to rent from Film Ideas. At costs ranging from \$115 each to \$2,200 for whole series, however, I would not recommend that teachers purchase any of these videos.

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## **AWARDS AND RECOGNITION**

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The Pittsburgh Conference  
300 Penn Center Blvd., Suite 332  
Pittsburgh, PA 15235-5503  
Tel. (800) 825-3221

**HILLCREST AWARDED SCIENCE  
EQUIPMENT GRANT**

Hillcrest High School, Bremen Community High School District 228, Country Club Hills, was recently awarded a science equipment grant by the Pittsburgh Conference PittCon '96 Science Week Committee to purchase a computer-interfaced Geiger-Muller system.

PittCon '96, held in Chicago March 3-8, 1996 at McCormick Place, is one of the largest conventions in the world featuring technical programs and an exposition of laboratory equipment and chemical analyses. A premier event for chemists and laboratory scientists world-wide, the conference celebrating its 47th year featuring the newest technologies and latest problem solving capabilities. PittCon '96 is sponsored by The Pittsburgh Conference on Analytical Chemistry of Pittsburgh and The Spectroscopy Society of Pittsburgh. Over 30,000 scientists are expected to attend the conference and more than 1,800 technical papers will be presented. The exposition will feature more than 3,000 exhibitor booths.

The Science Week Committee of The Pittsburgh Conference has developed special programs and workshops for Chicago-area teachers in conjunction with PittCon '96, including its High School Equipment Grant Program. "The aim of the High School Equipment Grant Program is to foster science education by providing new equipment to science teachers with innovative or exciting ideas for laboratory experiments that will enrich the learning experience for their students," states Robert E. Witkowski, Science Week Committee Chairman.

The computer-interfaced Geiger-Muller system includes a Geiger-Muller tube and low-emission radioactive sources. The system performs all the functions of a radiation counter, scaler and ratemeter, and is capable of three collection modes: meter, data collection, and graphing.

The grant purchase will be used to conduct student experiments and classroom demonstrations in nuclear science, including radioactive half-life, radiation shielding, and the radiation inverse square law. These nuclear science topics are a component of several science courses at Hillcrest High School, including biology, chemistry, physics, and earth sciences.

The High School Equipment Grant Proposal was written and submitted by Chemistry teacher and ISTA member, Joseph Kerke. An award ceremony and reception for the High School Equipment Grant awardees took place at McCormick Place on March 6.

**The Illinois Science Teachers Association announces  
The 1996 Illinois Presidential Awards of Excellence  
and ISTA Awards of Excellence in Science Teaching**

**SECONDARY SCIENCE  
TEACHING**

**Presidential Awards**

Sheryl Burris Deets  
Belleville West High School  
Belleville

Kevin P. Murphy  
Lyons Township High School  
LaGrange

Ronald L. Williams  
Schaumburg High School  
Schaumburg

**ISTA Awards**

Marianne Duellman Barker  
Carmel High School  
Mudelein

Thomas G. Koenigsberger  
Adlai E. Stevenson High School  
Lincolnshire

Kathy Ann Costello  
St. John the Baptist Catholic School  
Red Bud

Branson D. Lawrence, Jr.  
Illinois Math and Science Academy  
Aurora

Gaylyn Ann Grimm  
Kolmar School  
Midlothian

Carolyn T. Phillips  
Dallas Community Elementary  
School #336  
Dallas City

James Pudlewski  
James Hart Junior High  
Homewood

**ELEMENTARY SCIENCE  
TEACHING**

**Presidential Awards**

Karen Dozier  
Pawnee Elementary School  
Pawnee

Lois Marie Johnson  
White Eagle Elementary School  
Naperville

Elizabeth Ann Trummel  
Husmann Elementary School  
Crystal Lake

**ISTA Awards**

Janet Kathleen Bakewell  
Varna Grade School  
Varna

Valerie J. Lyle  
Lincoln Elementary School  
Marion

Louise Tolle Huffman  
Steeple Run School  
Naperville

Jennifer Ann May  
Ellis School  
Belleville

Christina A. Jones  
Lincoln Elementary School  
Springfield

Judith A. McKee  
Central Elementary School  
Wilmette

Jannean Marie Muehlfield  
William Holliday Elementary School  
Fairview Heights

**CONGRATULATIONS TO ALL!**

Joseph Kerke, Hillcrest H.S.  
Bremen Comm. H.S.  
District 228  
17401 S. Pulaski Rd.  
Country Club Hills, IL 60478-4699

**STUDENTS TALK  
WITH NOBEL  
LAUREATES**

Students at Hillcrest High School and other selected sites in Illinois and throughout the United States were given a unique opportunity to participate in a live satellite TV panel discussion on CFCs and the Ozone Layer featuring two of the 1995 Nobel Laureates in Chemistry on April 26.

The first in a series of interactive satellite TV presentations sponsored by the American Chemical Society, the panel featured Dr. F. Sherwood Rowland of the University of California Irvine and Dr. Mario J. Molina of the Massachusetts Institute of Technology, two of the winners of the 1995 Nobel Prize in Chemistry. Drs. Rowland and Molina were awarded the Nobel Prize for their work in atmospheric chemistry, in particular for their discovery that chlorofluorocarbon gases deplete the ozone layer of the stratosphere.

During the panel discussion, the Nobel Laureates discussed the significance of their research and invited students to telephone their questions during the broadcast.

The Hillcrest High School students attended the satellite site at Argonne National Laboratory, sponsored by the Chicago Section of the American Chemical Society and the Division of Educational Programs at Argonne National Laboratory.



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# EDUCATIONAL MATERIALS

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Laura Payne  
American Plastics Council  
A Joint Initiative with The Society of the Plastics Industry  
1275 K Street NW, Suite 400  
Washington DC 20005  
Fax 202.371.5679 • 202.371.5319

## AMERICAN PLASTICS COUNCIL

The American Plastics Council (APC) has produced a video tape called *The Busy, Busy Planet* which explores plastics role in reducing the amount of trash we produce, energy efficiency and recycling. It can be used as a companion piece with our curriculum kits *Plastics in Our World* for grade levels K-6 and 7-12. The video and kits are *free* of charge. Each kit has four classroom activities, general information about plastics in the environment and a *How to Set Up a School Recycling Program* booklet.

APC, with the help of the National Middle Level Science Teachers Association (NMLSTA), designed the *Hands On Plastics: A Scientific Investigation Kit*, which is available for \$10. This kit includes samples of the six common plastic resins, learning cycle activities and extensions and background information.

To order or for more information, please call 1(800)2-HELP-90 or visit our new web site at

<http://www.plasticsresource.com>.

For more information on Keep America Beautiful call (203)323-897.

## TEACHER HANDBOOK OF AIR EDUCATION

The Teacher Handbook on Air Education has been developed to supplement textbook information on air pollution. There are facts, teaching aids, games, and glossary. To obtain a copy of the handbook or other environmental education materials, please call the TNRC at (512)239-0010.

## NATIONAL SCIENCE EDUCATION STANDARDS

The vision for excellence in science education is clarified in the landmark **National Science Education Standards** (ISBN 0-309-05326-9, \$19.95) has been released by the National Academy Press. To order your copy by phone using VISA/MASTERCARD/AMERICAN EXPRESS, call toll-free 1-800-624-6242 or call 202/334-3313 in the Washington metropolitan area. Orders may be faxed to 202/334-2451. You may also order through your favorite bookstore or electronically via the Internet at <http://www.nas.edu>.

## TRIANGLE COALITION NETWORK NEWS Publications and Resources

• *Connect*, a newsletter published six times a year by Teachers' Laboratory, Inc., that provides hands-on learning, problem solving, and multidisciplinary approaches. Cost is \$18 annually. Contact: Teachers Laboratory, Inc., PO Box 6480, Brattleboro, VT 05302; 802-254-3457; fax: 802-254-5233.

• *Integrating Education, Health, and Social Services in Rural Communities: Service Integration Through the Rural Prism*, by Robert Bhaerman, discusses: main obstacles to service integration; how to make services more accessible and flexible; questions schools should consider; and lessons learned from other states. Cost is \$23.99 for the 137-page report (Cite order #RS-595-RD). Contact: Research for Better Schools, 444 N Third St., Philadelphia, PA 19123-4107.

## STATE ACADEMIES OF SCIENCE ABSTRACTS ON CD-ROM

The State Academies of Science of the nation have interfaced in the development of an abstract service on CD-ROM. This database communicates their research to the secondary and higher education science communities.

The State Academies of Science represent the largest group of scientific researchers in the nation. In most states, these organizations sponsor the Junior Academies of Science and State Science Fairs. Members of the academies are employed in education, government and industry, and are specialists in their particular fields of science. Their research is highly diverse, with topics ranging from primarily regional interest to those of international concern.

1996 State Academies of Science Abstracts on CD-ROM (1985- 95 abstracts) is unique in that it is the most important source of scientific studies encompassing all regions of the Continental United States. The student who is interested in researching regional problems will find this database to be an invaluable resource. In addition, it serves to introduce the student to individual researchers and science programs within his/her region. Most abstracts included on this CD-ROM are not indexed in other databases. The cost is \$249.00 plus \$10.00 shipping and handling. It can be networked within the school at no additional charge.

**For more information see the web page:**

<http://members.gnn.com/weeks1/science.HTM>

**or e-mail: [AcadInfo@AOL.COM](mailto:AcadInfo@AOL.COM)**

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## CLASSROOM NEWS

News and ideas published in the Spring 1995 issue of the *Journal of Natural Resources and Life Sciences Education*. These news items are selected especially for teachers of grades K-12. For more information, contact Susan Ernst, the American Society of Agronomy, 677 S. Segoe Road, Madison, WI 53711; phone (608) 273-8080 or fax (608) 273-2021.

### New Teaching Kit: The Fiber System

Ask kids where their T-shirt came from, and they're likely to answer, "The mall." Even those who know that their shirt is made from cotton are unlikely to know how this agricultural product moved from the farmer's field to their dresser drawer. A new set of materials, "It's a Puzzlement," developed by the National Farm-City Council, is an interdisciplinary unit designed for teachers in grades K-6 who use a thematic approach to teaching. The materials show how the products from cotton, sheep, and cattle are manufactured into the products students use every day. They include sample lessons that incorporate teaching about the fiber system into social studies, language arts, math, science, and fine arts. For a science activity, students make natural dyes from onions, blueberries, and marigolds. They experiment to see how different fabrics absorb color. The kit also includes suggestions for follow-up activities and a bibliography of children's books for those who want to explore the topic in more depth. "It's a Puzzlement," with its emphasis on the important links between rural and urban areas, is ideal for use during Farm-City Week, Ag Week, and other agriculture-related celebrations. Kits are \$5.00, which includes postage. Write the National Farm-City Council, 225 Touhy Avenue, Park ridge, IL 60068.

### Teach Science via Radio

Following last year's successful debut as a pilot program, the AAAS children's radio adventure—the *Kinetic City Super Crew*—flourished when the first of more than 90 new episodes reached the airwaves last fall, thanks to a recent \$3 million grant from the National Science Foundation.

The program, which emulates radio dramas of the past to teach children about science and technology, aims to capture the imagination of third, fourth, and fifth grade students through the intrigue of mystery and the mastery of problem-solving. The new episodes strive to repeat the success of the four pilot shows. Instructions for simple, at-home experiments are featured, providing listeners with a hands-on activity to reinforce learning. A toll-free number encourages the children to call and discuss the results of their experiment. Selected calls will be incorporated into the future episodes of *Kinetic City Super Crew*.

The program is being offered to radio stations that target children and young adults as their primary audience, and stations with a significant element of children's programming. For more information, call Ellen Cooper at (202) 326-6431.

### Fun With the Plant Nutrition Team

Primary grade children ask lots of questions: How do plants grow? What's in dirt? What happens to plants if they do not have water or sunlight? A new activity book helps teachers answer some of those questions. Developed by the Potash & Phosphate Institute (PPI) and the Foundation for Agronomic Research (FAR) for students in kindergarten through third grade, the teaching kit presents information about the importance of plant nutrients and basic concepts of food and fiber production.

"Fun With the Plant Nutrient Team" is a 24-page booklet introducing young children to nitrogen, phosphorus, and potassium, the major plant nutrients. They appear as cartoon characters in a variety of activities designed especially for primary grades: dot-to-dot, word puzzles, coloring activities, mazes, matching pictures, and experiments. The activities also present basic scientific principles, including soil conservation and the importance of modern science to today's farmers. The teacher's guide helps teachers incorporate the activity book into a variety of hands-on lessons. The guide also includes scientific data that helps teachers understand the background of the information presented in the activity book. Copies of the student activity book are \$1.00 each, plus shipping and handling. For more information, contact PPI, Circulation Manager, 655 Engineering Drive, Suite 110, Norcross, GA 30092-2821; phone (404) 447-0335.



### Raindrops Keep Falling on Our Heads

Did you know that the raindrops falling on our heads today could be the same water that splattered the noggins of dinosaurs millions of years ago? Once you and your kids understand that the water we use is the same water that has been in use since the beginning of time, you'll treat it differently.

A clean water packet for you and your family is available free of charge from the Soil Conservation Service, an agency of the USDA and from the Soil and Water Conservation Society, an independent, nonprofit, international organization. The packet explains the water cycle through two beautiful, colored posters, a cartoon booklet for kids, and descriptions of activities to do with kids. To order the packet, call (800) THE-SOIL (800/843-7645).



## Mum's the Word

Because elementary school children are growing so rapidly themselves, they are often fascinated to watch other growing things. Many teachers have found that plants make excellent teaching tools. A new teaching package for elementary schools, The Magnificent Mum Education Program, was designed to promote plant-oriented, hands-on, theme-based science teaching. Kits are available for grades K-1, 2-3, and 4-5. All encourage thematic teaching, and all help teachers incorporate lessons with a mum theme into science, math, reading, social studies, language arts, art environmental studies, and fitness.

The Teacher's Guide includes suggestions for hands-on experiments, plant growing projects, spring and fall mum festivals, and beautification activities for the school and the community. The accompanying kit includes a garden mum poster, a history of chrysanthemums, 60 stickers featuring cartoon characters known as the Mum Kids, a resource list of books and magazines, and 50 push-on tags containing growing tips and a photo. Also included is ordering information for a free Classroom Chrysanthemum Cutting Kit providing enough plant cuttings to grow 50 plants.

The program was written by garden education experts, but has been reviewed and approved by classroom teachers across the country. Copies of the book are \$9.95, plus \$1.50 shipping and handling. Contact Customer Service, Yoder Brothers Inc., P.O. Box 230, Barberton, OH 44203; phone (800) 321-9573.

## Our Natural World" Education Materials

The following educational packages are available through the Florida 4-H Program. All materials are provided at cost of development or construction.

**Recycling Adventures.** An educational waste management project. Emphasis on recycling, reusing, reducing, and refusing and related environmental impacts.

**Water Wise Guys.** A water education project for youth ages 9 to 11. Addresses the importance of water, the water cycle, water usages, and conservation.

**Earth Connections.** A curriculum emphasizing the inter-relations between earth (soil), air, and water, and the impact humans have on our environment. It is designed for 5 to 8 and 9 to 11 year olds.

**Energy Encounters.** An educational project designed to teach youth ages 9 to 11 about the environmental and economic issues associated with energy and develops understanding and attitudes about energy origins and uses, as well as conservation and its effect on the environment.

**Soil, Water, and Land Use.** A curriculum aimed at educating 15 to 18 year olds about soil properties and their effects on pesticide behavior and movement; so that individuals will be able to make responsible and informed decisions about issue and their impact on the environment.

Each project listed has a leader notebook containing complete easy to read outlines for each lesson, and each lesson provides a variety of activities that can be conducted depending on the time frame devoted to the project. The activities are experiential and are a mix of games, experiments, role-plays or demonstrations that help teach concepts of each lesson. In addition, there are supplemental pieces for selected packages. For more information, contact Craig Miller, Florida 4-H Foundation, P.O. Box 110520, University of Florida, Gainesville, FL 32611; phone (904) 392-1744.



## Teaching Tools to Get Free

Here is a list of five freebies to send for on topics including rocks, forest fires, earth science, creativity, and space.

**If your children (or you) are interested in collecting rocks,** send for *Collecting Rocks*, a U.S. Geological Survey publication that describes rock types and provides suggestions for starting a collection. Send your request to: USGS, Map distribution, Box 25286 Denver, CO 80225.

**Do you know an outer-space nut?** The *Solar System Puzzle Kit* includes patterns and supplemental materials that will help you and your child build a miniature solar system. The *Astronaut Fact Book* provides biographical sketches of current and former astronauts. For either of these, contact: National Aeronautics and Space Administration Educational Publications, Code FEO-2, Washington, DC 20546; phone (202) 453-1287. (They also offer posters and pictures of planets, space missions, and more.)

**Smokey Bear can help teach your child's class about forest fires.** The Forest Service has a variety of materials available to children, including posters, bookmarks, rulers, and me. To find the coordinator in your area contact: Smokey Bear Headquarters, USDA, Auditors Building, 201 Fourteenth St. SW at Independence Ave., Washington, DC 20250.

**If a teacher makes a request** on school letterhead (and specifies grade level) the Earth Science Information Center will send a map-reading and geography information package. Contact: Earth Science Information Center, U.S. Geological Survey, 507 GH National Center, Reston, VA 22092.

**Can creativity be taught? Project XL is a school outreach program** designed to do just that, by encouraging inventive thinking. Teachers can request an educator's resource guide, video, and special curriculum by writing to: Office of Public Affairs, Patent and Trademark Office, U.S. Department of Commerce, Washington DC 20231.

For multiple copies of "Classroom News," contact the ASA Headquarters Office for reprint prices: ASA, 677 S. Segoe Road, Madison, WI 53711; phone (608) 273-8080 or fax (608) 273-2021.

# YES, I WOULD LIKE TO CONTRIBUTE TO THE ISTA SPECTRUM

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

Name: \_\_\_\_\_

School or (name) \_\_\_\_\_

Business: (address) \_\_\_\_\_

(city, state, ZIP) \_\_\_\_\_

(telephone) (\_\_\_\_) \_\_\_\_\_

Home: (address) \_\_\_\_\_

(city, state, ZIP) \_\_\_\_\_

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Title of Contribution: \_\_\_\_\_

I would like my article to appear in:

\_\_\_ARTICLES

\_\_\_IN FOCUS

\_\_\_SPECIAL INTERESTS

\_\_\_MINI IDEAS

\_\_\_REVIEWS

\_\_\_POTPOURRI

\_\_\_OPPORTUNITIES

\_\_\_MEETINGS

\_\_\_AWARDS/RECOGNITION

\_\_\_FIELDTRIPS/WORKSHOPS

\_\_\_EDUCATIONAL MATERIALS

Please print my contribution in the following issue(s):

\_\_\_Fall (due June 1)

\_\_\_Winter (due September 1)

\_\_\_Spring (due December 1)

\_\_\_Summer (due March 1)

**Submissions and inquiries regarding the journal should be sent to:**

Diana Dummitt, Associate Editor

**ISTA SPECTRUM**

University of Illinois

College of Education

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(217) 244-0173

e-mail: [ddummitt@ux1.cso.uiuc.edu](mailto:ddummitt@ux1.cso.uiuc.edu)

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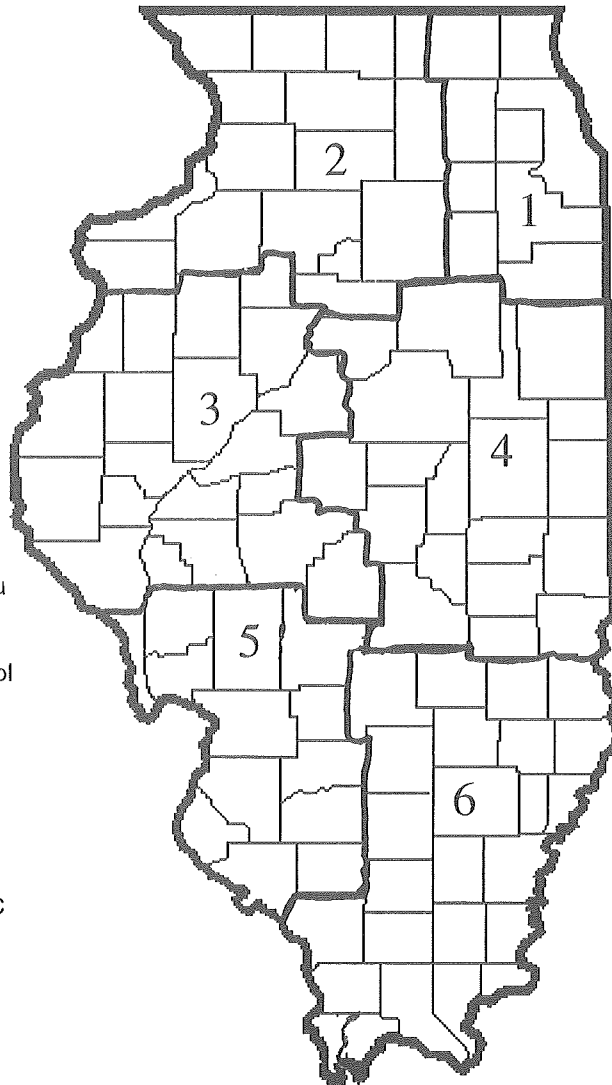
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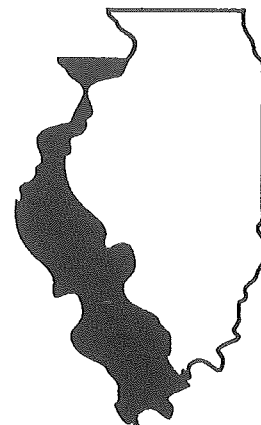
Suzanne Asaturian  
Carbondale Comm. H.S.  
200 N. Springer Street  
Carbondale, IL 62901  
(618) 457-3371  
FAX (618)549-1686

### Listing of Counties Comprising Each ISTA Region

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

# ILLINOIS SCIENCE TEACHERS ASSOCIATION

## MEMBERSHIP APPLICATION



NAME \_\_\_\_\_  
LAST FIRST

DATE \_\_\_\_\_ REGION (SEE MAP) \_\_\_\_\_

HOME ADDRESS \_\_\_\_\_  
STREET APT. NO.

\_\_\_\_\_  
CITY STATE ZIPCODE PHONE FAX/EMAIL

EMPLOYER ADDRESS \_\_\_\_\_  
STREET

\_\_\_\_\_  
CITY STATE ZIPCODE

(HOME ADDRESS WILL BE USED UNLESS OTHERWISE SPECIFIED)

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