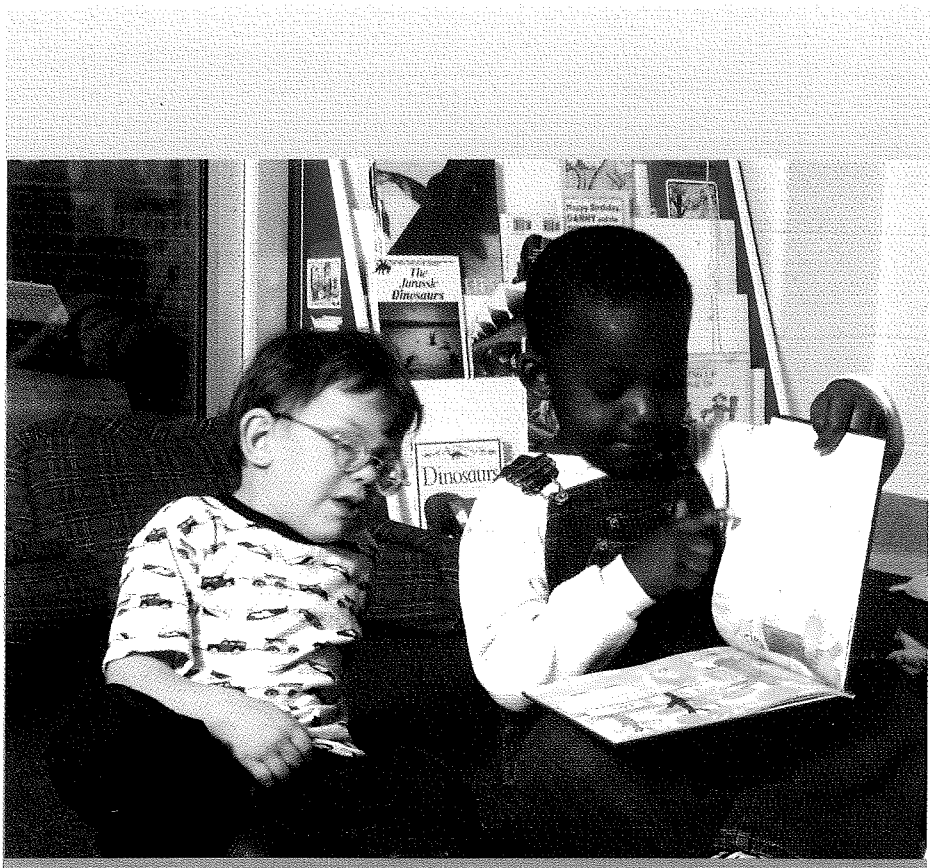
Winter 2004, vol. 30, no. 3 The Journal of the Illinois Science Teachers Association

ista SPECTRUM



SPECTRUM

THE JOURNAL OF THE
ILLINOIS SCIENCE TEACHERS ASSOCIATION
Volume 30, Number 3

SPECTRUM is published three times per year, in Spring, Fall and Winter by the Illinois Science Teachers Association, University of Illinois, 51 Gerty Drive, Champaign, IL 61820. Subscription rates are listed on the inside back cover.

Send submissions (Except articles, see below), subscriptions, and inquiries regarding the journal to:

Judith Scheppler, Ph.D.
Coordinator of Student Inquiry
Illinois Mathematics and
Science Academy
1500 West Sullivan Road
Aurora, IL 60506
quella@imsa.edu

The Illinois Science Teachers Association recognizes and strongly promotes the importance of safety in the classroom. However, the ultimate responsibility to follow established safety procedures and guidelines rests with the individual teacher.

The views expressed by authors are not necessarily those of ISTA, the ISTA Board, or the *Spectrum.*

COVER ART: Photograph compliments of the Early Childhood and Parenting Collaborative (ECAP), University of Illinois

SPECTRUM IS PRINTED ON RECYCLED/RECYCLABLE PAPER

SCIENTRUM

The Journal of the Illinois Science Teachers Association

Winter 2004 Volume 30, Number 3

Articles

Teacher-Scientist Partnership for Innovation in High School Environmental Science / 11
Donald J. Wink, Shakura Haqque, and Daniel Zavitz

Boys & Girls Club of Bethalto holds *Lights On Afterschool!* Event / 15
Amy Stephan

Great Balls of Fire / 17
R. James Vavrek, Ronald L. Holle, Dr. Mary Ann Cooper, and Jim Allsopp

Student Perceptions of YOU and YOUR Science Classroom Environment / 21
Dr. Richard A. NeSmith

Promote Children's Science Learning with Informational Books / 26
Jean Mendoza

Departments

ISTA NEWS

President's Corner / 2
Marylin Lisowski

Meet Your ISTA *ACTION!* Editor / 3

ISTA News

President's Corner

Marylin Lisowski
Eastern Illinois University

Dearest friends and exceptional educators,

"It was the best of times, it was the worst of times..." Many feel that these words of Charles Dickens have legitimacy in terms of the global events of these past several months. What do you think? If we focus our thoughts on what is happening in our arena as science educators, maybe we can be a little more hopeful of things to come.

The good news is that we can look forward to and anticipate a very promising event in the near future. Wait no longer for a bright beacon is on the horizon for us in Illinois. A wonderful, high potential experience is scheduled right in our state and ISTA is thoroughly committed and involved with it. What is the phenomenal event? On 10-12 November 2005, the National Science Teachers Association (NSTA) Regional Convention will be held in Chicago at the Navy Pier! We selected the theme of "World-Class Science" for we know that we have "world-class" science teachers in our organization and state as well as notable scientists who will want to be a part of this offering to the nation.

To provide a series of solid professional development experiences for the attendees, there are four major strands which support the theme of World-Class Science and they are: Connecting Classrooms through World Class Technology; World Class Scientific Research; The World as a Classroom; and World Class Theory to Practice. We anticipate that many respected and accomplished speakers will be participating and a wide spectrum of thought provoking, idea rich and practically based sessions will be offered.

Be sure to save these dates with your administrator. Registration forms and information will be appearing on the NSTA website later this spring. The site is: http://www.nsta.org/conventions

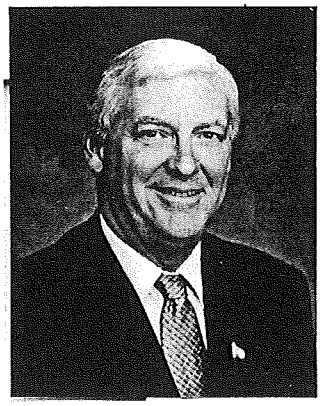
Also if you would like to volunteer to help during the conference please let Diana Dummitt, our capable Conference Chairperson know of your willingness to assist at the convention. We will be sending updates through our listserv and additional information will be posted on our website. It will be a fantastic opportunity to learn, share and network.

Even though we face challenges as educators as well as global citizens, there are those elements that can help fortify and refresh us as we carry on the important mission of education. We hope that being a part of ISTA and by participating in the upcoming NSTA Regional Conference hosted by ISTA will add to the vibrancy and professionalism that you already radiate. In the interim, enjoy the wonders of the upcoming spring season and thank you for your dedication to science education.

With best wishes and great hopes,

Marylin Lisowski

MEET YOUR New ISTA ACTION *Editor*



Gary Miller

Williamsville High School

Gary Miller teaches Physical Science, Astronomy, and Meteorology at Williamsville High School, just north of Springfield. He earned his Bachelor of Science in Education at Eastern Illinois University, and Master of Arts in Astronomy Education at the University of Illinois at Springfield. Gary coordinates teacher training for Starlab and is a member of the Sangamon County ROE Advisory Committee. After a twenty year stint as a member of the Bullets Football coaching staff, he now serves the Illinois Education Association as Vice Chair of Region 47, and recently chaired the IEA Scholarship Committee. An NSTA Building a Presence for Science Key Leader for several years in Central Illinois, Gary resides in Sherman with his wife Sharon, a first grade teacher. They have two daughters, Alison (who recently completed her student teaching at Hindsdale Central High School in mathematics) and Melissa (who works in commu! nications in St. Louis). With his proximity to the state capitol, he plans on keeping tabs for ISTA members on the General Assembly as they work through issues of importance to teachers. He can be reached at milleg_us@yahoo.com

Dear friends,

It is with mixed feelings that I write this message to you. As many of you know, I have accepted a position at the University of Illinois at Urbana-Champaign College of Medicine. My title is Associate Director of Development. I am excited about this new opportunity but at the same time will miss working for and with the Illinois Science Teachers Association.

Most of all I will miss all of you, the members, who tirelessly strive to make a difference in your students' lives. Some beleive that your most important role is to deliver the science content for those ever-more important test scores. But in my opinion your greatest contribution cannot be measured by standardized tests, nor is its power usually realized until many years later.

Your consistent compassion, encouragement, and challenge provide the positive force that changes the future for many students. Thanks for all you do! I hope to see you all the NSTA Regional in November - in the meantime - my very best to each of you!

Diana

Presidential Awards for Excellence in Mathematics and Science Teaching

Rewarding & Inspiring Great Teaching

National Science Foundation

"Be Recognized at the National Level"

Are you a Junior High or High School Teacher? Have you applied for the 2005 PAEMST?

Deadline for Receipt of Applications: May 2, 2005

The Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST) Program was established in 1983 by The White House and is sponsored by the National Science Foundation (NSF). The program identifies outstanding mathematics and science teachers, kindergarten through 12th grade, in each state and the four U.S. jurisdictions. These teachers will serve as models for their colleagues and will be leaders in the improvement of science and mathematics education. Beginning in 2003, the competition will alternate each year between teachers of grades 7-12 and teachers of grades K-6. In 2005, teachers of grades 7-12 mathematics and science in each state and the four U.S. jurisdictions will be eligible to apply. The nomination form for 2005 can now be downloaded by going to: www./nsf.gov/pa

The 2005 PAEMST Awardees will be announced at the beginning of March 2006. Each Presidential Awardee will receive a $10,000 award from the National Science Foundation. Each Awardee will also be invited to attend, along with a guest, recognition events in Washington, D.C. during the third week of March 2006. These events will include an award ceremony, a Presidential Citation, meetings with leaders in government and education, and sessions to share ideas and teaching experiences.

For Illinois information:

Science:	**Diana Dummitt**	**ddummitt@uiuc.edu**
Mathematics:	**Claren Einfeldt**	**einfeldt@uiuc.edu**

To download nominations and applications: www.paemst.org/

OHAUS

When it came to testing balance durability, Gustav left no rock unturned.

Scout®*Pro*. Built for durability, the Ohaus Scout®*Pro* is just what Gustav had in mind decades ago. Perfect for the classroom environment, this rugged balance boasts a sophisticated internal load cell design so durable, you can stand on it! Plus, Scout®*Pro* offers optional RS232 and USB computer interfacing. And with its simple 2-button operation, your students can start weighing with almost no instruction. All this at an incredible value puts the Scout®*Pro* at the top of its class.

THE OBSESSION CONTINUES...

800-672-7722 www.ohaus.com

Go to Dallas!

NSTA National Convention

March 31 - April 3, 2005

Building a Presence for Science
EVENTS SCHEDULE

THURSDAY, MARCH 31

3:00-6:00 PM — Building a Presence for Science State Coordinator Meeting
Reunion Ballroom H, Hyatt Regency Dallas Hotel
(By Invitation Only)

6:00-8:00 PM — Building a Presence State Coordinator Reception-Phase I & II
Reunion Ballroom H, Hyatt Regency Dallas Hotel
(By Invitation Only)

FRIDAY, APRIL 1

8:00-10:00 AM — Building a Presence for Science Key Leader/Point of Contact Breakfast – Sponsored by Texas Instruments
Pullman A, Union Station Section, Hyatt Regency
(By Invitation Only)

2:00-3:00 PM — NSTA's Professional Learning Community: Building a Presence for Science in Your State
Cumberland I Room, Hyatt Regency

SATURDAY, APRIL 2

Building a Presence for Science Cyber Café -- Drop in at NSTA's Cyber Café to learn how to use the Building a Presence Online System. Staff will be on hand to walk you through the many features and to answer questions. See final program for details.

5:00 – 7:00 PM — Building a Presence for Science – Texas Style Social
Reunion Ballroom H, Hyatt Regency
(By Invitation Only)

SHORT COURSE MENU

FRIDAY, APRIL 1

8:00AM – 3:00PM — Science Safety in K-12 Classroom & Laboratories – Short Course
City View 2, Adams Mark Hotel
Instructor: Jim Collins of the Charles A. Dana Center
($43 advance / $48 on site)

Go to Dallas!

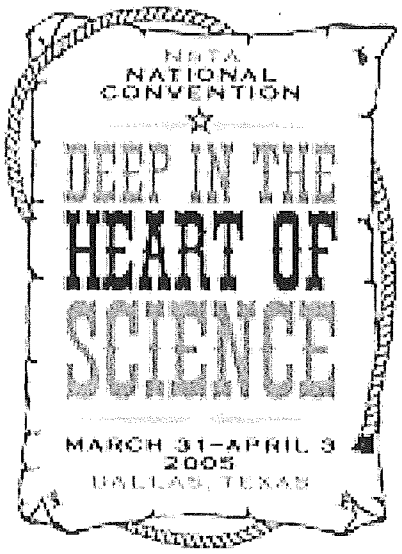
NSTA National Convention

March 31 - April 3, 2005

As a Member you are cordially invited to attend a reception for the

Illinois Science Teachers Association

Thursday, March 31, 2005
4:00-6:00 PM
Majestic 8 Room, Adam's Mark Hotel Dallas



This is a "members only" event so check the label on the back of this journal—if it says 2005, that means your dues expired in January 2005. Send in the membership form on the inside back cover and your check today so that you will be included in this great networking opportunity to celebrate Dallas with your Illinois colleagues.

2005 NSTA Regional Convention

"Chicago:World Class Science"

Navy Pier, November 10-12, 2005

The National Science Teachers Association Regional Convention is scheduled for Chicago! Don't miss this great opportunity to attend the Convention, which has not been held in the city since 1982. Many special offerings and programs are planned and several events will be scheduled for ISTA members as well as a discount in registration fees. Diana Dummitt is Convention Chair and Edee Norman Wiziecki is Program Chair. The strands and their leaders for this year's convention are:

- World Class Scientific Research — Raymond Dagenais
- Connecting Classrooms to the World through Technology — Nancy Komlanc
- World Class Theory into Practice — Douglas Dirks
- World As a Classroom — Marilyn Lisowski

Check the ISTA website at: www.ista-il.org for the latest information on this year's "World Class Event."

Your Career! Be an NBPTS Assessor!

The National Board for Professional Teaching Standards® (NBPTS) is a nonpartisan, nonprofit organization created in 1987. NBPTS offers a voluntary, national assessment program for preK-12 classroom teachers and school counselors.

Choose summer employment that provides a unique professional development opportunity that offers in-depth interaction with other experienced teachers and exposure to more examples of teaching than most educators will typically see during their entire careers.

Incentives

- Graduate credit opportunities from several institutions
- $125/day honorarium paid while at the scoring site
- A fee waiver applicable for future candidacy after serving at least 2 years as a member of the scoring staff
- Excellent professional development opportunity

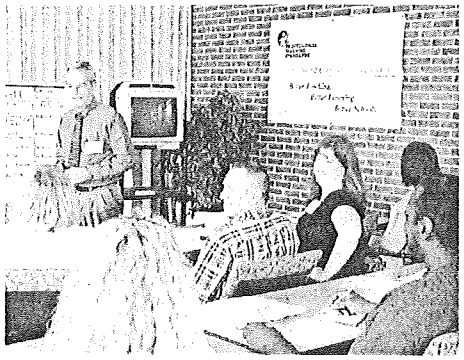
Eligibility Requirements

- Baccalaureate degree
- Valid teaching license/certificate if required by the state
- Three years of teaching experience in a preK through 12 setting
- Currently be teaching at least half-time in the certificate area you are applying to assess, or be a National Board Certified Teacher® in the certificate area
- Not be a current or nonachieving candidate for National Board Certification®
- Successful completion of NBPTS assessor training

Scoring Sessions

- Scoring sessions last 2 to 3 weeks
- Includes training
- Sessions held on weekdays from 8:30AM to 5:00PM
- Lunch and snacks are provided each day of scoring

"Being a National Board assessor is the most rewarding professional development I have ever participated in."



Contact NBPTS

- Call 1-800-22TEACH℠ to find out more about this exciting opportunity or visit our Web site at www.nbpts.org.

The National Board for Professional Teaching Standards is a private, nonprofit organization governed by a board of directors comprised of education, corporate and government leaders, the majority of whom are classroom teachers.

46031-50620 TEACHERS

National Board for PROFESSIONAL TEACHING STANDARDS

IPRB

Illinois Petroleum Resources Board

Illinois Petroleum Resources Board

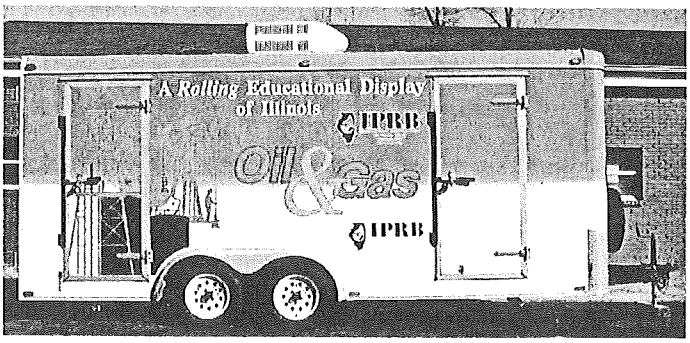
Restoring the Land - Increasing Awareness

The IPRB is governed by an unpaid, 12-member board made up of independent oil and natural gas producers and royalty-owner representatives.

The IPRB was formed to clean up abandoned well sites and provide public awareness and education programs throughout the state. Funding for IPRB programs comes from voluntary contributions of oil and natural gas producers and royalty owners in Illinois.

Our educational goals demonstrate and inform the public of the importance of Illinois oil and natural gas and are funded by the Illinois oil and gas industry. The FREE educational programs are designed to increase awareness about the science and business aspects of the Illinois oil and gas industry. Over 6,000 products are made from petroleum: medicines, cosmetics, plastics, and gasoline are just a few of the products that we use everyday!

For more information on the IPRB and how we can visit your classrooms, conferences, or special events, please contact the Illinois Petroleum Resources Board at 1-618-242-2861 or via e-mail that is accessible through our website at ***www.iprb.org*** *and arrange for us to visit!*



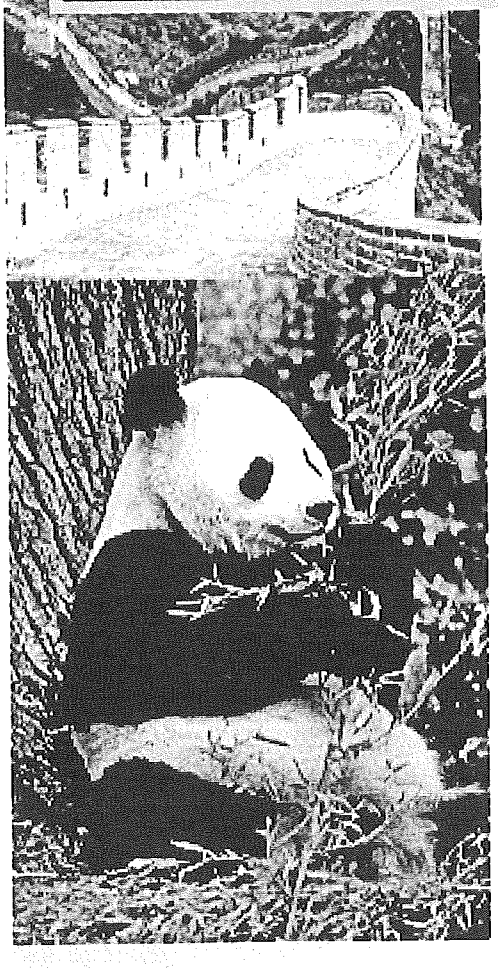
Charles Williams, Executive Director
Laurie Taylor, Executive Assistant
Phone: 618-242-2861 Fax: 618-242-3418
Website: www.iprb.org

IPRB
P. O. Box 941
Mt. Vernon, IL 62864

Eastern Illinois University presents:

Exploring the Ecology of China

June 2 – 18, 2005



Often considered a cultural Mecca, China is rising in the ranks as a popular natural history destination. Well-established projects devoted to conservation of local fauna, coupled with incredible geographical features and places of true historical significance, make China a destination not to be missed! Join Dr. Marylin Lisowski, President of Illinois Science Teacher's Association, and Dr. Bob Williams, The River's Project, as we explore the ecological wonders and the rich cultural heritage on this 17-day exploration of China.

Program Highlights

Cheng Du
Visit the well-known panda breeding and research station
See golden monkeys, musk deer and snow leopard
Enjoy verdant bamboo and over 3000 varieties of plant life

Xi'an
Visit Huaqing Hot Springs
See the remains of a neolithic village and Ban Po Museum
Visit the Entombed Terracotta Warriors of Qin Shi Huang

Beijing
Learn about China's goals for environmental protection
Visit the Great Wall, Ming Tombs and Forbidden City
Walk along Silk Alley and haggle with local vendors

Birding, botany, a visit to the Beihai wetland and the waterfalls of the Dieshui river, opportunities to see elusive wild elephants in Xishuangbanna, open air markets of the Yunnan tribal peoples, and more!

For More Information Contact

Dr. Marylin Lisowski
Professor of Science and Environmental Education, Eastern Illinois University
President, Illinois Science Teachers Association
217- 581-7830
cfmfl@eiu.edu
http://www.ux1.eiu.edu/~cfmfl/

Sandy Doss
Vice President of Academic Programming
Holbrook Global Field Expeditions
800-396-0763 (direct)
888-890-0632 (corporate)
sdoss@holbrooktravel.com

HOLBROOK

www.holbrooktravel.com/educationexpeditions 888 - 890 - 0632

Articles

Teacher-Scientist Partnership for Innovation in High-School Environmental Science

Donald J. Wink[1], Shakura Haqque[2], and Daniel Zavitz[3]

Introduction

In this article we discuss how university scientists (graduate student Dan Zavitz supported by faculty member Donald Wink) and a Chicago Public School teacher (Shakura Haqque) were, through a strong partnership, able to introduce a wide-ranging change in the teaching of environmental science in a high school classroom.

This partnership stems from a concept developed in 1999 by the National Science Foundation (NSF), the "Graduate Fellows in K-12 Education (GK-12)" program. This program aimed at bridging one of the great gaps in American education: between K-12 schools on the one hand and research universities on the other. The program gives talented science, technology, engineering, and mathematics (STEM) graduate students fellowships to support their work in K-12 schools. The graduate students (called Fellows) are not in teacher preparation programs, although some do become teachers. Instead, their expertise in cutting-edge research is used to enhance teaching and learning in K-12 classrooms. And at the same time, the graduate students learn about schools, classrooms, teaching, learning, and how to be involved in K-12 education.

One such program began in 2000 at the University of Illinois of Chicago. During the last five years, we learned how our program requires strong connections of Fellows and particular teachers. Otherwise, loose connections lead to diffuse impacts and a lack of understanding. We also learned how the Fellows' presence in classrooms could best support teachers in a way that continues after that year of work together.

A partnership for classroom innovation

One of the initial projects, which we maintain to this day, grew from the partnership of UIC with Crane High School on Chicago's West Side. Shakura started teaching in CPS and Crane in 2000. For two years she worked with Dan, who entered the PhD. program in chemistry in 2001 following a career that included teaching high school chemistry and environmental science in New Jersey, New York, and Ontario. Although Dan's thesis research is in surface science, his GK-12 work has tapped his environmental science background. This made a partnership with Shakura's environmental science classrooms a natural connection.

During the course of their first year working together Dan helped Shakura bring ideas, such as solar water heaters, to her classroom. As their partnership grew they developed a much larger idea: having students create sealed ecosystems that they could study over time.

[1] Department of Chemistry, University of Illinois at Chicago
[2] Chicago Public Schools
[3]Department of Chemistry, University of Illinois at Chicago

The concept of an ecosystem is, of course, one that is fundamental to environmental science. Dan and Shakura agreed that students needed to have experiences relevant to their own lives. They decided to draw on materials that students selected from their own neighborhood. This, they hoped, would allow students feel ownership of the projects they would design. In the method that Dan and Shakura developed, students take a 500-milliliter flask that has been pre-constructed with a narrow neck. The students create either an aquatic or a terrestrial ecosystem, using their understanding of the roles that different organisms can play as producers, consumers, and decomposers. The flasks are flame-sealed in the classroom, and then the students monitor how the ecosystems change over time.

Organisms live and die according to the resources available in the system. Yet, even after months with no material exchange with the outside world, the ecosystems are generally quite vibrant. Many have a rich amount of green plants and related photosynthesizers to capture light energy to sustain the system. It is also possible to observe small animals that have become the consumers of the plants.

A system for multiple teaching and learning innovations

The ecosystems do more than just illustrate the interaction of different abiotic and biotic components over time. Shakura found that she is able to use them repeatedly to point out actual examples of particular principles that run through the curriculum. For example, vapor condensing on the upper walls of the flask under the influence of sunlight demonstrates the water cycle. Moving the flasks to different places in the classroom and changing their exposure to light causes changes that highlight the role of external solar energy on the entire system. And, eventually, most ecosystems stabilize with living components present, representing the attainment of a climax community within the time frame of a few months (Figure 1).

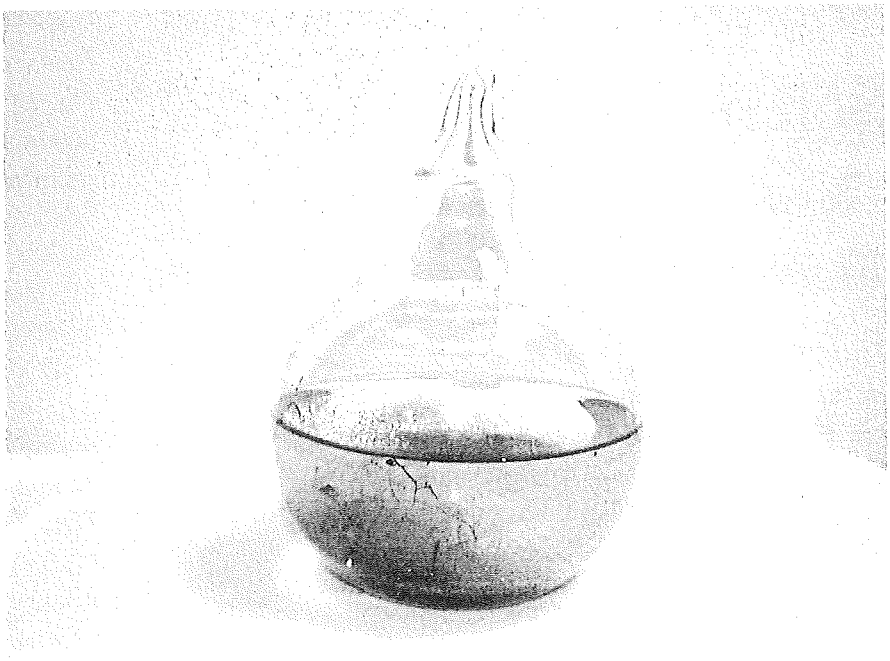


FIGURE 1: A student-designed sealed ecosystem, showing abundant life after many weeks with no interchange with the outside world

Multiple participants in a successful partnership

Different individuals, we have found, play complimentary roles in making a partnership succeed as these ecosystems have. The teacher is central. Shakura was the one who made sure that the project fit within the curriculum, and she helped students develop the necessary background so they can take advantage of this learning opportunity. She also organized the collection of material from the field and guided students every step of the way. Finally, she developed aspects of the project, including final reports and presentations, to be used as assessment methods of student learning.Dan, as NSF envisioned about the role of the Fellows, supported Shakura and her students. He did much of the conceptualization and design of the project, including obtaining some of the necessary glassware and the cooperation of a glassblower.

Also, as the project evolved during the second year, he developed a plan to let Shakura and her students carry out the sealing of the flasks using resources they could obtain themselves, an important step in moving towards sustainability. Finally, Dan's own background in environmental science was critical in moving the project beyond the "bottle biology" projects that are in the literature.

Of course, a third group was needed to make the partnership meaningful: the students. This is not a demonstration project: it is a project that the students themselves build. Each ecosystem is designed, equipped, and studied by one or two students. They have the sole responsibility for doing the research about what to put into their ecosystem. They must also see that the materials are obtained. Once the systems are up and running, the students are the sole monitors of what is going on. They use their observations/data to compose their own final reports where they demonstrate what they have learned about ecosystems.

These three partners: teacher, Fellow, and students, formed a relationship that had to grow over time. Dan's participation in some classroom activities was essential to aligning the design of the project with Shakura's students' interests and abilities. This, in turn, required that Shakura led Dan into the discourse and life of the classroom. These interactions were necessary for the development of the partnership that allowed Shakura and Dan to consider, refine, and finally adopt the ecosystem project.

Multiple partners: multiple outcomes

The outcomes of this project relative to student engagement are sometimes profound, as students follow the development of a sealed (except for light) system over time. Students place a personal value on the success of their organisms, and their final reports are filled with dramatic first-person descriptions of what "we" did and about what happened with "our" ecosystems. Their learning of the material benefited by giving them something that went far beyond their previous experience of science. For many, this was the first science experiment they had done that included data collection over time, design of a procedure, and analysis of their own data and observations. And, as mentioned earlier, they often were able to link concepts throughout the curriculum to particular aspects of this project.

Because of their encounter with the Fellow, the students also changed their view of themselves in regards to science. Dan became a valued science resource, and having him present in their classroom on a regular basis gave students a sense of personal value and competence. In addition, he became a visible example of university scientists, which helped students develop a clearer picture of the University as a place where they know someone, not just as a collection of buildings "over there."

In addition, Dan has gained a fresh perspective about urban science teaching and learning. Furthermore, for many Fellows, teachers become those who support and encourage them in their own growth as scientists. When Fellows are able to discuss their own research with teachers and students they find that their understanding of the "big picture" of their research expands dramatically.

The work done by Shakura and Dan also influenced the rest of the school. Ecosystems were implemented throughout the biology and environmental science curriculum last year, including in Crane's middle school. Ultimately other teachers are affected and they are all able to point to a common experience—the ecosystems—from the perspectives of multiple sciences.

Finally, such GK-12 partnerships also affect the University as university staff and faculty develop a richer understanding of K-12 teaching and learning. As one example, the ecosystems that are used at Crane are all made by the UIC chemistry glassblower, Brian Schwandt. Brian, in turn, has now described his work at professional meetings, pointing out to his peers how they, too, can get involved in K-12 education. And university faculty, including Dan's advisor, have a better sense of how their research science can have broader impact in the community.

Yet another powerful example is the UIC-based research that Shakura was able to do during one of the summers of her involvement with the GK-12 program. To do this, we took advantage of the "Research Experience for Teachers" (RET) program at NSF (separate from GK-12). This program provides supplements to NSF-funded investigators so that teachers can work in their laboratories. Shakura received a list of eligible investigators and chose one, Neil Sturchio, in UIC's Department of Earth and Environmental Sciences. Neil obtained an RET supplement from NSF, supporting Shakura for summer research in his laboratory on a project to study uranium isotopes in underground water supplies. This study allowed the research-team members, including Shakura, to more accurately characterize the flow of subterranean water, itself part of the hydrology that is discussed in high school environmental science.

A long way to go: extending the vision in a barrier-free relationship

Although the GK-12 program is relatively new, it may be a way to build enduring connections between K-12 schools and universities. This will occur over time as these relationships become common experiences on campuses, ultimately letting K-12 teachers and University students and faculty interact without institutional barriers.

Boys & Girls Club of Bethalto holds Lights On Afterschool! Event

Amy Stephan, Program Director

On October 14, Boys & Girls Club of Bethalto, along with more than 6,000 communities, rallied for afterschool by participating in the fifth anniversary of *Lights On Afterschool!* This nationwide event calls attention to afterschool programs and the resources required to keep the lights on and the doors open.

Boys & Girls Club of Bethalto is proud to have been a National Supporting Organization for this year's *Lights On Afterschool!* celebration. Afterschool programs are key to kids' success. Yet too many children and families are missing out on afterschool opportunities. On October 14, at *Lights On Afterschool!* events around the country, Americans stood up for kids and called for afterschool for all.

A special addition was made to the *Lights On Afterschool!* event that was held at the Boys & Girls Club of Bethalto. PhysicsPLAY, a program facilitated by Southern Illinois University at Edwardsville (SIUE), was on hand from 4:30 to 8:30 p.m. at the Club. PhysicsPLAY (Portable Learning Activities for Youth) is designed to let children of all ages manipulate things and see how they work. All of the activities are hands-on (with judicious supervision!) and there are suggested things to try and questions to think about at each activity. Some simple explanations are given for each activity and SIUE staff is always available to encourage inquiry and answer questions.

PhysicsPLAY is an expansion of the Not-So-Haunted-Lab that SIUE has sponsored with the Children's Museum for the past couple of years. This expansion was possible due to the generosity of the Meridian Society. The Physics Department at SIUE supports PhysicsPLAY with faculty and student support, as well. Both faculty members and students run the activities and lend equipment for the experiments.

Lights On Afterschool! is a project of the Afterschool Alliance, a nonprofit organization dedicated to ensuring that all children have access to afterschool programs by 2010. The National Presenting Sponsor of *Lights On Afterschool!* is the C.S. Mott Foundation. Additional support is provided by the JCPenney Afterschool Fund, the Ewing Marion Kauffman Foundation and the Open Society Institute. Governor Arnold Schwarzenegger is serving as Chair of *Lights On Afterschool!*, a role he first embraced in 2001.

Boys & Girls Club of Bethalto
324 E. Central St.
Bethalto, IL 62010
(618) 377-6030 phone
(618) 377-6003 fax

To learn more about *Lights On Afterschool!*, visit www.afterschoolalliance.org.

Great Balls of Fire

R. James Vavrek[1], Ronald L. Holle[2], Dr. Mary Ann Cooper[3], and Jim Allsopp[3]

Kentucky, early 1980's: A quick and violent thunderstorm arose in Kentucky, causing the skies to darken. Several farmers were gathered at an informal cattle show in an open field surrounded by trees. One man was standing near a tree by the rear of a cow. Lightning appeared to hit a tree and observers reported an orange ball about the size of a soft ball came down the tree and hit the first man. Different observers report that the ball of light either came out of this man's mouth or chest, rolled onto the cows back and forward to her head where another man was holding the cow's halter. Both the men and cow had cardiac arrests. Resuscitation was unsuccessful with the first man. Although the second man who had been holding the cow's halter regained a pulse, he was pronounced dead two days later after he failed to have an adequate blood pressure or resume spontaneous breathing. Two other people survived but suffered confusion and short-term amnesia afterwards. One of the two survivors said they saw 'a ball of white fire on the first man's chest, reached over to slap it out but it was not hot.' The dead man's clothes showed a distinct circle of color about 6-8 inches (15-20 cm) in diameter on his under-shirt. Tiny pieces of skin were also found stuck to the inside of the under-shirt. The metal zipper and other articles of the man's clothing showed typical lightning arcing marks.

Introduction

Lightning has probably existed since early in the earth's formation. Throughout human history, it has influenced cultures, religions, and myths. The term "bolt" has occasionally been used in reference to describe lightning, but is an undefined term. The words flash, stroke, or channel, are better suited to its description.

In the United States there are about 120 million flashes of lightning annually with over 20 million cloud-to-ground (CG) lightning strikes. In contrast, ball lightning is in a category by itself because it does not look or act, like any other form of lightning. Instead, it appears as a mysterious mobile, glowing or sparkling, sphere. There have been numerous reports of ball lightning dating as far back as the Middle Ages. Sightings are often accompanied by sound, odor, and sometimes, permanent material damage. However, despite many theories, there is no satisfactory explanation for these ghostly glowing apparitions nor have they been reproduced under scientific laboratory conditions. Many controversies abound about this phenomenon, making it the most puzzling, unusual, and unpredictable form of lightning in existence.

In the United States there are about 120 million flashes of lightning annually with over 20 million cloud-to-ground (CG) lightning strikes.

1. Science Teacher, Henry F. Eggers, Hammond, Indiana.
2. Research Meteorologist, Oro Valley, Arizona
3. Associate Professor, Departments of Emergency Medicine and Bioengineering and Director, Lightning Injury Research Program, University of Illinois at Chicago
4. Warning Coordination Meteorologist, NOAA, National Weather Service, Romeoville, Illinois

This paper will provide information about this controversial phenomenon. It will describe ball lightning's known characteristics, sightings, occurrence, origin, appearance, life span, motion, decay, presents theories about its existence, and probable causes. It will also act as a resource for science teachers, students, and other interested individuals.

Occurrence

Although the majority of reports about ball lightning occur during thunderstorms, other electrical discharges have been implicated. Ball lightning typically occurs at or near a lightning strike point immediately after a cloud-to-ground (CG) lightning flash. It may hang in mid-air, rotate or fall from the base of clouds toward the ground. It may appear as a sphere and show motion. Seldom has ball lightning been described as rising.

Ball lightning has often been confused with St. Elmo's fire. The latter is a faint bluish or greenish glow (corona-like light) observed around objects protruding from the surface of the earth. It can appear around trees, power or communication lines, ship masts, on the leading edge of an aircraft's front cockpit windows, and on the leading edge of wings on an airplane.

There are accounts of ball lightning occurring within enclosed metal objects such as airplanes in flight and in submarines. One of the discriminating differences between ball lightning and St Elmo's fire is the mobility and duration of the event. St. Elmo's fire remains attached to the conductor and have a longer duration whereas ball lightning tends to travel, bounce around and often, end with an explosion or 'pop'.

1963: Ball lightning is reported to have entered an Eastern Airlines flight enroute from New York City to Washington, D.C., during an intense electrical thunderstorm. It traveled down and along the center aisle the entire length of the airplane, appeared blue-white, then disappearing silently at the rear of the plane. It did not radiate any sensation of heat, or noticeable hissing sound.

Origin

Ball lightning frequently has its origin next to, attached to, or protruding from objects that have been struck. These can be trees, poles, or metallic objects such as wire fences, telephone lines, or moving along those objects. There are eyewitness claims of ball lightning entering homes via the telephone or electrical outlets, passing through window screens, windows, and even down chimneys.

1918: In Black Top, Ohio, lightning struck a tree during a thunderstorm, and ball lightning was seen bouncing onto the ground and exploding soon after.

Appearance and Duration

Ball lightning typically assumes a spherical shape and lasts 10 seconds or less, but a small percentage of incidents lasts over one minute. The diameter ranges from one half inch (1.3 cm) to many feet/meters. The average size is 4 to 8 inches (10-20 cm), the size of an orange or grapefruit. It has also been seen as small as the size of a pea to as large as a bus. Descriptions indicate ball lightning maintains a constant brightness and size after formation. Not exceptionally bright, it can be clearly seen in daylight. The most common colors are red, orange, and yellow, but other colors occur.

1977: In Wales, England, a brilliant yellow-green transparent ball bounced down a hillside. It lasted for about 3 seconds and was the size of a bus.

There is speculation that ball lightning may happen more often than previously thought. A brilliant cloud-to-ground (CG) lightning flash may temporarily affect a person's vision consequently blinding the witness to the appearance of a short-lived ball lightning event. An estimated 5-10% of the population is said to have seen ball lightning and those who have seen it say they will never forget it.

Motion

Ball lightning is usually reported to move horizontally at a speed of a few yards or meters per second. Other descriptions state that it remains motionless in mid-air or descends from the base of clouds towards the ground. Rarely does ball lightning rise, so the idea that ball lightning is a sphere of hot rising air is dismissed. Many reports have included seeing rotation or spinning and sometimes bouncing on or along the ground.

Heat-Sound-Odor

Although there have been accounts of structures burned and wires melting, ball lightning is rarely reported to produce the sensation of heat to the human skin. There are also reports of a 'hissing' sound coming from ball lightning. A large number of reports indicate there is distinct foul, repugnant odor resembling burning sulfur or the smell of rotten eggs associated with its appearance.

1996: During a thunderstorm a large, red-hot ball of fire fell from the sky striking a house, cutting the telephone wire, burning the window frame, and then burying itself in a tub of water. The water boiled for several minutes, then cooled enough for searching but nothing was found.

Decay

Ball lightning can decay either loudly or silently. The majority of the time it decays rapidly by exploding and producing a loud noise. Silent decay can be either rapid or slow. Whichever mode occurs, it is often reported that a mist or residue remains for a short period of time. Occasionally, ball lightning has been seen to break into two or more smaller balls before decaying.

Theories

At present, no theory adequately explains ball lightning. It cannot be tested or reproduced under controlled laboratory conditions and does not follow the known laws of physics. Purported photographs of ball lightning are predominantly time-exposed snapshots lasting seconds and appearing as a meandering ribbon of light. This makes the photograph questionable at best because of the lack of clarity and detail. This meandering light could easily be confused with automobile headlight movement, other moving lights, or moving the camera.

Some of the finest minds in physics and related fields have attempted to explain it without success. No theory can completely explain the high degree of mobility, consistency of light output, or lack of rising motion. The majority of theories have regarded ball lightning as some kind of hot plasma gas of electrons or positively charged atomic or molecular ions in an electrical discharge. This is understandable because ball lightning has predominantly been associated with thunderstorms whose lightning ionizes the air, creating columns of plasma along their path. One scientist suggested it was a kind of microwave laser where a wave-like excitation of air keeps its shape like a tidal bore in a river. Another recent theory explains ball lightning as an aerosol-related phenomenon.

All theories presented to date fall into two categories: those in which the energy source comes from within the ball (internal) and sustains the globe and those with the energy source from outside the ball (external). Theories for internal powered ball lightning include these six subclasses:

1. It is a ball of gas or air burning slowly,
2. The sphere contains heated air or various impurities,
3. It is a very high density ionized gas (plasma),
4. The ball is a closed-loop current flow in its own magnetic field.
5. It is an air vortex containing luminous gases, forming the sphere.
6. It is a high frequency electromagnetic field in a thin spherical sheet of ionized air.

One of the latest speculations advanced suggested that ball lightning might be nothing more than a burning orb of silicon, generated by lightning striking the ground and vaporizing minerals. This theory hypothesized that ball lightning may involve more chemistry than physics. When lightning

strikes the ground, the mineral grains in the soil are changed into tiny particles of silicon and compounds with oxygen and carbon. These tiny particles were predicted to link into chains forming filamentary networks, like sugar strands of candyfloss. The filaments could then form a light, fluffy ball-shape, which could be borne aloft by air currents. These tiny particles would be very reactive and slowly burn up in the air, emitting light in the process. Calculations for duration, brightness and color of the glow could match those for ball lightning. When this theory was tested, it failed and was unable to generate ball lightning. This theory was also flawed because it did not address ball lightning falling from the base of clouds, inside airplanes and submarines where there is no ground/silicon. While most scientists agree that ball lightning exists, the cause remains highly controversial. The mystery continues and is as elusive as ever.

Conclusion

Some people firmly believe that ball lightning does not exist and is caused by an overactive imagination or optical illusion. As proof they claim that there has not been a photograph, movie or video taken of the phenomena. Photographs that purportedly show ball lightning are questionable. Yet it would be very difficult to deny the existence of ball lightning. Too many reliable people have documented it over the centuries.

One of the difficulties in finding solutions to ball lightning formation is its inconsistency. It has occurred in many settings and displayed a wide range of characteristics. Ball lightning has been seen falling from clouds, in submarines, in flying aircraft, bouncing along the ground, floating in mid-air, appearing small or large, passing through solid objects, splitting into two, having different colors, and lasting a few seconds to over a minute. Another problem is that scientists are not able to reproduce it in laboratory.

Presently, it appears these orbs will remain a mystery. Some of the most creative minds in physics and chemistry have attempted to explain ball lightning. Nature seldom gives up its secrets easily and ball lightning continues to generate attention, curiosity, and controversy. A complete explanation and understanding about ball lightning continues to elude scientists and may do so for decades.

References

Abrahamson, J., 2002: Ball lightning from atmospheric discharges via metal nanosphere oxidation: From soils, wood or metals, Philosophical Transactions of the Royal Society, A360 (Jan. 15): 61-88.

Cooper, M.A., 1995: Myths, miracles, and mirages, Seminars in Neurology, Vol. 15, No. 4, 358-361.

Holle, R.L., R.E. Lopez, K.W. Howard, R.J. Vavrek, and J. Allsopp, 1995: Lightning Hazard Education. The Earth Scientist, 12 (4), 19-23.

Holle, R.L., R.E. Lopez, R.J. Vavrek, and J. Allsopp, 1997: Newspaper accounts of lightning from 1891-1895. The Earth Scientist, 14 (3), 20-22.

Hubler, G.K., 2000: Fluff balls of fire. Nature 403 (Feb. 3): 487-488.

Uman, M.A., 1986. All About Lightning. Dover Publication, 167 pp.

Uman, M.A., 1984. Lightning. Dover Publication, 298 pp.

Vavrek, R.J., R.L. Holle, and J. Allsopp, 1993: Flash to bang. The Earth Scientist, 10, 3-8.

Weiss, P., 2002: Anatomy of a lightning ball. Science News, Feb 9, Vol. 161, No. 6, 8 pgs.

10-13-03

We greatly appreciate the following individual who offered her assistance in completing this paper: Ms Jennifer J. Vavrek, Math Teacher, Crete/Monee Middle School, Crete, Illinois.

Morgan Park Academy wins 10th annual Rube Goldberg Machine Contest

Morgan Park Academy, Chicago, recently won Argonne National Laboratory's 10th annual Rube Goldberg Machine Contest held at Chicago Children's Museum on Navy Pier. The six-member team defeated eight other Chicago-area high schools by building a complex machine to remove both old batteries from a two-battery flashlight, install new batteries and turn the flashlight on. The machine had to complete its task in 20 or more steps.

Winning team members are Christopher Brewin, Daniel Cullina, Joseph Gradle, Kevin Larson, Steven Marovitch and Ryan Rasmussen. Wilmington High School and Minooka Community High School tied for second place.

Morgan Park Academy also won the People's Choice Award, chosen by popular vote by people attending the Chicago Children's Museum during the contest. The team received a trophy.

Rube Goldberg machine contests are inspired by Reuben Lucius Goldberg, whose cartoons combined simple household items into complex devices to perform trivial tasks. The machines combine the principles of physics and engineering, using common objects such as marbles, mousetraps, stuffed animals, electric mixers, vacuum cleaners, rubber tubes, bicycle parts and anything else that happens to be on hand.

Other teams in the contest were William Fremd H.S., Palatine, Perspectives Charter School, Chicago, Glenbrook South H.S., Glenview, Riverside-Brookfield H.S., Riverside, Maine Township South, Park Ridge, and St. Charles East H.S., St. Charles.

The winning team from Morgan Park Academy along with Argonne's Deon Ettinger, far right.

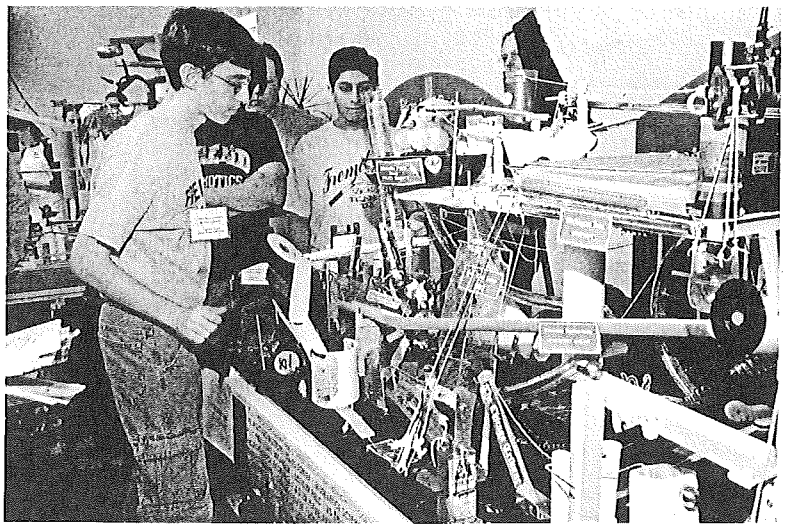
The winning team received a traveling trophy to display until the 2006 contest and will take a tour of Argonne at a later date. The tour will include the Advanced Photon Source, and lunch with Argonne scientists. In addition, each team member and the team's faculty advisor received an Argonne National Laboratory Rube Goldberg Machine wrist watch and an Argonne Rube Goldberg Machine Contest T-shirt.

The first-place team will also have the opportunity to demonstrate its winning machine at Argonne National Laboratory on the day of its tour. Both second-place team members and their faculty advisor received Argonne National Laboratory Rube Goldberg Machine wrist watches and Argonne Rube Goldberg Machine Contest T-shirts.

The top three teams in Argonne's contest advance to the 2005 Illinois State Championship to be held Saturday, April 9, at the University of Illinois, Urbana-Champaign. They will compete against the top three teams from an affiliated contest held Friday, March 11, at the University of Illinois, Urbana-Champaign. The top two teams in the Illinois State Championship will advance to the second annual National High School Championship contest to be held April 29, at the Wisconsin Exhibition Center, State Fair Park, Wisc. For more information see the national contest Website at http://www.uwm.edu/CEAS//rube/. Argonne will work with teams in its contest to help meet deadlines for the national contest.

Information about the Argonne Rube Goldberg Machine Contest for High Schools is available on the Web at:

http://www.anl.gov/OPA/rube/rubeteams.html



Students from William Fremd High School work on their machine.

Argonne's Division of Educational Programs and Communications and Public Affairs Division sponsor the February event in collaboration with Chicago Children's Museum, and the National Rube Goldberg Machine Contest, held annually at Purdue University. The event is licensed by Rube Goldberg, Inc.

"Rube Goldberg" is a registered trademark of Rube Goldberg, Inc., which can be reached by fax at (212) 371-3761, by e-mail at **license@rubegoldberg.com** or

information@rubegoldberg.com, or at **www.rgmc.com**

Chicago Children's Museum's mission is to create a community where play and learning connect. For more information about Chicago Children's Museum, call (312) 527-1000 or visit **www.ChiChildrensMuseum.org**

The nation's first national laboratory, Argonne National Laboratory conducts basic and applied scientific research across a wide spectrum of disciplines, ranging from high-energy physics to climatology and biotechnology. Since 1990, Argonne has worked with more than 600 companies and numerous federal agencies and other organizations to help advance America's scientific leadership and prepare the nation for the future. Argonne is operated by the University of Chicago for the U.S. Department of Energy's Office of Science.

For more information, please contact Donna Jones Pelkie (630/252-5501 or djpelkie@anl.gov) at Argonne.

Student Perceptions of YOU and YOUR Science Classroom Environment

Dr. Richard A. NeSmith
Eastern Illinois University

The ISTA mission is to provide proactive leadership in order to improve science education by promoting effective classroom practices. In the spirit of this, I opted in the last issue to delve into what I believe to be an overlooked factor in student learning, namely, that of student and teacher *perceptions* of effective teaching and learning and how this influences student achievement. In our last issue I introduced and confirmed the importance of the teacher and his or her science classroom environment on student achievement. I noted that the emphases in science curriculum in the ghost of education past, has fluctuated between *child-centered* and *teacher-centered* curriculum, but has redeployed more recently like a *fast* moving train to that of "standardized-test centered" curriculum. I proposed that what is truly needed is a complete shift to a more *learning-centered* curriculum and approach, and that determining student perceptions about effective teaching and learning can lead us in that direction.

Student perceptions about learning

Only a small consideration was given to the study of student perceptions by the mid-1980s. The practice of seeking a student's perception or "person perception," as coined by psychologists and educators (Kramer, 1992, p. 28; Payne & Wenger, 1998, p. 409), was concept accepted and recognized that perceptions are realistic to the one perceiving and *may* provide vital information on the teaching-learning interaction. The need for determining students' perspective in education established by the theories and works of Fullan (1994, 1991), Wilson and Daviss (1994), Hargreaves (1992), Dunn (1988), Sizer (1992), and Glasser (1997, 1986). Combs (1982), three decades ago, emphasized the affective domain as being a *vital component* of the educational process. Combs, like many cognitive scientists today, proposed that proper education cannot be achieved apart from addressing both the cognitive and the affective domains; since the affective domain addresses the students' attitudes, feelings, and emotions. According to Bloom (1983), the student's motivation to learn new tasks is an affective characteristic. Sizer (1992), and the Coalition of Essential Schools movement, supported the initiative that educational goals will vary as students themselves vary, and that learning should be personalized to the maximum feasible extent. A generation ago, Buxon (1973) proposed changing the system to "fit" its students. The students' perceptions are vitally important in order to aid the student-school fit (Dunn, 1988; Eccles, Midgley, Wigfield, et al., 1993; Fraser & Fisher, 1983, Marcus, 2001), therefore making the process of learning more effective and efficient. Darling-Hammond (1996) affirmed that teachers have a complex job, and one expertise that they cannot afford to be without is an understanding of how students think and perceive learning. Kawasaki (1996) noted that the complexity of one's concept of science partly reflects one's national culture. This is not a notion that most of us as science teachers have mused much about. "Perceptions can assist teachers," according to Dale Schunk "by showing how students think, which is useful for teaching" (personal communication, May 6, 1997). These suppositions are systemically related to the impact of current reform and emphasize the need to consider the importance, educationally and socially, of knowing what students perceive, as compared to what we, as educators, hope they have perceived.

To cut to the chase students' perceptions, though largely ignored in the past (Goodlad, 1984; Schneider, 1996), could provide educators with vital data that should be used in the classroom just as assessment is

used. Learning in schools is traditionally dominated and controlled by adults, but research indicates that in order to foster lifelong learning, students need to feel a sense of control in their own direction and learning (Barell, 1995). Beane (1993), a pioneer of the middle school concept, hypothesized that even in the midst of educational reform, middle school educators are still having a disconcerted sense that while they have done a great deal by way of organizational work, there was still a void. For Beane, this void appeared to be that of ignorance and exclusion of, *student perceptions.* When considering the curriculum, Beane (1993) surmised that appropriate curriculum begins with relevant, accurate, and up to date concepts of which much could be learned from knowing what students perceive. In his work, *From Rhetoric to Reality*, Beane (1993) equated that curriculum developed apart from the teachers and young people who experience it was anti-democratic and disgustingly dictatorial. Perhaps this should cause us to reconsider the process. Could it be that we just do not know how students actually perceive education? We assume their perceptions are those of our own. It is not surprising students sense alienation, powerlessness and even disenfranchisement over what is happening to them academically (Oerlemans & Jenkins, 1988).

Social Learning Environments

Since the mid- to late-1990s, there has been a gradual and significant increase in the number of studies regarding student perceptions. More educational researchers are now attempting to study student perceptions in the classroom learning environment (*action research*) than at any other time in the history of American education. Recently, Wenglinsky (2002) analyzed teacher classroom practices (teacher input and characteristic practices) with that of student academic performance. Campbell, Smith, Boulton-Lewis (2001) considered students' approaches to learning in regard to their teachers' approaches to teaching. Marchant, Paulson, and Rothlisberg (2001) studied student perceptions of family and school and how this affected academic achievement. These studies were centered principally upon the conceptual/theoretical field of learning environments. Learning environments are components of the educational experience and are constructed by individuals and groups of individuals in a given setting. Learning environments consist of socially-mediated beliefs about opportunities to learn and the extent to which those opportunities are constrained by the social and physical milieu (Ferguson & Fraser, 1996). Learning environments are not only constructs, but are *constructed* by the interaction that occurs within a classroom between a teacher and students (remember *Piaget* and *Vygotsky*!). It is within this environment that the foundation of learning transpires. This, however, is not to say that "learning necessarily follows from instruction" (Ahlgren, 2002, n.p.). Student learning, according to Wenglinsky (2002), "is a product of the interaction between students and teachers, and both parties contribute to this interaction" (p. 7). Cochran-Smith (2003) reminds us of the complexity involved in teaching and the mishap we create by attempting to over-simplify descriptions of the process. It was not the intent of this author to oversimplify effective teaching and learning, nor to provide the "silver bullet," but rather to draw attention to a neglected element of education. "Effective teaching," on the other hand, is simply defined as the ability to help students learn *effectively.* The issue in this report is not so much as *what is* effective teaching but rather *how* it bears on student achievement. More specifically, this article seeks to highlight one component of teaching that needs more consideration: *perceptions.* An understanding of student perceptions supplies the classroom science teacher with valuable data in which to modify one's approach to teaching. The study of student perceptions probably began with the study of learning how students construct knowledge (Naylor & Keogh, 1999). Educational researchers have reported on numerous occasions that students actively construct "knowledge on the basis of the knowledge they already hold" (Duit & Treagust, 1995, p. 49). Piaget (1929) pioneered the concept that students learn by constructing knowledge from their own personal

experience. The reality that students construct their own meaning of an idea, concept or fact is now referred to as constructivism. Constructivists recognized that a student's learning is not something that takes place in a vacuum, but rather is *embedded* in a particular "social setting" in which that individual is a participant, namely, the classroom learning environment (Duit & Treagust, 1995, p. 49; Wadsworth, 1996). There is more to constructivism than the explanation just rendered; however, the recognition of this interaction between the student, the environment, and the information to be learned is of vital importance in understanding the concept of "personal perception." Duit and Treagust (1995) said it well.

> If the teacher asks a question and students try to understand it, they are able to do this only from their perspective and on the basis of the conceptions that they hold. If these conceptions are different from those of the teacher, and this usually is the case, the students make sense of the question in a way different from the teacher's way; the answer the students might give is interpreted by the teacher from his or her point of view. An endless circle of misunderstanding can occur in such communication situations, and these incidents frequently occur in teaching and learning. (p. 49)

Student perceptions about learning environments

Schunk and Meece (1992) considered that "there are many types of student perceptions that operate in the classroom" (p. xi). Consequently, students *learn* when their concept, which is embedded in their own knowledge and evaluation of the environment, is *compared* and *contrasted* to that of their teacher's concept, which may and typically is from an entirely different environmental construct (Treagust, Duit, & Fraser, 1996). This construct of a class environment is a product of the interactivity that occurs within a class with a teacher and amongst peers. In a sense, a student's ability to learn is limited only to the degree to which a concept can be made *personal*. Therefore, a personal concept is a *percept*, thus perception (Payne & Wenger, 1998, p. 409; Kramer, 1992, p. 28). This provides legitimacy to the study of students' and teachers' perceptions. A student's perception provides him or her with tools in which to decipher, translate, construct, and make sense out of any given concept. "Prior knowledge," according to Lorsbach and Tobin (1997), "is used to make sense of data perceived by the senses" (n.p.). As students' perceive their perceptions are **very real** *and accurate for each individual student.* For example, what happens when a student believes that a teacher does not like him? It may not be true in reality and the teacher may not feel that way at all about this student. The student's perception, however, will act as a filter through which the student will either limit or facilitate learning. Though Lorsbach and Tobin (1997) recommend using constructivism as a "referent," it seems highly appropriate here to suggest that a students' perception is indeed their referent to learning. Learning occurs through the senses and in the context of the environment in which the learner is a member. This places a great deal of importance and worth on student perceptions in the learning process, and these perceptions are cultivated, fine tuned or mystified by the classroom environment.

In discussing student perceptions on learning and teaching practices, Antonowich (1995) found that gifted middle school students perceived academic success *regardless* of the form of academic grouping practiced. Daniels, Kalkman, and McCombs (2001) established that primary students valued *similar* characteristics in teachers regardless of the classroom context. Marchant, Paulson, and Rothlisberg (2001) suggested that middle school students' perceptions were predicative of their academic achievement and Robison (2001) found that middle school students' reports of teacher supportiveness significantly predicted student science grades. This is a noteworthy concept and needs further investigation. If student perceptions are predictors of academic achievement, then what perceptions determine success and what perceptions foster academic failure? What influence or contrast does that of the teachers' perception have on this interplay? It has been noted that students' perceptions are not usually the same as that of the educators'. In examining instructional teaching

methods, Hagborg (1994) found that students tended to rate teacher methods as *more limited* and *more dependent* on teacher direction than did teachers, who saw their methods as broader and requiring more student participation. Indeed, Rickards and Fisher (1998) found that teacher and student perceptions vary greatly from one another and that teachers *always* give themselves higher ratings than do students.

The seeking of students' perceptions regarding their educational experiences may be a step in the right direction to improving the learning process. It certainly could be a step in a more effective and efficient direction towards a more constructivistic ideology of student learning based on student perceptions and experiences. In my research, it was hypothesized that student perceptions' regarding effective teaching may not only be different from that of their respective science teacher, but also that the larger the disparity between the two perceptions of effective teaching and learning the greater the effect it would have on student achievement.

In our next issue, we will identify an effective classroom learning environment survey (the *QTI*) that can be used in your own classroom (and free of charge), how it can be used in your class, as well as the results I unearthed from randomly surveying nearly 500 middle level students and their science teachers from twenty-one science classroom, using quantitative and qualitative methods.

References

Ahlgren, A. (2002). Research on student learning. *Project 2061*. Washington, DC: American Association for the Advancement of Science. Retrieved December 26, 2002, http://www.project2061.org/newsinfo/research/ahlgren/ahlgren3.htm

Antonowich, L.R. (1995). *The attitudes and perceptions of gifted students toward cooperative learning in homogeneous and heterogeneous classes*. Unpublished doctoral dissertation, Widener University, Chester, PA.

Barell, J. (1995). Critical Issues: Working toward student self-direction and personal efficacy as educational goals. Retrieved June 20, 2001, from http://www.ncrel.org/sdrs/areas/ issues/students/learning/lr200.htm

Beane, J.A. (1993). *A middle school curriculum: From rhetoric to reality*. (2nd Ed.). Columbus, OH: National Middle School Association.

Bloom, B.S. (1983). *Human characteristics and school learning*. New York: McGraw-Hill.

Buxton, C.E. (1973). *Adolescents in school*. New Haven: Yale University Press.

Campbell, J. Smith, D., Boulton-Lewis, G., Brownlee, J., Burnetter, P.C., Carrington, S., & Purdie, N. (2001). Students' perceptions of teaching and learning: The influence of students' approaches to learning and teachers' approaches to teaching. *Teachers and Teaching: Theory ad Practice, 7*(2), 173-187.

Cochran-Smith, M. (2003). The unforgiving complexity of teaching: Avoiding simplicity in the age of accountability. *Journal of Teacher Education, 54*(1), 3-5.

Combs, A. W. (1982). Affective education or none at all. *Educational Leadership, April*, 495-497.

Daniels, D.H., Kalkman, D.L., & McCombs, B.L. (2001). Young children's perspectives on learning and teaching practices in different classroom contexts: Implications for motivation. *Early Education and Development, 12*(2), 253-274.

Darling-Hammond, L. (1996). What matters most: A competent teacher for every child. *Phi Delta Kappan, 78*(3), 193-200.

Duit, R., & Treagust, D.F. (1995). Student conceptions and constructivist teaching approaches. In B.J. Fraser & H.J. Walberg, (Eds.). *Improving science education* (pp. 46-69). Chicago: The National Society for the Study of Education.

Dunn, R. S. (1988). Ten steps to better middle schools. *Teaching PreK-8, 18*, 39-41.

Eccles, J.S., Midgley, C., Wigfield, A., Buchanan, C.M., Reuman, D., Flanagan, C., MacIver, D. (1993). Development during adolescence: The impact of stage-environment fit on young adolescents' experiences in schools and in families. *American Psychologist*, Feb., 90-101.

Ferguson, P.D., & Fraser, B.J. (1996). Study on the transition from primary school to secondary school: School size, gender, and changes in learning environment during the transition from elementary to high school. Paper presented at the annual meeting of the American Educational Research Association, New York.

Fraser, B.J., & Fisher, D.L. (1983). Student achievement as a function of person-environment fit: A regression surface analysis. *British Journal of Educational Psychology, 5*, 89-99.

Fullan, M.G. (1994). Coordinating top-down and bottom-up strategies for educational reform. System Reform: Perspectives on Personalizing Education, September. Retrieved December 4, 1999, from http://www.ed.gov/pubs/EdReformStudies/SystReforms/fullan1.html

Fullan, M.G. (1991). *The new meaning of educational change.* New York: Teachers College Columbia University.

Glasser, W. (1997, April). A new look at school failure and school success. *Phi Delta Kappan*, 597-602.

Glasser, W. (1986). *Control theory in the classroom.* New York: Harper and Row.

Goodlad, J. I. (1984). *A place called school: Prospects for the future.* New York: McGraw-Hill.

Hagborg, W.J. (1994, July-Sept.). Student and teacher perceptions of classroom instructional methods and evaluation procedures. *Evaluation and Program Planning, 17*(3), 257-260.

Hargreaves, D. (1972). *Interpersonal relations in education.* Boston: Routledge Kegan & Paul.

Kawasaki, K. (1996). The concepts of science in Japanese and Western education. *Science and Education, 5*, 1-20.

Kramer, L.R. (1992). Young adolescents' perceptions of school. In J. L. Irvin. (Ed.). *Transforming Middle level education: Perspectives and possibilities* (pp. 28-45). Boston: Allyn and Bacon.

Lorsbach, A., & Tobin, K. (1997). *Constructivism as a referent for science teaching.* San Francisco: National Association for Research in Science Teaching.

Marchant, G. J., Paulson, S. E., & Rothlisberg, B. A. (2001). Relations of middle school students' perceptions of family and school contexts with academic achievement. *Psychology in the Schools, 38*(6), 505-520.

Marcus, D. L. (2001, April 9). One class, and 20 learning styles. *U. S. News & World Report*, 94.

Naylor, S., & Keogh, B. (1999). Constructivism in classroom: Theory into practice. *Journal of Science Teacher Education, 10*(2), 93-106.

Payne, D.G., & Wenger, M.J. (1998). *Cognitive Psychology*, New York: Houghton Mifflin Company.

Oerlemans, K., & Jenkins, H. (1998). Their voice: Student perceptions of the sources of alienation in secondary school. *Proceedings Western Australia Institute for Educational Research Forum 1998.* Retrieved December 31, 2002, from http://education.curtin.edu.au/waier/forums/1998/oerlemans.html

Robison, K. A. (2001). *Student perceptions of middle school: Relationship to academic motivation, learning strategies, and academic achievement in science.* Unpublished doctoral dissertation, Tulane University, New Orleans, LA.

Schneider, E. (1996). Giving students a voice in the classroom. *Educational Leadership, 54*(1), 22-26.

Schunk, D.H. Personal communication, May 6, 1997.

Schunk, D.H., (1992). Theory and research on student perceptions in the classroom. In D.H. Schunk, & J.L. Meece, (Eds.). *Student perceptions in the classroom* (pp. 3-23). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Sizer, T. (1992). *Horace's compromise: Redesigning American high schools.* Boston: Houghton Mifflin.

Treagust, D.F., Duit, R., & Fraser, B.J. (Eds.). (1996). *Improving teaching and learning in science and mathematics.* New York: Teachers College, Columbia University.

Wadsworth, B.J. (1996). *Piaget's theory of cognitive and affective development:*

Wenglinsky, H. (2002, February 13). How schools matter: The link between teacher classroom practices and student academic performance. *Educational Policy Analysis Archives, 10*(12). Retrieved January 7, 2003 from http://epaa.asu.edu /epaa/v10n12/

Wilson, K.G., & Daviss, B. (1994). *Redesigning Education.* New York: Teachers College Press.

Promote Children's Life Science Learning with Informational Books

Jean Mendoza
College of Education, University of Illinois

Incorporate high quality children's non-fiction into your classroom library!

This is the second article in a series for teachers who secretly (or not so secretly) believe they can't "do science" with their students.

Are you uncomfortable with the thought of trying to teach science to children, be they preschoolers, 5th graders or any age in between? Here's one low-stress way to get started: Incorporate high quality children's non-fiction into your classroom library!

By bringing science books for children into the lives of your students, you address two goals. First, you provide your class with access to scientific information just by reading the books aloud or making them available for children to use on their own. Second, you give yourself an opportunity to become more knowledgeable about science, and more self-confident about your ability to share science with children. The following is a true story. Only the names have been changed.

Miguel, Patrick, Liz, and Rashad have gathered at a small table in their K-1 classroom. They have agreed to study and report on "relatives of turtles" as part of a class project on turtles that was sparked by interest in two box turtles that visited their class.

"Frogs are related to turtles," Miguel asserts. The others agree. They want to see pictures of frogs to compare to the turtles. They page through the classroom copy of "Eyewitness: Reptiles". They find pictures of turtles, lizards, snakes...but no frogs.

Liz looks perplexed. "I saw lots of frogs in an Eyewitness book," she says. "But if they are reptiles, they should be in here," says Miguel.

"Maybe they aren't reptiles," Rashad proposes.

"They're relatives of turtles. Turtles are reptiles," insists Miguel.

"I'm going to find that book," says Liz, and the four of them descend on a book cart that holds 20 or so Eyewitness books donated by a student's family.

"Here's 'Fish'.

"Frogs are not fish. I know that."

"Not mammals."

"Here! Am, am-something!" Rashad almost shouts. He can't read the title, but Patrick can. "Amphibians!" exclaims Patrick.

Rashad has found the book with plenty of information about frogs. They look at the pictures together, while Patrick reads the words he knows. Later, they ask a teacher to read some of the text aloud. Liz, Miguel, Rashad and Patrick have found out that while frogs may be similar in some ways to turtles, their differences are great enough that they "belong" in separate books.

In this K-1 classroom, children were encouraged to formulate their own questions for study and to find answers through primary or secondary sources. While spontaneously using illustrated non-fiction books as secondary sources of information, Miguel, Liz, Patrick and Rashad had an exercise in scientific classification, with no input from the teacher (who stayed within earshot the whole time to see how they would resolve their problem).

Taxonomy is a complicated undertaking. Good-quality books that help children identify and differentiate among the animals and plants that interest them also foster a beginning understanding of how scientists classify life forms according to phylum, class, order, family, genus, and species. Children in urban classrooms may have little opportunity to see certain forms of wildlife. This does not mean they lack interest. You can fuel their engagement in the study of animals, and facilitate investigations by children in suburban and rural classrooms, by keeping on hand a supply of informational books about "nature". Often, local public libraries will carry a variety of such books. If you have the budget to buy books, purchasing some good-quality, child-friendly books that focus on classification will be a good investment in the children's science learning. You might want to borrow some samples from the library first. Book-talk them with the class, then make the books available to the children for several weeks to see what gets the most use. Ask the children for their opinions about each book, too. Then make your purchases.

What are some must-own or must-borrow books to enhance children's natural history investigations?

The Eyewitness books, written mainly for ages 9-12, are published by Dorling Kindersley, and are being re-released in extended versions (according to the DK Web site). Several features make them a useful addition to the early childhood or early elementary classroom library. Although they are daunting read-alouds, they tend to be highly popular even among children who cannot handle the reading level. Children seem to gain a great deal just from examining the illustrations. The detailed, visually engaging photographs, are clearly labeled with single words or short phrases that sometimes can be deciphered by a beginning reader. Each Eyewitness natural history book focuses on a single topic: "Reptiles", "Sharks", "Insects". The books are big enough to share during "buddy reading" and for a small topic group to look at together.

A drawback of the Eyewitness books is that children cannot use them as field guides to local flora and fauna because they are international in scope. Miguel, Liz, Rashad and Patrick might have also used the Golden Guides or the adult-level Audubon Society field guides in their classroom library to find out more about frogs in their region. Field guides to North American wildlife will enable children to look up plants and creatures they see at home, on the playground, or on the way to school. Some reliable field guide series for children to use include:

- The Golden Guides (often described as a good introductory series)
- The Peterson Field Guides for Young Naturalists
- National Audubon Society First Field Guide Series (includes birds and shells)
- National Geographic Field Guides for Beginning Naturalists
- Nature Finder Guides

There are field guides to birds, insects, spiders, reptiles and amphibians, trees, mushrooms, flowering plants, and more. Choose the guides that you feel do the best job of emphasizing external identifying features of the animals and plants. Range maps indicating the regions where an animal or plant can be seen are also helpful. Like the Eyewitness books, field guides might not make good read-alouds, although if children are interested in a particular specimen, they will appreciate hearing you read about it.

You might keep in mind that children who cannot read can still use the pictures in a field guide. Older elementary students sometimes prefer to use adult-level field guides; though the reading level may challenge them, they appreciate the more "grown up" format. The Golden Field Guides, the Peterson Field Guides, the National Audubon Society Field Guides, and the Lone Pine Regional guides

(which focus on animal tracking, and include Animal Tracks Illinois) all have much to commend them. Each has a slightly different approach to field identification. For example, some use photographs, showing exactly what a representative specimen looks like, while others use illustrations that emphasize particular points to look for when trying to identify something.

If you have no budget for new materials but would like to have something in the classroom to help children identify local flora and fauna, visit the Illinois Department of Natural Resources (IDNR) Web site. IDNR offers some free posters of Illinois wildlife, including *Common Birds, Salamanders, Rare Plants of Illinois, and Turtles.* The posters are attractive and informative. IDNR also has free posters on such topics as *Spring Woodland Wildflowers, Southern Illinois Wetlands,* and *Inland Sand Areas*, each of which comes with background information. As of 1/23/05, the IDNR home page URL was http://dnr.state.il.us/. Select "Publications" on the left-hand side bar. On the publications page, click on the word "Clearinghouse" (in blue) near the top of the page to access an online order form that lets you browse through IDNR's free offerings.

In short, you don't have to be an experienced naturalist to help children meet those Illinois learning standards related to life science! Share richly illustrated books (and posters) about wildlife with your class. The more you familiarize yourself with those resources, the more comfortable you will be with investigating natural history. Provide the children with ready access to the books and posters. Let them use the resources to follow up on questions that intrigue them, and even some of your non-readers may be drawn into the study of the animals and plants around them!

Environmental Education Association of Illinois

2005 Annual Meeting and Southern Illinois EdVenture

CONFERENCE

April 15 & 16, 2005
Touch of Nature Environmental Center

Carbondale, Illinois

The father of outdoor education, L.B. Sharp, developed the concept of using "the land for learning." Simply stated, "That which can best be learned in the classroom should be learned there. That which can best be learned in the out-of-doors through direct experience, dealing with native materials and life situations, should be learned there."

By incorporating Aldo Leopold's land ethic which "enlarges the boundaries of community to include soils, water, plants, and animals, or collectively: the land," into this concept we can take the sometimes abstract academics of the classroom and watch them come alive in the field.

Feeding off of last year's conference success, the southern region decided to showcase the incredible natural resources of southern Illinois through a plethora of field experiences. Our hope is that this conference gives you the opportunity to build a "land bridge" of community

Thanks to CORE2, the Unimin Corporation, the Land for Learning Institute, and other generous sponsors, we have been able to keep conference costs to a minimum. The fee for current EEAI members is $65, and non-members pay $95 which includes a one year membership to EEAI. Fees include Friday's dinner and evening programs; Saturday's meals, field sessions, and evening entertainment; and all social activities.

Conference registration is limited to the first 100 people:

GO to: http://www.eeai.net/

Surfing for New Ideas?

Mary Rice, Database and Project Manager for CORE²

Have you used the new statewide environmental education database to find professional development opportunities or teaching aides for yourself or field trip opportunities for your students? If not, go to www.illinoisee.org to discover what it has to offer. Illinoisee.org is a searchable database with a statewide calendar of events. It incorporates the former Illinois Green Door (previously housed on the state board of education's website) and lessons from Projects WILD, Aquatic WILD, Learning Tree, and WET. Visit the site and search for: EE providers (nature centers and museums, etc.) by name, city, county, or region; EE programs by title or topic; and events by date range, month, or type (workshop, field trip, etc.). Searching a program by topic will bring up a link to Illinois Green Door that contains a series of Illinois specific websites identified by teachers for teachers.

The ultimate goal of the database is to coordinate the delivery of environmental education statewide. Illinoisee.org is a project of CORE² (Centers of Regional EE), a virtual approach to organizing EE within the state. CORE² is funded through EETAP (the Environmental Education and Training Partnership) with money from the US EPA. It is based on the regional structure of EEAI (EE Association of Illinois) and coordinated by IEEAC (Illinois EE Advancement Consortium). For more information, contact Mary Rice at marice@parkfun.com or (847) 985-2100.

Illinoisee.org was designed with you in mind! You're the end user! If, in using it, you notice an EE provider missing, please contact them and invite them to join. It's free. It's easy. It's going to make a difference. Help us spread the word! Tell another teacher about www.illinoisee.org.

Free Careers in Physiology Brochure

The American Physiological Society (APS) announces a color brochure available to all interested teachers and students. The brochure explains what physiology is, what physiologists do, why physiology is important, and how to become a physiologist. It also contains short biographies of several physiologists who are employed in a wide variety of physiology careers. This brochure is part of the careers outreach program of The APS and was produced in conjunction with a totally new "careers" link at:

http://www.the-aps.org

Find information for students at different educational levels. Included on the website are physiology experiments for students to try, biosketches of many physiologists involved in different areas of physiology, extensive information on careers in physiology and other life sciences, awards available to students, resources specifically for minority students, and much more.

For your free copy of the APS Careers in Physiology brochure, send your request to:
education@the-aps.org

Access our educational resources at:
http://www.the-aps.org

Weather Resources for Teachers

Jim Vavrek

Eggers Middle School, Hammond, IN

1- Ideas for Using Weather and Tornadoes to Teach Math and Science

<http://www.nssl.noaa.gov/edu/ideas/>Several ideas for using real or simplified science to teach a number of subjects from math, geometry, geography, and even biology.

2- Atmospheric Datasets Online

A set of <http://www.nssl.noaa.gov/%7Eschultz/data/>links to atmospheric datasets and some analysis/graphing packages online.

3- Resource Listing for Weather and Climate Instruction

INTRODUCTION AND SCOPE

This document is intended to assist those who teach weather and climate at any level from preschool through introductory college level courses, by listing some of the available instructional resources. While an effort was made to select easily obtainable materials, some materials may not be available everywhere or may have become obsolete. This list is for informational purposes only and inclusion of an item on the list by no means represents an endorsement of that product. Some good source materials may have been neglected inadvertently. Permission is hereby granted for the reproduction of portions or all of this document for non-commercial educational use in schools on the condition that this source is acknowledged.

The entire Resource Guide can be downloaded in PDF format: (50 pages.) **<http://www.nssl.noaa.gov/resources/resourceguide.pdf>**

Or you can download individual sections, also in PDF format:

1. Cover Sheet / Table of Contents: **<http://www.nssl.noaa.gov/resources/contents.pdf>**

2. Introduction and Scope and Career Guidance Material: **<http://www.nssl.noaa.gov/resources/sect1and2.pdf>**

3. General Instructional Materials: **<http://www.nssl.noaa.gov/resources/section3.pdf>**

4. Audiovisual Materials: **<http://www.nssl.noaa.gov/resources/section4.pdf>**

5. Printed Material: **<http://www.nssl.noaa.gov/resources/section5.pdf>**

6. Instruments and Other Equipment: **<http://www.nssl.noaa.gov/resources/section6.pdf>**

7. Computer/Internet: <http://www.nssl.noaa.gov/resources/section7.pdf>section7.pdf - New 3/19/01: <http://www.nssl.noaa.gov/resources/wwwlinks.html>web page: partial listing of Internet links

8. Data Sources: <http://www.nssl.noaa.gov/resources/section8.pdf>section8.pdf

9. Professional Organizations: <http://www.nssl.noaa.gov/resources/section9.pdf>section9.pdf

10. Additional Resource Contacts: <http://www.nssl.noaa.gov/resources/section10.pdf>section10.pdf

11. Abbreviations: <http://www.nssl.noaa.gov/resources/section11.pdf>section11.pdf

<http://www.adobe.com/prodindex/acrobat/readstep.html>

Credits: The original Resource Listing for Weather and Climate Instruction was created by Dr. Edward J. Hopkins of the University of Wisconsin-Madison. It was adapted by Ronald L. Holle of Global Atmospherics, Incorporated, and R. James Vavrek of Eggers Middle School, Hammond, Indiana. This version was updated by: Daphne S. Zaras (daphne.zaras @ noaa.gov) of the National Severe Storms Laboratory; Ron Holle (rholle @ glatmos.com),

Global Atmospherics, Inc.; and James Vavrek (jv48 @ netzero.net), Eggers Middle School, Hammond, IN.

You are invited to the

19th Annual preK-8 Science Education Update Conference

Inquiry & Assessment in Science

Friday, April 15, 2005

8 am to 3 pm

This conference is intended for teachers from the early elementary through the middle school levels. We do our best to invite science educators representing best practice to present and participate. The conference includes:

- Hands-On Science Activities
- Science Materials Displays
- Curriculum Resource Displays
- Environmental Education Displays
- Children's Literature in Science Displays
- Over $1000 in Door Prizes

The conference agenda is as follows: Concurrent sessions 8:30 – 10:20, Exhibits & Refreshments 10:20-10:50, Concurrent sessions 10:50-11:40, Mini-sessions 12-1, Box lunch 1:15-2:00, Announcements & Door prizes 2-3.

This year's conference will focus on inquiry based science and assessment. Presenters are invited to show how assessment and inquiry science can be combined in a seamless fashion to meet standards for teaching and learning.

We are planning on including many teacher tested programs and ideas related to environmental education and science PreK-8 grade. Invited presenters represent the Illinois Department of Conservation, Illinois Environmental Protection Agency, Energy Education, Recycling Education, The Nature Conservancy, and Audubon, just to name a few.

Over 20 presentations will be made by environmental educators and classroom teachers preK-8 during the three 50 minute morning sessions. These 50 minute presentations will provide practical and classroom tested ideas for science activities and will include a variety of informational handouts and activities sheets. Session III will be immediately followed by the mini-sharing sessions where participants move from table to table of their choice to spend 10 minutes receiving information on a specific topic, demonstration or activity and receive a brief handout for reference. Time will permit participants to visit 5 or 6 stations of the 15 or more options at levels (preK-3) and (4-8).

• Note that your participation in this conference may be used toward your professional development goals. We will be providing documentation for you to use in your professional portfolio (CPDU's).

Conference Date and Time is Friday, April 15, 2005 on the W I U Campus from 8am to 3 pm

✂ .....

PreK-8 Science Education Update Conference
REGISTRATION FORM

NAME _____ SCH. NAME_____

SCH. ADDRESS _____

CITY _____ STATE _____ ZIP _____

Your e-mail address _____ School Phone _____

Check Here if you need special assistance due to handicap _____

Full Conference Registration Fee (includes lunch) ..... $30.00 Lunch options (please **circle** box lunch choice):

Chicken Parmesan **Smoked Turkey** **Gargantuan Hero*** **Vegetarian**
*(pepperoni, ham, salami, provolone)

Conference Registration only (no lunch) $20.00

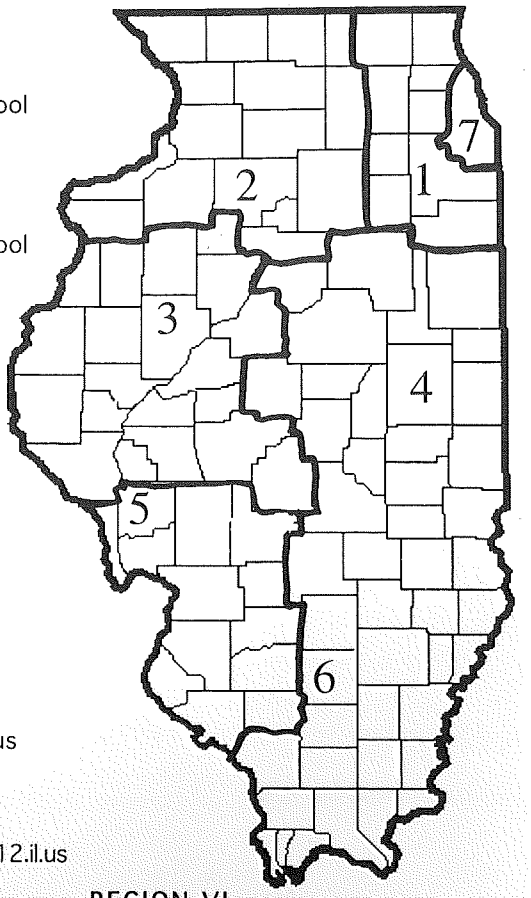
Make checks payable to Western Illinois University . **Circle** one

Payment Enclosed **Payment to follow from school district**

RETURN FORM TO: Dr. John B. Beaver, 1 University Circle-HH47, Western Illinois University, Macomb, IL 61455
309/298-2065 or 298-1777 email JB-Beaver@wiu.edu

Confirmations will be returned, if received by April 8th, with a campus map and parking information.
We encourage you to consider joining the Illinois Science Teachers Association.

ISTA REGIONAL DIRECTORS



REGION II
Larry McPheron
Boylan Catholic High School
Rockford
lamcp@hotmail.com

Donald Terasaki
Boylan Catholic High School
Rockford
dsaki@hotmail.com

REGION III
Jill Carter
Pekin Comm. H.S.
jcarter@pekinhigh.net

Randal Musch
Jacksonville High School
pvnrt@fgi.net

REGION V
Pam Abbott
RCUSD #1
Roxana
pabbott@madison.k12.il.us

Liza Basden
Highland High School
lbasden@highlandmadison.k12.il.us

REGION VI
Wesley Heyduck
Fairfield Community High School
wheyduck@fchs.wayne.k12.il.us

Jacqueline Meadows
Egyptian Elementary School
Tamms
wbdoodle@yahoo.com

REGION VII
Renee Bearak
Ames School
Chicago
rbearak@comcast.net

David Krumwiede
Sumner
krumfun@aol.ocm

REGION I
Tom Kearney
Andrew High School
Tinley Park
TKearney@d230.org

Anna L. Zuccarini
Crone Middle School
Naperville
anna_zuccarini@ipsd.org

REGION IV
Kendra Carroll
Shiloh Schools
Hume
carrollk@shiloh.k12.il.us

Susan Golden
Dist. 161
Decatur
sgolden@dps61.org

ISTA Membership Categories

Option 1: Full Membership Dues- $35.00 Full Membership entitles individuals to the following benefits: a one year subscription to the SPECTRUM and ISTA ACTION; inclusion in the members-only ISTA-TALK listserv; notification of regional conferences and meetings; voting privileges; and the opportunity to hold an ISTA Officer position.

Option 2: Two-Year Full Membership Dues- $60.00 — Two-Year Full Membership entitles member to Full Membership benefits for two years.

Option 3: Five Year Full Membership Dues- $125.00 — Five Year Full Membership entitles member to Full Membership benefits for five years.

Option 4: Associate Membership Dues- $15.00 — For full-time students and to individuals who are on retirement status. Entitles member to Full Membership benefits, with the exception of the opportunity to run for office.

Option 5: Institutional Membership - $75.00 — Institutional Membership entitles the member institution, for a period of one year, to two subscriptions to the SPECTRUM and ISTA ACTION; notification of regional conferences and meetings; and a reduced registration fee for the Annual ISTA Conference for a maximum of three members of the institution.

ILLINOIS SCIENCE TEACHERS ASSOCIATION

2005 MEMBERSHIP APPLICATION

PLEASE PRINT OR TYPE AND FILL OUT COMPLETE FORM

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

CHECK APPLICABLE CATEGORIES IN EACH COLUMN

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

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

MEMBERSHIP OPTION (See inside back cover)_____

AMOUNT ENCLOSED_____

ISTA SPECTRUM
UNIVERSITY OF ILLINOIS
COLLEGE OF EDUCATION
51 GERTY DRIVE
CHAMPAIGN, IL 61820

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

********AUTO**3-DIGIT 625 98 18
DUES TO 2010
GARY L, BUTLER
420 S TOWER RD
DAWSON IL 62520-3392

WINTER 2004