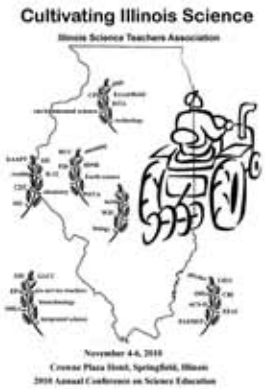
SPECTRUM

ISTA

Fall 2012, Vol. 38, No. 2

The Journal of the Illinois Science Teachers Association

In this Issue: **New Picture Books to Support Science**
Teaching Erosive Power Using Stream Boards
Using Inquiry to Teach Microscope Skills



Plan Ahead:

Illinois Science Education Conference - November 1-3, 2012 in Springfield
NSTA National Conference on Science Education - April 11-14, 2013 in San Antonio,Texas
NSTA STEM Forum and Expo - May 15-18, 2013 in St. Louis, Missouri
Illinois Science Education Conference - October 24-26, 2013 in Tinley Park, Illinois
NSTA National Conference on Science Education - April 3-6, 2014 in Boston, Massachusetts

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Spectrum

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Send submissions and inquiries to the editor. Articles should be directed to individual area focus editors (see next page and *write for the SPECTRUM information).*

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Cover: On the Fall Specturm cover are cover images from our past six conferences, and our upcoming Fall 2012 ISEC conference. Inside this issue is a preview of work by the ISTA Archives committee, celebrating our rich beginnings and heritage.

The Illinois Science Teachers Association recognizes and strongly promotes the importance of safety in the classroom. However, the ultimate responsibility to follow established safety practices and guidelines rests with the individual teacher.
The views expressed by authors are not necessarily those of ISTA, the ISTA Board, or the *Spectrum*.

The *Spectrum* is printed on recycled/recyclable paper

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Fall 2012 Volume 38, Number 2

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ISTA News

President's Corner
Carol Baker

Greetings to all Illinois Science Teachers!

I hope you have had a great start to your school year! I look forward to seeing all of you at the Illinois Science Education Conference (ISEC), November 1 - 3 in Springfield. The Illinois Science Teachers Association has again partnered with other Illinois science organizations to bring you an incredible conference this year!

We are excited to have chosen the theme *Next Generation Science: Foundations and Futuristics* to reflect the Next Generation Science Standards (NGSS) which are currently being created by a team of science educators from across the country. We are excited to bring you presentations from four individuals directly related to the creation of the standards: Norm Dahm teaches biology at Belleville East High School, is the science assessment advisory hairperson for ISBE, and is a member of the Illinois review team for NGSS. Chris Embry Mohr, from Olympia High School in Stanford, Rita Januszyk from Gower West Elementary School in Willowbrook, and I are all members of the NGSS writing team. Together we will bring you the most up-to-date information on the creation and progress of the Next Generation Science Standards. We are also thrilled to welcome Doug Sisterson, climate researcher, from Argonne National Laboratory as our luncheon speaker. Additionally, since the conference starts just after Halloween, Patricia Sievert at the NIU STEM Center will bring their *Haunted Physics and Spooky Science* apparatus for viewing in dark and lighted rooms on Thursday evening and Friday morning. Something completely new this year is Science Flea Market. If you have any good used equipment, books, or materials that you no longer need, you can donate them to the conference for a science "garage sale." More details on this later on. You won't want to miss the Friday evening Gala which will be in the Crowne Plaza Hotel and have a Star Trek theme, featuring food, refreshments, networking, and a laser light show.

Shortly after the conclusion of the conference, the second public draft of the Next Generation Science Standards will be released. Members of the writing team are currently working hard to read all of the comments and make appropriate edits from the first draft release in May. Attending the ISEC conference in Springfield, November 1 - 3 will be the best way to get the most up-to-date information on the new science standards.

Have a wonderful fall, see you in November!
Carol K. Baker, Ed.D.
ISTA President

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ISTA Conference	Gwen Pollock
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Nominations and Elections	Past President – Gwen Pollock
Professional Development/Science Matters	Mary Lou Lipscomb
Publications Committee	Judith A. Scheppler
Informal Science	Susan Herricks

Join the ISTA listserve to Network Online!

ISTA encourages all of its members to join the listserve of our organization. News of timely value and networking opportunities are posted regularly. Safeguards have been incorporated to protect you from unneccessary electronic intrusions. Please send Kendra Carroll (kcarroll63@gmail.com) a simple note with your email in the body of the note and the wording on the subject line: please add me to the ISTA listserve.

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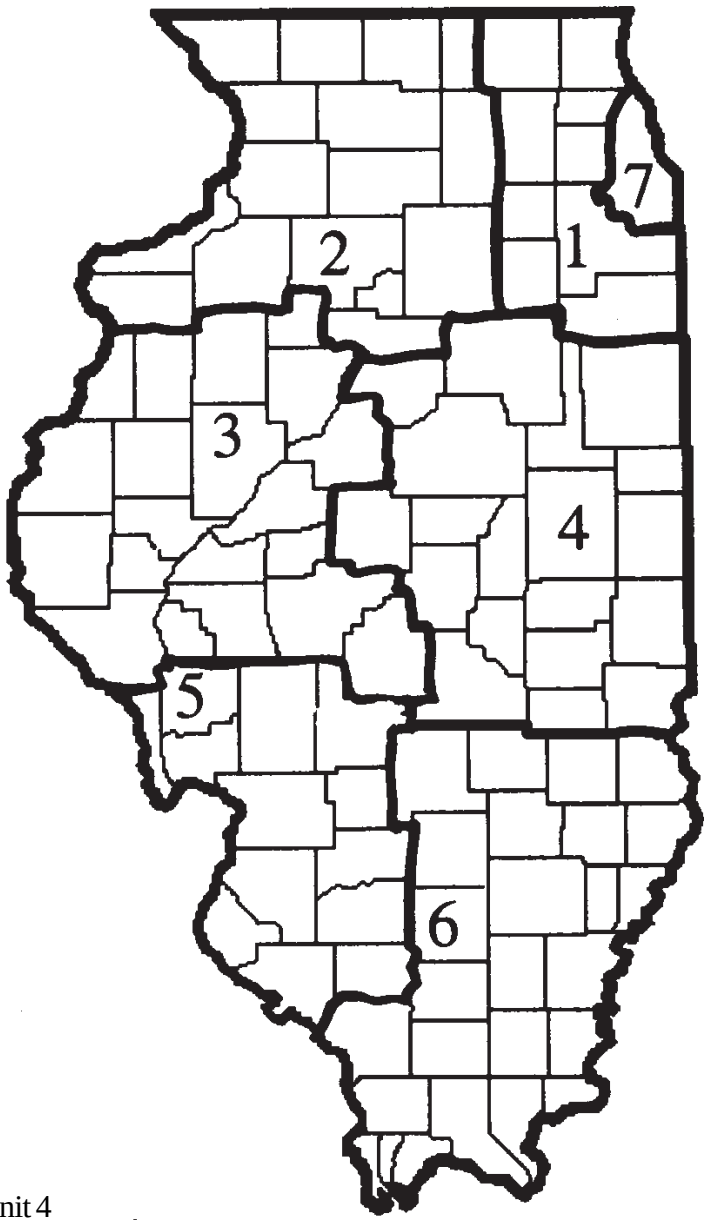

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According to ISTA bylaws, regional directors may serve only two consecutive terms. Directors noted with an "a" are in the first of a two-year term; those noted with a "b" are in the second consecutive two-year term.

Illinois Science Teachers Association

Membership Application
Please print or type and fill-out complete form

Name	Day Phone
Affiliation (School or Organization)	Home Phone
Address of Above Organization	Home Address
City, State, Zip Code	City, State, Zip Code
Email and/or Fax	County in Illinois/ ISTA Region (see map)

Check Applicable Categories in Each Column:

O Elementary Level	O Elementary Sciences	O Teacher
O Middle Level	O Life Science/Biology	O Administrator
O Secondary Level	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: Pamela Spaniol (email: pamela.spaniol@yahoo.com), ISTA Membership, PO Box 312, Sherman, IL 62684.

Membership Option (see below)_____ FFSE Membership Yes/No _____ Amount Enclosed _____

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*; 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 member benefits for five years.
Option 4: Associate membership dues - $15.00. For full-time students and individuals who are on retirement status. Entitles member to full menbership 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*; 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.
Option 6: Initial Certificate Option - $20.00. Full membership benefits to beginning teacher in the first to fourth year of teaching.

Fermilab Friends for Science Education (FFSE): Thanks to an ISTA-FFSE board agreement, for Options 1, 4, 5, and 6, teachers may receive a regular $10 membership in the FFSE for an additional $4.
See http://ed.fnal.gov/ffse/ for membership details.

Illinois Section - American Association of Physics Teachers (Is-AAPT):
Option A: College faculty will receive both ISTA and IS-AAPT memberships for $55 (+$20);
Option B: K-12 faculty will receive both memberships for $45 (+$10);
Option C: Full time college students and retirees will receive both memberships for $15 (no additional charge);
Option D: K-12 teachers in their first through fourth year of teaching will receive both full memberships for $30 (+$10).
See http://isaapt.org/ for membership details.

2012 Archives Update

Location and Contact: Western Illinois University Library, Macomb, IL 61455; Kathy Nichols, WIU Archives, 309-298-2717, k-nichols@wiu.edu

Conditions: All records become the property of Western Illinois University. The public will have free access to the materials, in accordance with the common practice of WIU libraries for such collections. Materials may be examined and photocopied but shall not be permitted to leave the premises.

Materials on Deposit:
A complete set of board minutes, correspondence, financial reports and membership data by year (1966-1999);
A complete set of conference programs (1967-2011);
A complete set of ISTA Newsletters/*Spectrum*s (1973-2011);
Spectrums published online (2012 and later) and currently archived at www.ista-il.org

Backup and Additional Records: These are located in the Maurice G. Kellogg Science Education Center, Horrabin Hall, Western Illinois University. They include:
An extra set of conference programs (1967-2008);
An extra set of ISTA Newsletters/*Spectrum*s (1973-2009);
An extra set of yearly records and correspondence (1966-1995);
Audit reports and other miscellaneous materials.

Current Archive Maintenance:
ISTA Archives Committee 2012: Tara Bell (chair), Harry Hendrickson, Maurice Kellogg, Pat Schlinder, Gwen Pollock, Don Powers (309-298-1258, DT-Powers@wiu.edu)

Previous Archive Maintenance: John Beaver, D. Wayne Green, Donald K. Hamilton, Maurice G. Kellogg, Don Nelson

Elizabeth M. Rueck
ISTA Founder
and first President

Illinois Science Teacher Association Early History

In the Spring of 1966, Elizabeth M. Rueck, chairperson of the Barrington Consolidated High School (BCHS) science department; Katherine Taft, BCHS chemistry and Earth science teacher; together with Ms. Nadine Dungan, a State of Illinois science supervisor; Sister Mary Alvernia, OFSC, of Madonna High School; and Sister Mary Wilma, SJ, of Nazareth Academy were invited to a meeting in St. Louis by Hank Blindel, NSTA's liaison for state and chapter groups. Following this dialogue and with financial support from Barrington Consolidated High School and the Illinois Office of Education, plus the enthusiastic support from the science staff at BHCS and other volunteers, the process of a establishing a state affiliate of NSTA was begun.

Barrington Consolidated High School provided the initial facilities, funding, staff, and motivation for the founding of a statewide organization. With the support of the Illinois Office of Education and the help of many volunteers, letters were sent to elementary, middle, and high school teachers of science inviting them to the October, 1966 NSTA regional convention in Chicago and to an organizational meeting of the Illinois Science Teachers. At this meeting of science teachers, Rueck was selected as the chairperson of this new science teachers group. Her selection was based on two considerations. First, Barrington was far enough from Chicago that it would not be viewed as a Chicago organization, but rather a statewide effort; and second, Rueck was well known for getting things done. The following statement by BCHS superintendent Robert Finley regarding her ability best exemplified her reputation, "Give her the job and get the hell out of her way!" In March, 1967 Rueck was officially elected the first president of the Illinois Science Teachers Association.

Planning for the first ISTA conference, to be held in the fall at LaSalle-Peru Community College and High School, began immediately with Mary Keegan serving as the first ISTA conference chair. There was consensus from the very beginning that the conference program collectively would encompass grade levels kindergarten through university science education and all science disciplines. The first program reflected this balance with a kindergarten teacher presenting a session on *Sensory Observations*; high school teachers presenting sessions titled *Physics in Illinois* and *Model Making in Chemistry*; and junior high teachers presenting *IPS: Introductory Physical Science*. Program sessions also included *Evaluating Science Instruction* and *Engineering Concepts*. This balanced program strategy was a success with 650 attendees and fifty-four exhibitors participating in the conference. The first conference drew science educators from as far away as Marion, even though it meant leaving home at 3AM!

The 1968 NSTA regional conference in Chicago served as the state conference the next year. The second annual ISTA conference was held in Rock Island in September 1969 and included a Friday afternoon and evening session. Lois Case served as the program chairperson for this conference and Maurice Kellogg chaired the Friday evening program.

ISTA has continued to sponsor an annual conference at sites such as Edwardsville, Chicago, Bloomington, Springfield, Rock Island, and Peoria, ensuring statewide coverage. Membership continued to grow under the aegis of early presidents which included Elizabeth Rueck, Hal Bunkelmann, Maurice Kellogg, Darrell Goar, Donald Hamilton, and Lois Case.

A more detailed history of ISTA will be found at the Archives table as well as procedures to access archive materials in the brochure *In the Beginning: The Origin of ISTA*.

ISTA State Conferences and Presidents

1967	LaSalle-Peru High School	Elizabeth Rueck
1968	NSTA National Convention, Chicago	Elizabeth Rueck
1969	Rock Island High School	Hal Bunkelman
1970	Bloomington High School	Hal Bunkelman
1971	LaSalle-Peru High School	Maurice Kellogg
1972	Hyatt Regency, O'Hare with School Science/Math Association	Maurice Kellogg
1973	Richwoods High School Peoria	Darrell Goar
1974	Southern Illinois University - Edwardsville	Darrell Goar
1975	Sheraton O'Hare with School Science/Math Association	Don Hamilton
1976	Forum 30, Springfield	Don Hamilton
1977	Hyatt Regency O'Hare	Lois Case
1978	Ramada Inn, Champaign	Lois Case
1979	Northern Illinois University, DeKalb	Fred Zurheide
1980	Knox College, Galesburg	Fred Zurheide
1981	Museum of Science and Industry, Chicago	Larry Small
1982	Northern Illinois University, DeKalb	Larry Small
1983	University High School/Illinois State University	Wayne Green
1984	Museum of Science and Industry, Chicago	Wayne Green
1985	Illinois State University, Normal	Tom Fitch
1986	Museum of Science and Industry, Chicago	Tom Fitch
1987	Hotel Pere Marquette, Peoria	John Staver
1988	Naperville High School	Wes Heyduck
1989	Parkland Community College, Champaign	Jenny Grogg
1990	Governors State University	Jenny Grogg
1991	Peoria Civic Center	Mark Wagner
1992	Pheasant Run, St. Charles	Mark Wagner
1993	Gateway Center, Collinsville	Dave Winnett
1994	Pheasant Run, St. Charles	Dave Winnett
1995	Prairie Capitol Convention Center, Springfield	Bernie Bradley
1996	Merchants Mart Expo, Chicago	Bernie Bradley
1997	Peoria Civic Center	Doug Dirks
1998	Rosemont Convention Center	Doug Dirks
1999	Prairie Capitol Convention Center, Springfield	Don Nelson
2000	Pheasant Run, St. Charles	Don Nelson
2001	Peoria Civic Center	Edee Wiziecki
2002	Pheasant Run, St. Charles	Edee Wiziecki
2003	Peoria Civic Center	Marylin Lisowski
2004	Interstate Center, Bloomington	Marylin Lisowski
2005	NSTA Regional Conference, Chicago	Ray Dagenais
2006	Peoria Civic Center	Ray Dagenais
2007	Peoria Civic Center	Jill Carter
2008	Peoria Civic Center	Jill Carter
2009	Peoria Civic Center	Gwen Pollock
2010	Crowne Plaza, Springfield	Gwen Pollock
2011	Tinley Park Conference Center	Carol Baker
2012	Crowne Plaza, Springfield	Carol Baker
2013	Tinley Park Conference Center	Paul Ritter

2011-12 ISTA Outstanding Science Teachers

Chris Embry Mohr, a ninth through twelfth grade agriculture science teacher at Olympia High School in Stanford, has worked on a farm milking cows, researched corn hybrids, and served as an agricultural education consultant. All of these experiences have helped her shape a unique and diverse science classroom and philosophy about education. Chris uses the agricultural approach to teach science concepts because it integrates various topics such as food production and medical research as well as new technologies. One example of Chris' innovative integration is an award-winning project that utilized hydroponics in the school's greenhouse. Andrew Wise, business and operations manager at Olympia, partnered with Chris on this project and said, "Chris had a vision … challenged students to design and build a system which would produce vegetables. Students created hydroponic systems [with] creativity, ingenuity, and imagination. Utilizing the latest technology in tablets and probes, students conducted growth experiments, ranging from [testing] soil types, water and pH levels, lighting, water flow rates, and a variety of other growing and environmental factors." With students taking ownership of their systems and completely immersed in the concept, Chris took the project a step further by seeing that the fruits and vegetables were served in the school cafeteria like the current farm to table movement. This project was presented at NSTA in Indianapolis this year and drew a crowd of curious science teachers beyond anything she imaged. According to Brandi Cooper, a fellow science teacher at Olympia, Chris revamped the science curriculum to include research-based projects that included cross-curricular aspects. "Chris also serves on the National Writing Teach for the Next Generation Science Standards … insuring the new standards are challenging and usable in the classroom." Her teaching has evolved from just memorizing facts to incorporating scientific and engineering practices so students can move beyond the basics to critical thinkers and decision makers. Thank you so much for your dedication and innovation Chris. Great job!

Emily Dawson, a seventh and eighth grade science teacher at Riverview Grade School in East Peoria, has an endless number of activities that keeps everyone at her school asking "What is she up to now?" From exploding pumpkins to lessons in boiling points of bubbling liquids dressed up as a witch, Emily keeps her students engaged by having fun with science. In January, the seventh graders competed in the ASCE Bridge Bust competition to see if the bridges they constructed encompassed the fundamentals of physics concepts, while the eighth graders dissected various specimens aided by three-dimensional interactive technology on the classroom white board. In addition, both classes are sending photograph requests to EarthKAM on the International Space Station to use in a multi-disciplinary unit that includes history and language arts classes. According to Bob Richardson, principal of Taylorville High School, "Mrs. Dawson provides countless hours into the success of her students, from science fair, Envirothon, and anatomy field trips, to the classroom instruction that she provides each and every day. I cannot begin to list all of the specific tasks she carries out to benefit her student learners." Another amazing and successful job Emily has taken on is grant writing. With all of the financial issues many districts are facing, Emily has not let that deter her. Here are few of the grants she has been awarded just in the last few years: American Society of Civil Engineers 2011 State Public Affairs Grant, STEM Education Outreach Activities at RGS, Environmental Education Association of Illinois 2011 mini grant, PNC Foundation 2012 FirstGrant, BrickLab Implementation K-8, 2009-2010 FirstGrant, Robot Build 2010, Challenger Learning Center 2012 Grant, DonorsChoose.org 2011 Worm Power, 2011 Bird is the Word, 2011 Illinois Water Quality and Conservation, 2010 Environmental Education, 2010 Pond, 2009 Yellowjacket Gardening/Greenhouse. Joseph Blessman, Riverview's superintendent, shares, "When our budget limits activities, Mrs. Dawson finds a way. She has

written numerous grants … to do activities that they otherwise would not have been able to experience." With her record of success I am sure everyone would be anxious for her to share her secrets. As one can see, Emily is dedicated to reaching her students in every way possible. Great job, Emily!! Congrats!

Jeremy French, a sixth through eighth grade science teacher at St. Joseph School in Olney, has been able to redefine his method of teaching for his students' learning by incorporating more hands-on investigations, leaving the wrote memorization behind. He found that this simple change encouraged his students' to start asking "what if" which led them to more experimentation. With this new excitement generated around Jeremy's science classes, he decided to expand their learning about scientific investigations by offering a science fair. The students begin their projects in August and use the scientific method as the guidelines for designing, researching, and writing about their experiments. By the end of January they are expected to have completed their research as well as written their papers in order to compete in the local, regional, and state science fairs. Jeremy's students have consistently advanced to state with papers and projects receiving best in category honors. Iffat Ali, the chair for Illinois Junior Academy of Science Region 4, praises Jeremy for his dedication to the science Fair. Dr. Ali commented, "Jeremy religiously brought his school, every year driving over one hundred miles. Many times he paid the entry fees for the students, drove them to the competitions, cheered, complimented, and encouraged them. His students always earned good marks and outstanding awards." Carol Potter, principal of St. Joseph also mentions, "Mr. French's commitment to the state science fair and students' successes in this endeavor serves our children and families well. The local high school teachers consistently praise our students." In addition to science fair, Jeremy has brought StarLab and Camp Invention to diversify his students' science knowledge. StarLab is a large inflatable dome that allows students to view the solar system as well as understand Native American mythology related to constellations, plate tectonics, and ocean currents. Camp Invention is a summer program he developed to offer students from all over the area the opportunity to use their scientific knowledge to solve work problems through new inventions they create. Jeremy's dedication to improving student learning through various programs and projects shows how important he is to his school and the community. Congratulations on a job well done!!!

Joe Jakupcak, a high school geology and environmental science teacher from Ottawa Township in Ottawa, has devoted his entire educational career to teaching science formally and informally. His remarkable legacy began in 1973 and has consistently included professional honors, presentations, workshops, organization leadership roles, and maintaining memberships in NSTA, NAGT, ISTA, and NESTA up to the year 2011. It is clear that Joe has touched many students' lives through the incorporated hands-on activities in geology and ecology that include field trips within LaSalle County to experience the actual geological formations or ecological habitats first hand. Two former students that Joe has influenced are Tara Bell and Stephen Brusatte. Tara, a current science educator, remembered the impact the field trips had on her. She was able to reconnect with Joe recently and observed him on a field trip. Tara said, "I appreciate his approach to science because the ability to think through problems in a logical, systemic way is one of the most important lessons we can teach students. Mr. Jakupcak believes one of the most valuable places to learn lessons is in the field, for authentic learning." Stephen Brusatte is currently a Ph.D. candidate in Earth and Environmental science at Columbia University and credits Joe with the passion that sparked his interest in geology, plus the personal mentorship he provided. According to Stephen, "I was a shy kid with a burgeoning passion for dinosaurs and fossils. I signed up for Mr. Jakupcak's geology class and learned about the Pleistocene landforms that dotted the Illinois prairies, but which had long gone unnoticed to my eyes." Joe spent personal time taking Stephen to

various fossil sites and encouraged him to do a senior research project that became a one hundred page thesis which was eventually published. Joe's outstanding dedication has recently won him the honor of being names Science Teacher of the Month by the Ottawa Township High School foundation. Joe Jakupcak is a shining example of a seasoned educator that has a special enthusiasm for the Illinois landscape and is teaching students that you don't have to travel very far to see all the wonders of the Earth and environment. Thank you for your tireless devotion, Joe. Congrats!!

Lisa Wissert, from Jonathan Y. Scammon Elementary School in Chicago, has established the goal of fostering a partnership between the school, families, and the community that enhance student learning in the classroom. She builds interactions between these partnerships with interactive homework assignments. One assignment required the students to design their own experiment in class then run the experiment at home, collect data, and analyze it with the involvement of the family. These types of assignments open up communication between teachers, students, and families where there might be hesitation due to informal education experiences. Carla Shortino, science instructional coach at the school, emphasized, "Lisa possesses so many extraordinary characteristics as a sixth and seventh grade science teacher. She brings to her classroom a sincere commitment to seeing her students succeed, and has an exceptional ability to help her students construct a solid understanding of scientific concepts and processes by finding creative ways to capture student attention." Lisa has also developed Family Science Night in which her students lead family and community members through experiments they have done in class and share the science behind it. For instance, students conducted experiments with attendees that demonstrated how diseases could spread through a population, they presented their findings from an infectious disease research project, and they shared wellness information provided by a local pharmacy. This experiment enabled the students, families, and community to see the real world application of science and the importance of understanding the implications it has on everyone. Joanna Doyle, a colleague of Lisa's at the school wrote, "She not only demonstrates mastery of pedagogy and content, but constantly goes above and beyond to provide students with rigorous and rich learning opportunities through professional development, grant writing, and the innovative use of technology in the classroom." Lisa obtained thirty-two iPads through a grant she wrote and now uses them to collect real-time data, developed eBooks, and organizes student research. Lisa has truly gone above and beyond to help her students; families and community come together for science. Congratulations Lisa!

Michael Novak, eighth grade science teacher at Park View School in Morton Grove, has transformed his science classroom through the use of IQWST (Investigating and Questioning Our World Through Science and Technology). Using the inquiry-based materials associated with this program, Michael saw such positive impact on students' levels of engagement and learning that he became a field test site for Northwestern University, Michigan State, University of Michigan, and the University of Illinois, and the research collected eventually lead to contributions to the New Science Standards Framework. Michael also found this type of involvement allowed him to self-critique more constructively, share scientific enterprise with his students, and pursue National Board certification. Lisa Brody-Fine, a colleague at Park View, reaffirms Michael's commitment by saying, "(He) took it upon himself to seek out what was then a radically new form of science curriculum for our school. After teaching the pilot, (he) made an impassioned case to the teachers and administrators (and) wanted us to move the district's entire curriculum … to this more innovative inquiry- based, standards-

aligned middle school science curriculum. [It] changed my teaching style to accommodate a much wider range of students' abilities … and I loved teaching the materials." Michael then realized that he must share these findings with others through numerous professional development workshops, journal articles, and presentations. He presented "Prove It! Writing Evidence-Based Explanations in Science" at ISTA's fall conference, as well as presenting a township-wide workshop to disseminate the New Science Standards Framework. Brian Reiser, professor of learning sciences at Northwestern University, said, "Michael is clearly an inspirational leader in his school. He has enthusiastically pursued opportunities for his teachers to become involved in professional development, research collaborations, and collaborated on developing and field testing innovative science curriculum materials. He has been an advocate for new initiatives in science education at his school, vigorously pursuing opportunities to bring the best ideas and practices to his school." Michael has definitely raised the bar for continuing the effort to make science education a cut above the rest. Congratulations Michael!

Rob Lang, the physics and engineering teacher at Glenbard South High School in Glen Ellyn, has numerous accomplishments that range from designing STEM curriculum to mentoring new teachers, piloting technologies, and hosting professional development events. As curriculum design leader he has developed student-centered and inquiry-based physics lessons that require students to collaborate to discover the phenomena behind the physics. Paul Z, a student that had taken the physics class said, "Memorization is minimized and conceptual understanding is maximized. Not only will students understand the material more thoroughly with student discovery labs, but they will also enjoy comprehending the overall theme/message of the unit." Rob then shared his overhauling experience with DuPage County to make an "Essential Physics Curriculum" so assessment could be improved, as well as incorporating professional development. As Rob redesigned the curriculum he was able to incorporate new technologies such as clickers, data collection software, and online quizzes and to help other teachers pilot or train with these devices. Professional development is another aspect Rob excels at. He mentors new teachers by making sure they are attending professional development activities, giving them feedback on their teaching and daily struggles. When he is not mentoring, he is attending conferences like ISTA, NSTA, and Physic West/ISPP meetings then sharing and training his colleagues from what he has learned. Daniel Pfeifer is one of those individuals that has benefitted from Rob's mentoring and sharing. Daniel said, "I would not be the educator I am today without the guidance of Rob. (He) knows when to step in to give more guidance and when to let me struggle. He introduced me to other passionate physics teachers in professional organizations such as the ISPP, and Physics Northwest. I have learned so much from Rob and look forward to working together in the future. Creating a STEM environment in our classrooms is a goal all science teachers strive for. Rob co-designed a project-based engineering course where students learn and use technology skills which include AutoCAD, woodworking, metal working, and robotics along with scientific principles to design and build projects. By combining physics and AutoCAD, students' projects became cross-curricular and reemphasize the correlation among STEM topics. The interest in this curriculum has spread into evening and summer classes for middle school students, further establishing the importance and fun of STEM. If that is not enough, Rob is the sponsor of the Science Olympiad team and the Technical Theater which builds set pieces for plays and musicals. It is clear that Rob is a dedicated teacher and selfless colleague. Congratulations!!

Ronald Fonck, honors biology teacher at Joliet West High School in Joliet, defines his greatest accomplishment as developing and teaching the first ever Advanced Placement Environmental Science (APES) class. Ronald dedicated two years of preparation to creating and revising the curriculum so that current and future students would have a program that would continue to challenge and benefit them, but also improve the scholastic achievements of the school. The APES class uses a variety of methods to meet the requirements of the College Board: extensive laboratory work with Environmental Science Kits offered by Carolina Biological, several practice test questions taking time to analyze the answers as well as the wording of the questions, and expanding students' knowledge with outside of class content research. As a result of Ronald's support and encouragement, of the students that took the AP exam, three had perfect

scores of 5, while 9 others scored highly giving Joliet an honor roll ranking. Ronald's principal Dr. Teresa Gibson noted, "Only 376 schools in the US made that honor roll; truly a proud accomplishment for (the) district." John Meyers, a student teacher of Ronald's, remembered that no matter what class he was teaching he always set high academic standards and supported every student with positive feedback and relentless energy. "As a colleague, he freely shares his educational philosophies and listens to the opinions of others, while always displaying his high degree of professionalism." Karla H. Guseman, assistant superintendent of educational services, said, "I meet regularly with Mr. Fronck and I have further witnessed his collaborative spirit and desire for the entire district to meet the needs of our students," Ronald is the kind of science teacher that every teacher should aspire to be. Congratulations Ronald. Continue your outstanding job!

Sindy Main, a seventh grade life science teacher at Carl Sandburg Middle School in Freeport, has made extraordinary accomplishments both inside and outside of the classroom which include participating in science research, improving our science curriculum, and investigating instructional methods. One of Sindy's fascinating adventures was being selected to go to Antarctica and collaborate with researchers from four different countries. She spent a month at Lake Untersee near a Russian Base and upon her return she created a curriculum that simulated the expedition, including tents set-up in the snow and data collection. Then her students taught elementary students about the rocks, birds, and bacteria that were currently being studied in the Antarctica area. Sindy had another arctic adventure to share with her students. After receiving a fellowship to participate in the Earthwatch expedition "Climate Change at the Edge of the Arctic," she was off to Canada and blogged to her students about the research on northward movements of tundra tree lines. Through both of these endeavors she has helped her students participate in real scientific research and expand their knowledge about global warming. Recently, Sindy has applied for the NOAA Teacher at Sea program, continuing with her adventurous spirit and dedication to bring the world to her students. Janice Hawkins, associate principal at Carl Sandburg, proudly described Sindy's fundraising/education project that helped her supply budget. "(Sindy) introduced Lights for Learning, a program to increase the awareness about global warming and add funds to our schools' science budget. Over the past three years the science teachers and students at both Freeport middle schools have raised over eight thousand dollars by selling…CFL's, and her students have learned the importance of reducing carbon emissions. Money earned is spent on science supplies, new science clubs, and community projects." Stacey Kleindl, principal of Carl Sandburg, further praises Sindy's work by saying, "She works tirelessly to improve and promote science education in Freeport as the instructional leader for science at the middle level." It takes a really strong educator to go the extra mile for science education and Sindy is truly the essence of one. Congrats on an exciting job well done.

ISTA Thanks

Chicago Drug and Chemical Association

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2011-12 ISTA Outstanding New Teachers of Science

Leilani Dominguez, a biology and physics teacher at Lyons Township High School in Western Springs, realizes that teaching requires continuous improvement and ongoing learning on her part. She stays ahead of the changes that occur at the state and federal level by attending workshops and classes that define the benefits of such changes in student learning. Since students' needs vary, Leilani has designed instructional patterns to address these different needs by "varying the nature of assignments, using multiple approaches to content, and using a blend of whole class, group, and individualized instruction." She has also implemented an innovative and creative curriculum that provides rigorous performance standards as well as new ideas and strategies to better facilitate a safe and productive learning opportunity for her students. Her method of instruction includes lecture, real-life application, demonstrations, group exercises, and student presentations so each student's learning style can be addressed. Leilani wants her students to go beyond learning in the classroom so she became a part of Science Olympiad. She said, "As a sponsor of the Science Olympiad team, I encourage my students to further explore their curiosity and passion for science by joining our afterschool academic team." In addition, Leilani encourages student to pursue independent projects that motivate them and help them become life-long learners. Leilani takes her job as a role model seriously. She wants to leave her students with the tool to be productive, responsible leaders that will benefit both the students as well as the community. Thank you, Leilani, for your caring and dedicated spirit. Congratulations!!

Michelle Wrona, a third year biology and physical science teacher at Lyons Township High School in Western Springs, is multi-faceted. She not only has passion for her students but shows dedication to the science field by holding state endorsements in biology, chemistry, and physics. Michelle began her science career working as a research specialist in the Department of Surgery Burn and Shock Trauma Institute at Loyola University Medical Center where she trained others in clinical lab practices. This type of real-world experience has helped Michelle design more meaningful hands-on experiments for her class as well as stories for the purposes of application of techniques. According to Jason Crean, a colleague at Lyons, "Michelle's teaching style is simple: make it interesting and the students will want to know more." Last year she helped develop a new curriculum to engage low level readers in biology and English as a Tier II RTI. The Biology English Cross Curricular Integration (B.E.C.C.I) course allowed Michelle to be creative by including a unit project that melds the skills of both biology and English. This curriculum challenged Michelle to help students improve reading scores, scientific literacy, and steer them to becoming life-long learners. She also worked on the committee to develop a college preparatory physical science course that emphasized chemistry with real-world applications. Outside of the classroom, Michelle continues her own life-long learning by taking classes through the Chicago Zoological Society, Chicago Botanic Gardens, and traveling to Belize to work on environmental conservationism. With such vast exposures, she is then able to compile all of that enrichment and bring it back to her classroom for her students to experience. Beyond her teaching skills, Michelle has an amazing ability to further connect to her students by volunteering at local fundraisers or just attending student plays or sporting events. It is easy to see why Michelle deserves the new teacher award. Congratulations Michelle! We are anxious to see what is next from you.

Peter Dong, a fourth year physics teacher at the Illinois Mathematics and Science Academy in Aurora, has impressed his colleagues with the quality and thoroughness of the feedback he gives his students on their written assessments. During his first years, he used the standard curriculum to carefully evaluate the work, making comments to enable students to improve their research and communication skills. But recently he has taken it upon himself to revamp the Scientific Inquiries

Physics class by putting all the assessment questions into Exam View, and coding them by topic and difficulty level so that the teachers can make multiple versions of unit assessments. He has also written additional integrative assessment problems to challenge students' critical thinking skills. Peter helped set-up and organize the Methods of Scientific Inquiry course by frequently volunteering information during meetings to assist instructors who are teaching the course for the first time. According to Susan Styer, an IMSA colleague, "Peter has great rapport with the students. Every year, he shows the musical that he wrote named Les Phys (a parody on Les Miserables) at an evening session. He also finds time to sit-in on other classes so that he is able to use pedagogical ideas from those classes in his own." Outside of the classroom, Peter dedicates time to helping students prepare for debate team, is a representative on the IMSA strategic planning committee, and gives seminar presentations on academic ethics. As a new teacher Peter has definitely shown how important it is to be not only a caring teacher but part of the school community. Congratulations Peter!

Rob Wallon, high school Earth science and anatomy and physiology teacher at Morris Community High School in Morris, has realized early in his career the importance of not waiting for things to happen for you, but to make them happen. In these three years, he was a fellow for the NSTA New Science Teacher Academy, participated in an elite conference of digital microscope technologies, became advisor for the Science Club, and coached the Environthon team to a state qualification. In addition to all of that, Rob has been attending professional development programs in CRISS strategies, iPad technology uses, and continues to be a life-long learner by taking graduate courses. Kelly Hussey, principal at MCHS, has nothing but praise for this new teacher. He said, "Rob has contributed both as a member of our science teaching faculty, and as an assistant coach. I will not only claim him as the single best non-tenured teacher I have worked with in my thirty-three year teaching career, but also that he has been a positive influence on both our faculty and student body." Rob is considered a challenging teacher, but he has won over his students by raising the bar and pushing them to meet the challenge. He "shows poise and professionalism, mature and positive characteristics, and a strong work ethic" which all of his students benefit from because it shows them what a productive individual is. It is clear that Rob has a promising career in science education. Congratulations on your early success and we look forward to see and hearing more about your enthusiasm for science.

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Illinois Science Education Conference—REGISTRATION FORM

Joint Partnership of ISTA-IACT-IABT-EEAI

Springfield Crowne Plaza Hotel--November 1-3, 2012

YOUR INFORMATION—please print clearly or type; all fields are needed; * fields will appear on your badge.

First name*_____ Last name*_____

Job Position/Title*_____

School/Affiliation*_____

Business Mailing Address_____ Business phone_____

City*_____ State_____ County_____ Zip_____

Home Mailing Address _____Home phone_____

City_____ State_____ Zip_____

Email _____

Name of guest/spouse attending conference with you*_____

Please check:

I prefer to receive mail at home___ OR School/Business___. I plan to be a session presenter____. I have taught 4 years or less____.

I prefer a non-meat luncheon___. I will donate science equipment or resources___. I'll need Special Assistance___. Describe_____

I am a member of □ ISTA □IACT □ IABT □EEAI Membership#_____(Membership will be confirmed)

Discipline(s)-check all that apply		Position(s)-check all that apply	Grade(s)-check all that apply
□ Earth sciences	□ Integrated sciences	□ Teacher	□ Elementary
□ Elementary sciences	□ Physical sciences	□ Supervisor/Coordinator/ Administrator	□ Middle/Junior High
□ Biology/Life sciences	□ Chemistry	□ Student	□ High School
□ Environmental sciences	□ Physics	□ Retired	□ 2-yr Community College
□ General sciences	□ Other_____	□ Other_____	□ 4+-yr College/University

CONFERENCE REGISTRATION—Thursday, Friday, Saturday Options

*includes Thursday reception 6-8 pm, Friday & Saturday continental breakfasts, and Friday noon luncheon.

Registration Fees with Postmark Deadlines—*Circle your choice*				Payment Totals
Status option	Postmarked by 9/29/12	Postmarked by 10/20/12	Onsite/ posted after 10/20/12	
*Full, current ISTA/IACT/IABT/ EEAI member	$130	$145	$155	Registration: $_____
*Full, ISTA membership renewal	$165	$180	$190	Spouse fee: $_____
*Full, non-member	$165	$180	$190	Gala $_____
*Full, Institutional member (up to three individuals)	$125 /each	$140/each	$150/each	Saturday tour $_____
*Full, Student including membership	$30	$30	$30	Saturday workshop $_____
Thursday evening only	$70	$75	$80	TOTAL $_____
Saturday only	$70	$75	$80	
Non-teaching spouse/guest (no Friday Luncheon)	$20	$20	$20	Payment Method:
Special events: see Description Page (may be sold at registration, pending space availability)				By Check #_____
Friday Evening Gala—entry, food, refreshments, fun.			$35	By Purchase Order #_____(attach)
Saturday Field Trips Choice 1st ___2nd___3rd____ See ad. details			$20	By Credit Card—online only: www.ista-il.org No additional charge for online registration with credit card.
A. Lincoln Museum & Nat. Museum of Surveying- Science on Sphere				
B. Rail Splitter Wind Farm				
C. IPRB petroleum drilling sites				
D. Adams Wildlife Sanctuary—IL Audubon Society				
E. Rolling Meadows Organic Farm and Brewery				
F. IL State Museum & Research & Collections Center				
G. Dickson Mounds Museum & Emiquon Natl. Wildlife Refuge				
SATURDAY WORKSHOP SIGNUP (see www.ista-il.org in August for details)				

Please make checks or purchase orders payable to Illinois Science Teachers Association. Send to ISTA Membership Secretary, PO Box 312, Sherman, IL 62684. Admittance to conference only by registration. If your registration is received by 10/22/12, you will receive confirmation by email. All registration materials will be at the conference registration desk.

2012 ISEC Schedule

Thursday, November 1 Crowne Plaza Hotel

Noon - 8:00 PM **Registration Open**: Registration Desk, Ground Floor
Noon - 5:00 PM Exhibitor Set-up: East Loading Dock and Plaza Rooms, Ground Floor
4:30 PM - 8:30 PM **Haunted Physics and Spooky Science**: Plaza Rooms A and E
5:30 PM - 8:00 PM **Exhibit Hall Open** and **Reception**: Plaza Rooms F - J

Friday, November 2 Crowne Plaza Hotel

7:00 AM - 4:30 PM **Registration Open**: Registration Desk, Ground Floor
7:30 AM - Noon **Exhibit Hall Open:** Plaza Rooms F - J
8:00 AM - 11:50 AM **Conference Presentations** in Twenty-two Rooms: First - Fourteenth Floors
9:00 AM - 9:50 AM **Plenary Session**: Next Generation Science Standards, Second Floor Diamond Room
Noon - 1:15 PM- **Presidents' Luncheon**: Second Floor Diamond Room (ticket required)
Keynote Speaker **Douglas Sisterson**, Argonne National Laboratory
1:15 PM - 4:30 PM **Exhibit Hall Open**
1:15 PM - 1:50 PM **Illinois Association of Chemistry Teachers** meeting, Second Floor Topaz Room
1:15 PM - 1:50 PM **Illinois Association of Biology Teachers** meeting, Second Floor Onyx Room
1:15 PM - 4:30 PM **Science Flea Market,** Exhibit Hall
2:00 PM - 3:50 PM **Conference Presentations** in Twenty-two Rooms: First - Fourteenth Floors
4:00 PM - 4:30 PM **Raffle** in Exhibit Hall Plaza Room G (must be present to win)
4:30 PM - 5:00 PM **Illinois Science Teachers Association Annual Membership Meeting**: Plaza E
6:00 PM - 10:00 PM **Gala: Star Trek Light and Sound Show** with food and beverages (ticket required)
Second Floor Diamond Room

Saturday, November 3 Crowne Plaza Hotel and Various Field Session Locations

7:00 AM - 10:00 AM **Registration Open**: Registration Desk, Ground Floor
7:30 AM - 9:00 AM **Continental Breakfast**: Plaza Room F
8:45 AM - 9:00 AM Transportation Loading for **Field Sessions**: Hotel Front Entrance
9:00 AM - 11:50 AM Seventeen **Workshops and Sessions** in Thirteen Rooms, First and Third Floors
Noon - 3:00 PM ISTA Board Meeting and Luncheon: Third Floor Governor's Conference Room

Conference Highlights

Exhibit Hall Opening and Reception
Thursday, November 1, 5:30 - 8:00 PM
Plaza Rooms F - J

Reception, food, refreshments, and exhibits!

NIU's Haunted Physics and Spooky Science
Thursday 4:30 PM - 8:30 PM
Plaza Rooms A and E

Douglas Sisterson
How do Scientists Get it Right?
Friday Noon Luncheon Keynote

Science Flea Market
Friday 1:15 PM - 4:30 PM
Exhibit Hall

Raffle of Thousands of $$$$ of Science Materials and Services
Friday 4:00 PM in the Exhibit Hall
(you must be present to win)

Gala: Star Trek Light and Sound Show

Second Floor Diamond Room
Crowne Plaza Hotel

Friday, November 2, 6:00 -10:00 PM

Food, Fun, Refreshments, Colleagues

This is an excellent opportunity for you to meet informally with your fellow science educators, while ebjoying food, beverages, a sound and light show, and a few surprises!

Pre-registration required: Tickets are $35
Check at the registration desk for ticket availability

Registration Hours

Thursday 11/1/12	Friday 11/2/12	Saturday 11/3/12
CPH Registration Desk	CPH Registration Desk	CPH Registration Desk
Ground Floor	Ground Floor	Ground Floor
12:00 PM - 8:00 PM	7:00 AM - 4:30 PM	7:00 AM - 10:00 AM

Plenary Session

The most up-to-date information on the creation and progress

of the

Next Generation Science Standards

presented by members of the Illinois writing team

Carol Baker - Community High School District, Oak Lawn
Norm Dahm - Belleville East High School
Chris Embry Mohr - Olympia High School, Stanford
Rita Januszyk - Gower West Elementary School, Willowbrook

Friday, November 2, 2012

9:00 AM - 9:50 AM

Second Floor Diamond Room

Crowne Plaza Hotel

The Crowne Plaza Hotel is located at 3000 South Dirksen Parkway, exit 94 from I-55 then go north 1/4 mile. Amenities include: free parking, free WiFi, indoor pool on the fourteenth floor, a fitness center, and the Rosewood Dining Room.

Haunted Physics and Spooky Science

4:30 PM to 8:30 PM Thursday

Plaza Rooms A and E

Hundreds of demonstrations and science-based displays!

Hooking Kids with Haunted Physics

NIU Spooky Science Saturday started out as NIU's Haunted Physics Laboratory in the fall of 2003 as a way to draw families to a physics department outreach event on campus. It has been an overwhelming success, growing from several interactive displays in two labs visited by 250 people that first year to nearly one hundred interactive displays in six physics and chemistry labs and several hallways visited by thousands of people.

In 2005, NIU Physics Outreach received a grant from the American Physical Society to bring the Haunted Physics Laboratory to several community colleges in the region. As part of that process we wrote up some of the activities to be used by elementary and middle school teachers in their classrooms. We are now making them available online. If you have questions about any of the activities, please contact Pati Sievert, NIU's STEM Outreach coordinator, at psievert@niu.edu or go to www.niu.edu/stem.

Conference Session: *Hooking Kids with Haunted Physics and Spooky Science*
Friday 8:00 AM, First Floor Plaza Rooms A and E

Presidents' Luncheon

Friday, November 2, 2012
Crowne Plaza Hotel
Second Floor Diamond Room
Noon - 1:15 PM

Guest Speaker: Douglas Sisterson
Research Meteorologist
Environmental Science Division
Argonne National Laboaratory

How Do Scientists Get The Right Answer?

Abstract

How do scientists get the right answer? How do they do what they do? This presentation will begin with an engaging dialogue that will explain how scientists get the right answer. Be prepared to be challenged. Doug uses a whip to make his point! Then, he applies this scientific process to address the latest results on climate change. Is global warming the real deal, or just a good story?

Biography

Doug Sisterson is a senior manager at Argonne for the U.S. Department of Energy's (DOE) Atmospheric Radiation Measurement (ARM) Climate Research Facility. The ARM program is the largest federally sponsored climate change research program in DOE and the ARM facility provides the world's most comprehensive 24/7 observational capabilities for obtaining atmospheric data specifically for climate change research.

Doug has the overall responsibility for one fixed site, one mobile site, and instrument coordination for the ARM Program. Specifically, Doug manages the Southern Great Plaines (SGP) site, the first and largest field measurement site established by the ARM Program. Scientists use SGP data to improve cloud and radiative models and parameterizations and, thereby, the performance of atmospheric general circulation models used for climate research. Doug also oversees the operation of the second ARM Mobile Facility that will be deployed on Gan Island in the Maldives in late 2011. Additionally, Doug manages the instrument mentors that oversee the day-to-day quality of all ARM instrumentation used to provide atmospheric observations.

Before turning to climate change, Doug's experimental work covered fundamental boundary layer meteorology and micrometeorology, wet and dry removal processes, and pollutant transport. His earliest work focused on wind energy. Studies between 1980 and 1990 emphasized the physical and chemical processes that lead to acid precipitation. He was principal author of a cornerstone report: the *State of Science Report* for the National Acid Precipitation Assessment Program. In 1990, he transitioned from basic research to management of climate facilities for the ARM Program.

Doug has always had a fascination with severe weather. He has participated in hail and lightning research programs and has even chased tornadoes with members of the National Severe Storms Laboratory tornado chase program. Doug frequently lectures on a range of weather and climate topics in educational environments ranging from middle school classrooms to scientific forums to TED talks.

Science Flea Market

ISEC Science STUFF

Sustainable Teachers Using Functional Finds

Sponsored by American Science and Surplus http://www.sciplus.com/

Friday 1:15 PM - 4:30 PM
Exhibit Hall

Your trash may be someone else's treasure!
Bring items that you no longer need, which others may find useful.
You may even find incredible stuff at unbelievable prices!

Examples of Items You Can Bring to Share	Please Don't Bring
Demonstration props Hands-on materials Workbooks Resource books Copies of activities Surplus supplies such as glassware, goggles, and aprons Equipment no longer part of your curriculum Pieces of equipment that others might use for replacement parts School supplies such as binders, markers, or construction paper	Class sets of old textbooks Any books greater than ten years old, except reference books Mercury thermometers Chemicals Anything in formaldehyde Computers, monitors, printers, or other similar equipment

At the Conference

Bring your donations to our area in the exhibit hall Thursday evening through Friday noon: look for the *Science Flea Market* sign.
There will be carts at the registration area for your use.
Be sure to sign-in at the Flea Market area so we can recognize donors.

The items in the flea market will be available for purchase by ticket only, from 1:15PM - 4:30 PM on Friday.
Everyone will receive tickets with their registration, and extra tickets can be purchased for $1 each (6 for $5 and 12 for $10) at the registration booth or in the flea market area.
Merchandise will be priced to sell. This is a fundraiser and proceeds will benefit Illinois science teachers.
Any items remaining at the end of the event will be donated or disposed of at the committee's discretion.

Questions? Comments? Suggestions? Want to Help?

contact Susan Camasta: sfc1939@comcast.net

ISEC Conference Support

Sponsor of the Presidents' Luncheon

PASCO

Igniting 21st Century Scinece Education

CESI

Council for Elementary Science International

New Teachers Reception

The Scope Shoppe Inc.

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ISTA General Membership Meeting Friday November 2 4:30 PM - 5:00 PM Plaza Room E

This session of the convention affords the members of the Illinois Science Teachers Association the opportunity to express their ideas, concerns, and suggestions to the board regarding the future directions of the association. All members (including those who have just joined at this convention) should plan to attend. You won't want to miss it!

NSTA National Conference on Science Education

San Antonio, Texas

April 10 - 14, 2013

Future Science Education Conference Plans

(tentative)

2013 - NSTA STEM Forum and Expo, St. Louis, Missouri, May 15 - 18, 2013
2013 - ISEC - Tinley Park Conference Center, Tinley Park, Oct. 24-26, 2013
2014 NSTA National Conference on Science Education in Boston, April 3 - 6, 2014
Fall 2014 Science Education Conference, Southern Illinois
2015 NSTA National Conference on Science Education in Chicago, March 26 - 29, 2015

Achieve3000
Anatomy in Clay Learning System
ISTA Archives Committee
Artec Educational
Bedford, Freeman, and Worth Publishers
Carolina Curriculum
Challenger Learning Center
Council on Elementary Science International
CPO Science
Delta Education
EF Education
Eastern Illinois University
Environmental Education Association of Illinois
Fermi National Accelerator Laboratory
Fisher Science Education
Flinn Scientific
Frey Scientific
Grace Educational Resources
Grand Classroom
Great Rivers Research and Education Center
iBIO Institute
Illinois Association of Aggregate Producers
Illinois Association of Biology Teachers
Illinois Association of Chemistry Teachers
Illinois American Water Company
Illinois Department of Natural Resources
Illinois Environmental Protection Agency
Illinois Junior Academy of Science
Illinois Mathematics and Science Academy
Illinois Petroleum Resources Board
Illinois Section of the American Water Works Association
Illinois Science Matters
Illinois Science Teachers Association
Illinois Society for Clinical Lab Science
Illinois State Board of Education
Illinois State Geological Survey
Illinois State Museum
Illinois State University and Western Illinois University: Illinois Wind for Schools
Illinois Water Environment Association
It's About Time
Lights for Learning
NSTA eCybermission
Morton Arboretum
Museum of Science and Industry
National Oceanic and Atmospheric Administration
Northern Illinois University: STEM Outreach Center
PASCO Scientific
Phillips 66: Wood River Refinery
Presidential Awards for Excellence in Mathematics and Science Teaching
Sangari Active Science and Sangari IQWST
Sequestration Training and Education Program
The Science Alliance
The Scope Shoppe
University of Illinois at Urbana-Champaign: Extension
University of Illinois at Urbana-Champaign: Physics Department
University of Illinois at Urbana-Champaign: School of Integrative Biology
Vernier

Visit the Exhibit Hall!

Plaza Rooms F - J

Visit with vendors, scientists, fellow teachers, and government, industry, and organization leaders on science education issues

Hours

Thursday 5:30 - 8:00 PM
Includes Reception

Friday 7:30AM - Noon
and
1:15 - 4:30PM

Entrance to Exhibit Hall with conference identification badge only

Science Matters

Mary Lou Lipscomb
Illinois State Coordinator

As the Illinois coordinator for Science Matters, I attended an informative meeting at the NSTA National Conference last spring regarding the Science Matters network. Attendees at the meeting included many of the thirty-six state coordinators; NSTA president Patricia Simmons; NSTA executive director Francis Eberle; NSTA director of professional development Kim Cherry; and senior director of the NSTA Learning Center Flavio Mendez.

The primary topic at the meeting was the transition of the Science Matters network from an email system through the NSTA/Science Matters website, which we have used for the *Network News* here in Illinois for several years, to becoming part of the NSTA Learning Center. The change would require members of the Science Matters state networks to log on to their state page on the Learning Center to find the information that is currently sent to them via an eblast.

Initially the state coordinators were told that NSTA would be closing down the Science Matters email system at the end of this year, December 2012. However that deadline was pushed back indefinitely when NSTA realized how many of the Science Matters state coordinators depended on its use to contact members of the network, and how many network members there are across the thirty-six states that are part of the Science Matters network.

I have been working with the ISTA board of directors to determine if ISTA could provide some level of support if (when) NSTA stops providing the web-based email system to Science Matters. When I met with them in June, the ISTA board was receptive to providing support, but because the actual end date for the use of NSTA's web-based email is not currently known, the board did not move forward on making any decisions regarding the level of support to be given to Science Matters.

I would encourage all Illinois science teachers to visit and become members of the NSTA Learning Center: http://learningcenter.nsta.org/. It is free to join and membership in NSTA is not required. The Learning Center is an interactive website that provides a wide variety of opportunities for personal professional development, including live, on-line seminars and classes; links to books, articles and websites; do-it-yourself learning experiences; and much more. At this point Illinois does not have a dedicated page on the Learning Center website, but I will contact the current members of the Science Matters network as soon as the Illinois section of the Learning Center is up and running.

If you are not a member of the Science Matters network and would like to become one, please go to http://bap.nsta.org and click the "Become a Point of Contact" button. If you previously were a member but have changed your email address, or for some other reason have stopped receiving the *Network News*, please contact me at lipscomb@imsa.edu. Include your full name and your school name and address in your email request. Until further notice, the *Network News* will continue to be sent to all of the Science Matters network members, as it has been for the last several years.

Book Review

A Planet of Viruses
Authored by Carl Zimmer

Book Review by Ray F. Boehmer
Millikan University

If you are interested in biology and you have never read anything by Carl Zimmer, you had better get moving. Zimmer has written some very popular books in recent years, including *Microcosm: E. coli and the Science of Life*, *Parasite Rex*, and *Brain Cuttings: Fifteen Journeys Through the Mind*. He has also written for the *New York Times*, *Scientific American*, *Discover*, *Time*, and *National Geographic*. He seems to have a great feel for the latest that is happening in the life sciences and produces a great book that is fun and easy to read. I was captivated by *Parasite Rex* - I couldn't put it down, while finding much of it repulsive and shocking. Zimmer gets very high reviews from some very well known scientists and science writers like Richard Dawkins and Laurie Garrett.

A Planet of Viruses is a short book with brief, but information-packed chapters. And there are many illustrations, most of which are color-enhanced electromicrographs. To quote writer Jonathan Weiner, this book should be of interest to "anyone on this planet who has played host to a virus." So that's everybody, most likely. And if you don't believe that, you will after reading *A Planet of Viruses*.

As a former biology teacher and current science teacher educator, I consider this book essential background reading for all life science teachers. And the good part of having that hanging over our heads is that the book is only 108 pages in length, including the index. Each of the ten chapters, as well as the introduction and epilogue, has from three to eight selected references to provide the reader with additional sources. Of the sity-six references, there was one from 1991 and one from 1999, the rest being from 2003 to 2011. Twenty-six of the sixty-six sources were from 2009 or later, attesting to the up-to-date material that Zimmer took the time to include.

I suppose if you have taken a full course in virology, the book might seem superficial. But if you are looking for a primer on viruses that covers the basics and more, this is a good place to start. Or if you want to be able to give your students a good taste of how pervasive viruses are in our world and how scientists have discovered what we know about viruses, this book is a great source.

The chapter on the "uncommon" cold is fascinating – everyone should read it. It might make us think a little differently about the annoying malady that strikes most of us at least once a year. How about this?: "Scientists have gathered a great deal of evidence that children who get sick with relatively harmless viruses and bacteria may be protected from immune disorders when they get older, such as allergies and Crohn's disease." (p.13)
The book is divided into three main sections after an interesting introduction about the tobacco mosaic virus. The first main section approaches viruses from a historical angle, with excellent chapters on the "uncommon" cold, influenza (plus a fascinating account of the origin of the word), and human papillomavirus. The second section looks at where viruses can be found - as in everywhere. The are three chapters that deal with bacteriophages, marine phages (this is the chapter that totally surprised me), and endogenous retroviruses (our inner parasites). The book's third section is about "the viral future." The four chapters in that section are on human immunodeficiency virus (HIV), West Nile virus, severe acute respiratory syndrome (SARS) and Ebola, and smallpox.
Even the epilogue was very informative. It gave the account of the discovery in England in the 1990s of a very large virus that was first thought to be a bacterium. It was what is now known to be a mimivirus. A mimivirus breaks the cardinal rule for being a virus – it is one hundred times too big to be a virus (p.90). But that's exactly what it is.
Other topics the book reveals that biology students and teachers will find interesting and useful: viruses are sloppy copiers of genes when they are involved in hijacking cells; they don't carry their own repair systems like most cells; viruses are more vulnerable to lethal mutations; viruses contain a genetic archive that has circulated Earth for billions of years.
You will get up to speed on viruses with Zimmer's book. I learned something new and fascinating in each and every paragraph. This is also the kind of book that we can hand to a motivated middle or high school student and expect him or her to be able to understand much of it. With the combination of high resolution photos and short chapters, the book can prove to be something that students can use to gather basic information about the viruses in their world.

Zimmer, Carl. (2011). *A Planet of Viruses*, University of Chicago Press.

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Articles

New Picture Books to Support Science in the Classroom

Jean Mendoza
University of Illinois at Urbana-Champaign

Teachers in pre-kindergarten through elementary grades who are looking for ways to engage students in thinking about some of the big ideas of science may want to try introducing their classes to some new picture books. The following five, published in 2011 and 2012, are likely to start some very interesting conversations!

Green by Laura Vaccaro Seeger

Laura Vaccaro Seeger is known for her clever approach to illustration and her ability to make the most of very few words. In *Green*, Seeger invites young readers to consider many shades of green that occur in the natural world and in the world humans make for themselves. While not an informational book in the strictest sense, *Green* is a science book because it invites readers into an unusual way of looking at real things in natural and built environments.

The book's text consists of sixteen lines of verse, expressed in only thirty-four words counting the title and a STOP sign. The illustrations – richly textured paintings on canvas – are given added dimensions of mystery and humor with artfully placed die-cuts that link each two-page spread to the ones that come before and after it. The result is a book that is by no means as simple as it initially seems.

Among the scenes Seeger creates are a dense deciduous forest, an undersea environment with fish and a sea turtle, two tabletop still-lifes, and several representations of life on a farm. The paintings depict daytime, nighttime, and a variety of seasons.

This book could appeal to children at several age levels. Children in preschool, kindergarten, and the primary grades can easily understand the simple text and its relationship to the illustrations. Class investigations could take off from the book in a variety of directions: What can we find around here that's green? What foods are green? What life forms are green? *Green* could support investigations of plants, animals, or farm life. Or if a class is studying light and shadow, or day and night, they might want to compare how various shades of green look in sunlight to how they look at night or in shadow. The book could also inspire experiments with color-mixing: How might a person create shades that match green things they see around them?

Green might also inspire older children to rework their observational drawings of plants and animals into paintings with cutouts, which they might share with younger science buddies to show what they have learned about the things they have depicted.

I have only one concern about the book's factuality. Partially hidden behind one of the stylized trees on the "forest green" page is a white, pink-nosed rabbit – something that would only be seen in a real forest if someone's albino pet bunny escaped. This would be an opportunity to pull out a field guide to mammals and discuss the real colors of wild rabbits. (Another illustration of a zebra with green stripes, is labeled "wacky green," indicating that this creature is purely fantasy and is meant to be humorous.)

See Seeger's website for a *Green* book trailer and a glimpse of the notebooks that were integral to the creation of *Green*. http://www.studiolvs.com/website_root/StudioLVS_Home/Educators_Kids.html

Step Gently Out by Helen Frost, Photographs by Rick Lieder

The world of children's literature is proving to be a comfortable home for "science poets" – authors who use imagery, figurative language, and verse to write with factual accuracy about scientific topics. (This subgenre is sometimes called "creative nonfiction" or "lyrical nonfiction.")

Among the most recent books of science poetry is *Step Gently Out*, a collaboration between author Helen Frost and photographer Rick Lieder. A look at the book's front endpapers gives readers a sense of what's inside: a larger-than-life-size honeybee flies away from the camera, toward a glowing background of gold and red. Following on that is a series of evocative two-page and single-page photographs of familiar-looking insects and spiders, illustrating Frost's text. As the title suggests, the poem itself is an invitation to the reader to step out into nature and observe the creatures that "share the world with you." The way it makes that world so accessible might help alleviate the fears that some children have about such creatures.

Step Gently Out could serve a supporting text for a class investigation of insects. The macro photographs reveal detail seldom seen by the naked eye, which might inspire students to look more closely at the creatures and plant life they encounter daily. On the final two pages of the book is a key featuring small versions of the photographs, with brief factual text about each insect or spider in the book, which can augment what the students might be finding in field guides or other resources. And be sure to call children's attention to the back endpapers!

***Falcon* by Tim Jessell**

Straddling the line between realistic fiction and creative nonfiction is author/illustrator Tim Jessell's *Falcon*. This book consists of a few line of prose on each of fifteen two-page spreads, plus two single-page illustrations. Most of Jessell's expressive paintings show a peregrine falcon in a variety of settings: flying through a snowstorm or along a rugged coastline, perching at night on sea cliffs, standing high above a contemporary city. The story begins, however, with a boy lying on grass, looking upward, and thinking, "If I were a falcon…." Each subsequent painting describes what he imagines himself doing as a falcon. The book ends with the boy obviously delighted to see a falcon overhead.

By letting the boy share his thoughts, rather than having the falcon itself "speak," Jessell makes this a story about a fact-based fantasy, rather than a fantasy story. In the process, he manages to impart quite a bit of information about peregrines, such as their eating habits ("No bird would dare to venture out when I came into view."), their migration patterns ("I would fly along the coastline and over the sea, darting above the waves and scattering seabirds before me."), and their recently-acquired ability to survive among "the man-made cliffs of a great booming city."

Amazon.com recommends this book for "age three and up" but the vocabulary and content are suitable for older students as well. *Falcon* could support investigations focused on birds or on wild animals in cities. As students become expert on animals they study, they might incorporate their knowledge of the creatures' habits into stories that start, as this book does, with "If I were a ___..."

The teacher also might want to show children the Field Museum's web pages about peregrines (http://fieldmuseum.org/explore/illinois-peregrines) which has information about where peregrines have been seen in Illinois, including places where they have recently nested – primarily in and around Chicago. Students may be especially interested in links to nest cams and still images of peregrine chicks hatching. (For example, a mated pair known as Nona and Squawker, have nested on the Evanston Public Library for about five years.)

***Look and Compare: A Photo Analogy Game* by Kristen McCurry**

Understanding analogies is important in math and science. *Look and Compare* provides a basic explanation of analogies, followed by a fill-in-the-blank "game" in which readers/players can choose from several options (represented with photographs) to complete such analogies as "Bat is to ball as hockey stick is to ___" and "Sun is to day as ___ is to night." These analogies involve objects or experiences familiar to most children: pizza, a spoon, shoes, a baseball. The photographs, while not great art, are for the most part unambiguous enough to avoid confusion, and each option is clearly labeled.

It's easy to visualize a teacher of five to eight-year-olds "walking through" the book with a group of children, talking with them about how they have decided which answer is the best match. And it's a good idea for the teacher to be involved to help literal-minded children get past some inconsistencies.

For example, "sky is to blue" is represented by two photos – a blue sky with small puffy clouds

and a blue crayon next to a blue scribble on a white field. The corresponding phrase is "as grass is to ___". The correct choice to fill in the blank is a green square labeled "green." Some children may wonder why "green" is represented by a solid block of color instead of a green crayon and a scribble.

At least one of the analogies is open to argument. "Fish is to water as ___ is to sky" offer the choices "blue," "dog," and "bird" (specifically, a hummingbird). Children who are critical thinkers and who have first-hand knowledge about birds may assert that none of the choices is exactly right - birds do not live only in the sky, while fish can live only in water. But the resulting discussion is likely to stretch the children's minds, and the teacher can introduce the strategy of choosing answers that makes the most sense, even if it's not completely accurate.

Look and Compare is meant to be didactic; its sole purpose is to teach how to understand analogies. But for children who are new to, or challenged by, the concepts and processes involved, this book may help make analogies enjoyable and less mysterious. Teachers who share the book with their classes may also find that the conversations it provokes are sources of insight into how individual students reason.

***Do You Know Which Ones Will Grow?* by Susan A. Shea, illustrated by Tom Slaughter**

What does "life" mean? How do we know that something is alive? *Do You Know Which Ones Will Grow?* can help start a discussion about such questions. *Do You Know* begins by pointing out that some things grow, while some "stay the way they're made/Until they crack, or rust, or fade." The rest of this lift-the-flap book offers a series of comparisons and questions for the reader or listener:

If a duckling grows
and becomes a duck,
can a car grow
and become… *(lift flap)*
a truck?

Tom Slaughter's illustrations are appealing cut-paper collage, and the lift-the-flap feature adds a touch of playful suspense to a book-sharing session. Susan Shea's rhymed verses are simple and clear, lightly humorous, and charming. The only hitch is the verse that rhymes "fox" with "clock"; sticklers for exact rhymes may find that one grating, but should be able to get past their concern.

Children in pre-kindergarten through first grade are likely to enjoy answering "Yes" or "No" to each of the book's questions. Follow-up questions posed by the teacher or by the children themselves could lead to interesting discussions that reveal much about how individual children's minds work: How do we know that watches don't grow into clocks and pickup trucks don't become big rigs? What makes it possible for things to grow?

A teacher could introduce this book to elementary-age children who are familiar with the analogies in *Look and Compare*; they might enjoy thinking of each verse in *Do You Know* as an analogy that either works or doesn't work.

These are by no means the only science-related picture books that have come out in 2011 and 2012. Among the other titles that look promising are two science fiction books: *Leo Geo and His Miraculous Journey Through the Center of the* Earth (by Jon Chad, Roaring Brook Press) and *Oh No! Or How My Science Project Destroyed the World* (by Mac Barnett, illustrated by Dan Santat, Hyperion Books). Authors weave poetry and science together in *Swirl by Swirl: Spirals in Nature* (by Joyce Sidman's, illustrated by Beth Krommes, Houghton Mifflin) and *All the Water in the World* (by George Ella Lyon, illustrated by Katherine Tillotson, Atheneum). Check them out!

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An Activity for Teaching Erosive Power Using Stream Boards

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Background Information
This science activity is designed to demonstrate the factors that determine the erosive power of a stream. Stream boards, with pre-cut grooves on 4x4 or 4x6 pieces of lumber, simulate the physical conditions under which stream erosion and deposition can occur by recreating ideal stream conditions on sloping, grooved wood boards. Water motion is created by rolling marbles down the boards. Remember that stream gradient is the amount of elevation drop per horizontal distance. The steeper the gradient, the faster the marble rolls. Channel roughness is the expression of the bumpiness in the channel, as expressed by nails within the grooves of certain boards. Meandering is the expression of the bending of the channel - the more extensive the meander, the slower the marble.

Begin by accessing students' prior knowledge about streams and stream activity. Ask: Why is stream activity something that people should care about? We like to show the students a short video clip about the value of streams and rivers from the National Geographic at http://video.nationalgeographic.com/video/places/regions-places/africa-tc/zambia_threerivers/.

Photo of a curvy and a straight stream board.

Grade Level: upper elementary to high school
Duration: 50-60 minutes
Process Skills: observing, measuring, investigating, and communicating

Objectives
- Students will demonstrate their understanding of stream erosion using a board and rolling marble to collect data on the velocity and slope.
- Students will identify the characteristics of stream erosion and deposition by writing their results from the investigation in a short paragraph.

Materials
Stream boards with pre-cut grooves.
- board with a straight groove
- board with a curvy groove
- board with a curved groove and small nails or tacks embedded along the groove

Marbles - that fit the pre-cut grooves
Stopwatches for each group (we like photo gates to measure the velocity of the marble; one gate placed at each end of the stream board)
Graph paper
Blocks of wood to change the angle
Rulers and string to measure distance of meandering boards
Protractors (if you want to measure the angle)
Directions/Student Handout

Data Table for Curvy Stream Board

# of wooden blocks	Trials 1-5	Average Time	Speed of water (marble)
No blocks	1. 2. 3. 4. 5.		
Big block			
Big block + one small Block			
Big block + two small blocks			

Concept Introduction

Show students a video clip of the importance of streams/rivers. Students were asked to explain why people care about stream activity. Students should be given materials and the student handout with directions.

Concept Application

After calculating the velocity of the marbles, students should create a graph using their data.
Questions to consider: What is the relationship between the travel times versus the tilt of the boards? Also, what is the relationship between boards with/without nails, or straight versus meandering? What situations would produce the greatest erosive power and the least erosive power if you assume the marble represents water movement?

Connections to the real world include concepts such as stream systems, channeled wind currents or to really any object rolling or sliding down a slope (mass movement, avalanches).

Directions for Stream Board Activity

Today we are going to observe the things that effect how fast stream water will flow using stream boards.

First, follow the directions carefully. Repeat the instructions for each stream board.

1) Measure the distance from the top of the stream board to the bottom of the stream board. _____ inches. You'll have to use a string to measure the distance of the stream board that has a curvy line (this represents a meandering stream).
2) Prop a stream board on a table without any wooden blocks underneath it.
3) Roll a marble down the board, and using a stopwatch (or photo gates), record the time it takes to travel from one of end of the board to the other end.
4) Record your time.
5) Repeat this five times, recording your time s in a data table.
6) Determine the average time by adding all the times together and dividing by 5; record this.
7) Add a wooden block underneath the top of the stream board. Use the big block first. Record the height of the board.
8) Repeat steps 3 and 4.
9) Repeat step 7 by adding a second wooden block and then repeat steps3 and 4.
10) Set up the next stream board and repeat steps 1-9.

Draw a picture of each stream board here:

Using Inquiry to Teach Microscope Skills

Susan Styer
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Introduction

One of the first lab activities often done in a high school biology course is learning to use the microscope. As it is typically described in laboratory manuals, there is no inquiry involved in this activity. Students learn the parts of the microscope and information explaining its operation. There may be a review of the metric system. Then students examine cells, often to observe the difference between plant and animal cells. Students may be instructed to prepare wet mounts and do simple staining. All of these are important skills to have in order to use the microscope correctly, but it doesn't give students the chance to *do* science.

This activity introduces students to the inquiry process as they learn about and practice using the microscope. Current national science standards state that all students should participate in scientific investigations as well as understand about the nature of science inquiry (NRC 2012; NGSS 2012). The activity described in this paper asks students to design and carry out a simple experiment about the thickness of hair. Students collect evidence through experimentation in which they ask a question, design a procedure to answer that question, record data, analyze the data, and draw conclusions.

The Class Activity

Students are introduced to the compound microscope, learning its parts, proper use, magnification, and how to measure. If the microscopes do not have ocular micrometers, a clear, thin plastic ruler with millimeter markings can be set in the field of view so that hair can be lined up for measurement. Students can practice using the microscope and measure their own hair thickness.

Students formulate a question about the thickness of human hair that can be answered with the available lab equipment. If you have access to non-human hair, this can be included as well. (Note: Some students may be allergic to the dander in pet hair.) Sidebar 1 gives ideas that can help students formulate a question. The teacher should review each student's question to ensure feasibility.

Sidebar 1. Possible Sources of Hair

Hair may be obtained from your own head or body, or (if willing) from many classmates' and teacher's head. The hair may be moussed, sprayed, dyed, bleached; curly, straight, wavy; red, brown, black or some variation.

Next, students design their experiment. Information on the hallmarks of good experimental design (see sidebar 2) includes dependent, independent, controlled variables and experimental validity. This sets the stage for some simple statistical analysis, such as mean, median, and mode. In advanced classes, standard deviation and the use of t-tests can also be included. There are many educational web sites that explain how to do these statistics with Microsoft Excel, for example, as well as online resources.

http://www.vassarstats.net/

http://easycalculation.com/statistics/standard-deviation.php

http://studentsttest.com/

With this information, students construct an experimental protocol that will answer their question.

Students can collect hair samples outside of class for the next lab period. After students make measurements, they calculate the mean, median, and mode of their data. Depending on the experimental question, students may calculate the standard deviation, do a paired t test, or a one-sample t-test. For example, if a student question was to find the thickness of hair on his or her head, standard deviation would be calculated. The standard deviation tells how far an individual hair measurement is from the mean value of the hair measurements. If the question was whether black hair is thicker than blonde hair, students would use the two-sample *t*-test to determine if the two population means are equal. If the question was to see whether or not there is a difference in arm hair thickness compared to head hair thickness taken from the same individual, the paired-sample t-test would be used.

Sidebar 2. Hallmarks of Good Experimental Design
(Modified from McCormick, B. and C. MacKinnon, 2004)

Dependent variable. This is the factor that you are measuring. It is the one thing in the experiment that you can't control. Changes in the dependent variable depend on what you do when setting up the experiment.

How will you measure the dependent variable?

Independent variable. This is the factor in the experiment that you choose to change. It is the one thing that is different between the samples being studied. The choices made in selecting the independent variable and decisions on how to change it should be considered in relation to how they address the research question.

How will you change the independent variable?

Controls. There are many things that can be altered between samples in an experiment. A well-designed experiment has as few variables as possible. In addition, a good experiment controls all of the factors that can be controlled, so that the changes in the dependent variable can be attributed to the changes you made in the independent variable.

What will you do to make sure there are controls?

Validity. Accuracy and precision are important in experimental results. In many types of experiments, you will need to make multiple measurements to show that your results are both accurate and precise. The use of statistics shows how consistent your data are.

How can you be as certain as possible that your conclusions are reliable?

Sidebar 3. How do Scientists Report on Their Findings?

(Modified from Pechenik, 2012).

Now that you have some evidence that supports a conclusion about hair thickness, what do you do with this? Ultimately, scientists put their evidence and conclusions in front of their peers to be reviewed and either accepted or rejected. The most common way is through publication in a peer-reviewed journal. Now, we won't do this with your hair data, but we will learn about the highly stylized form of writing that is done for this kind of journal.

There is a conventional format to follow in communicating your findings to the scientific community. Below you will find a brief description of that format and the requirements of each section.

Title

The function of the title is to succinctly convey the important points uncovered by your experimentation. The title should be short and unambiguous.

Abstract

This is a short summary of the important points of the paper. This can be general statements telling your reader the importance of this work. A statement of rationale is often found in this section: why you performed the work described in the paper. Also, a brief statement of conclusion is given: the important findings that are described in the paper. Data should not be presented in an abstract. Neither should experimental methods be presented here, unless the paper is concerned with the development of an important, new technique. An abstract should be no longer than about two hundred words.

Introduction

The function of the introduction is to provide background and rationale for your research. Background is provided by writing short review of the literature in the field of your research. State the question being asked and answered. You may also include your expectations prior to performing the experiment.

Materials and Methods

This section is used to give the procedural details of your work. It should be written so that any well-versed reader could easily repeat your experiment by following what you wrote. This section is written as a narrative in the past tense, not like a recipe. You should also include descriptions of analyses performed on data.

Results

The writing in this section is often quite brief. Here is where the experimental evidence is stated. Present your data; do not interpret or discuss its significance in this section. Often data are presented in a table or figure. Report your data only once, do not make both a table and a figure for the same set of data.

Tables and figures should be constructed as if they will stand alone. This means that each table and figure needs to be titled, given labels and a figure legend, and clearly report the results of your research. The reader should be able to quickly view a table or figure and be able to draw conclusions. Within the text of this section can be found brief explanations of figures and tables as well as the presentation of other data. Report results of statistical analysis (if any). Give statistical test used, test statistic, degrees of freedom and/or sample size, significance level, and probability value.

Discussion

Interpretation of your work is done in this section. Draw conclusions from your data as well as suggest further hypotheses that can be tested to clear up any discrepancies or ambiguities. It is good to close the circle; return to the introduction section to remind the reader of the importance of your work and then state the importance of your addition to the joint knowledge of the scientific community.

References

It is important to give credit to sources for the ideas and information that they have provided to you. Firstly, it is helpful to allow your reader to know all of the resources that you have used in the creation of your experiments and conclusions. Secondly, it is unethical to take credit for somebody else's works ideas, or findings. This is called plagiarism.

Assessment

There are many choices for assessment. One possibility is to have students write a report (see Sidebar 3) which asks the students to draw a conclusion from their data, and to give evidence that supports this conclusion.

Conclusion

Adding an inquiry on hair thickness may seen like a lot of effort compared to simply learning how to use the microscope, but it sets the stage for continuing inquiry in your class. And hair is a topic that can be revisited when your class moves into the study of proteins; as they see how the amino acids twist to form hair protein, you can refer to this lab.

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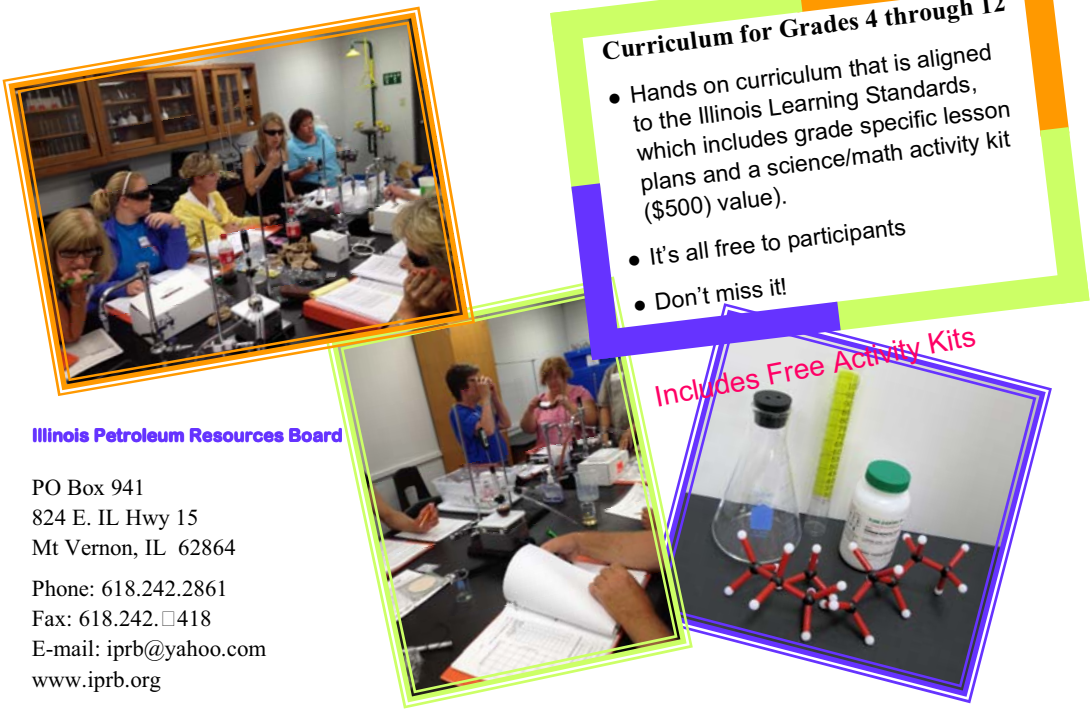

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