



Synergy . . .

Winter 2006

SCIENCE, TECHNOLOGY, AND SOCIETY (STS)

The December issue of NSTA's *Science Class* features the theme of Science, Technology, and Society (STS). It states, "An emerging field of study in itself, STS is interdisciplinary in nature, as it examines science and technology as social and cultural phenomena. Researchers make important new discoveries almost daily – in such areas as genetic engineering, the environment, emergent diseases, computers and the internet, nuclear waste, and international agriculture –that lead to ethical considerations that today's students will have to face; many of these issues have never been addressed before because we they arose and from new scientific knowledge and technological innovation."

Steve Metz, field editor of the *Science Teacher*, explains in his December editorial that "when interconnections among science, technology, and society are made part of science teaching, we empower students with skills that allow them to become active, responsible, and thoughtful citizens."

See the NSTA Journals and this issue of *Science Class* to explore how STS can engage your students and help answer the question "Why do we have to learn this?"

PRCST STS BY GREEN DESIGN PROGRAMS

For over twenty years the Pittsburgh Regional Center for Science Teachers (PRCST) has been conducting programs that have as a basis the interdisciplinary STS approach. For over ten years annual STS Symposia attracted up to 200 educators as outstanding speakers in various related fields brought state-of-the-art information about current research and materials. This current and accurate information was related to existing academic curricula during related professional development workshops throughout the year. The newsletter, LASER, was initiated to bring to educators who could not attend these programs, the information from the symposia and other workshops. Needs surveys annually provided data about the current status of educators and their developing need for information, resources, and professional development.

Beginning with the 1980s STS based programming and publications, PRCST later added the engineering design approach, working with Dr. Indira Nair, Carnegie Mellon University (CMU) and the Department of Engineering and Public Policy. This resulted in the STS by Design program that went beyond "one-shot workshops" and included

sustained professional development for participating schools/educators. Both CMU and the University of Pittsburgh materials science departments provided speakers and workshop opportunities to support this new program component. Development of the valuable and relevant *Life Cycle Analysis* activity brought a fresh approach to science and technology classes/teachers, helping enhance coordination and even building relationships to social studies classes. PRCST worked with teams of teachers from a variety of disciplines often including librarians and business and language arts teachers. Their classroom activities brought students into active learning and often community oriented projects.

Again working with CMU, PRCST added “Green” to the STS by Design Program. The first, and possibly the only, professional development program available to educators in our area for a long time, STS by Green Design went beyond a simple environmental focus providing a solid integration across disciplines, increasing the relevance to students’ lives and preparation for life.

This program fit beautifully with the emergence of Pittsburgh as a “Green Building City”: it now ranks second in green-certified space among cities across the nation, 2.3 million square feet. Only Sacramento, CA has more, with 3.2 million square feet. (*from Green Building Alliance*) And continued work with Conservation Consultants, Inc. has provided actual interface with development of Green buildings, as they renovated a building for their offices. “We’ve always worked on environmental principles”, said CCI Executive Director Ann Gerace. “As such, we wanted to use fewer resources and do things to make the building healthier for employees.”

“Green Buildings were defined as buildings which use design and construction practices to significantly reduce or eliminate negative effects on the environment and occupants” by this year’s Market Barometer survey of Turner Construction Company. The survey focused on Green educational facilities, K-12 and higher education facilities, and showed that Green facilities provided a more effective learning environment. More executives of organizations involved with green K-12 facilities rated them more highly than traditional facilities on a range of benefits:

Ability to attract and retain teachers (74%)

Reduced student absenteeism (72%)

Student performance (71%)

Which Green features of K-12 facilities are most important?

49% cited indoor air quality

37% named increased natural lighting

Higher construction costs are a concern. But many executives believe Green educational facilities have lower long-term costs since they benefit from significantly reduced energy and other operating costs.

(abstracted from *Sustainable Business 2006*. Bayer Consulting surveyed 665 executives on Green building issues.) See

www.sustainablebusiness.com/features/feature_template.cfm?ID=1284

GREEN VALUE

The STS by Green Design program offers educators support in working across disciplines to help their students achieve understanding and conceptual development, as they address current and relevant issues of the day. Local and action involvement components are emphasized in the program to enhance this relevance and engage all students. Continuation of the Life Cycle Analysis continues to bring a focus on materials development and use and the relationship to environmental impact. Work with Sustainable Pittsburgh brings current and accurate information to the programs.

Global issues can have avenues for local connections as students research and develop action plans and reports. Working as scientists, students begin to understand the relationships among their lives and the current status of local and global environments. The GLOBE Program, a new addition to PRCST programming offers specific opportunities to focus on one aspect of the environment – collecting and analyzing data from local sites, joining an international database, and comparing data from related and varying sites throughout the world.

Past GLOBE programs have addressed Atmosphere and Soils Protocols. Pending programs will address Land Cover and Hydrology:

EARTHDAY WORKSHOP:

Spring and the Land: A GLOBE workshop on the “LandCover” Protocol.

This all day workshop April 19, 2006 will be held at the Carnegie Museum of Natural History and will include a special luncheon focus on the completion of the Lewis and Clark Commemorative Voyage. All participating teachers are invited to attend. The new Education Component of the PRCST Lewis and Clark website will be introduced. Comparison of land cover in our region in 1803 and 2003 will be addressed.

This workshop is conducted by the PA NASA Educator Resource Center (ERC) and sponsored by the Pennsylvania NASA Space Grant Consortium. Teachers will receive GLOBE resources along with related NASA resources. Early registration is recommended since space is limited and there is a small registration fee of \$20.

A final tour of the Carnegie Museum of Natural History display of animals noted by Lewis and Clark is planned. All participants will receive a copy of the poster published by the Museum that covers the geology of the Lewis and Clark Trail in beautiful detail (a \$12 dollar value).. To register call or write PRCST 412/648-7315; fax 412/648-7081; email konrad@pitt.edu

This workshop is supported by the Pennsylvania Space Grant Consortium and the PA NASA Educator Resource Center (ERC).

Visit the LASER newsletter for more information on the GLOBE program and a teacher’s report on the GLOBE Soils workshop.



Soils GLOBE Program Lab Work



Teachers learn to collect soil samples on site, recording coordinates.



ORGANIC INDUSTRY GROWING

- The organic industry can be expected to grow and thrive at a sturdy rate over the next 20 years, but at a slower pace than the current 20% average growth in sales.
- Younger shoppers will continue to be interested in organic foods, particularly as Generation Xers pass down their belief systems. Ethnic shoppers, including Asian Americans and Hispanic Americans, will be more likely to buy organic products in proportion to their representation in the general population.

Some challenges cited in a survey of the Organic Trade Association (OTA) were consumer confusion about definitions around the organic labels, unbalanced governmental support and promotion of conventional farming methods at the expense of organic agriculture, and the acceptance of value of organic packaged products versus perishables in the marketplace.

(This information was abstracted from Sustainable Business.com)

Food Safety FIRST

Food Safety FIRST is an online training program for secondary science teachers to help them implement active food safety education lessons in their classrooms. There are three modules:

Bacteria Are Everywhere

Food Handling is s Risky Business

Current Controversies in Food Science

The cost is \$195 plus a registration fee from the University of Massachusetts Division of Continuing Education. A kit is also available from Connecticut Biological Supply. See: www.foodsafetyfirst.org

This is a fertile area for utilizing the “Life Cycle Analysis” activity, a valuable component of PRCST STS by Green Design programs.

SUN-EARTH DAY

Sun-Earth programs culminate in the spring near the Spring Equinox. In 2006 a total solar eclipse will occur just nine days after the equinox! So the official date for Sun-Earth Day 2006 has been moved to March 29, 2006. Join NASA in a journey of exploration, discovery and understanding to prepare for this exciting day. A live webcast will take place: see <http://sunearthday.gsfc.nasa.gov> for more details.

By registering you will receive a free Sun-Earth Day educational kit containing NASA materials and monthly Sun-Earth Day e-news. The 2006 theme is “Eclipse in a Different Light: and show how eclipses have inspired people to observe and understand the Sun-Earth-Moon system.

From:

******* WINDOWS TO THE UNIVERSE TEACHER RESOURCES *******

******* NEWSLETTER FOR EDUCATORS *******

******* January 2006 *******

Check out this great resource site!

***** Randy's Corner *****

Earth at Perihelion

As I mentioned in last month's newsletter, students often mistakenly believe that the seasons are caused by variations in Earth's distance from the Sun. Earth's axial tilt is, of course, the real reason for our seasons. The Earth does, however, travel around the Sun in an elliptical orbit which brings it closer to and further away from our neighborhood celestial furnace during the course of each year. Astronomers call the point of closest approach "perihelion", and the most distant point "aphelion". These words come from Greek roots: "helios" is Sun, "peri" means near, and "apo" means away from.

Earth passes through perihelion in early January each year (on the 4th in 2006), so it is closest to the Sun in the depths of the Northern Hemisphere's winter. Earth is about 3% further from the Sun at aphelion (in early July) than at perihelion. Earth's orbit is very nearly circular, so its aphelion and perihelion distances are not much different from one another. Some planets have orbits which are much more elongated; astronomers say such orbits have a large "eccentricity". Pluto, for instance, is about 66% further from the Sun at aphelion than it is at perihelion.

Check out these pages on Windows to the Universe to learn more about elliptical

orbits, perihelion & aphelion, and eccentricity:
- Interactive Animation Illustrating Shapes of Orbits

http://www.windows.ucar.edu/tour/link=/physical_science/physics/mechanics/orbit/orbit_shape_interactive.html)

- Elliptical orbits

http://www.windows.ucar.edu/tour/link=/physical_science/physics/mechanics/orbit/ellipse.html)

- Perihelion and Aphelion

http://www.windows.ucar.edu/tour/link=/physical_science/physics/mechanics/orbit/perihelion_aphelion.html)

- Eccentricity of Elliptical Orbits

http://www.windows.ucar.edu/tour/link=/physical_science/physics/mechanics/orbit/eccentricity.html)

These topics are relevant to "Content Standard D: Earth and Space Science" in the National Science Education Standards (Grades K-4: Objects in the Sky & Changes in Earth and Sky; Grades 5-8: Earth in the solar system).

*** Marina's Corner ***

The position of the planets affects their size and composition. Most planets are tilted, like Earth, so most planets have seasons, too. The four innermost planets in the Solar System (Mercury, Venus, Earth, and Mars) are all similar to Earth - they have solid bodies with compact, rocky surfaces. However, the four giant planets (Jupiter, Saturn, Uranus, and Neptune) are known as gas giants because they are comprised mostly of a thick outer layer of molecular hydrogen and helium gas. Each has a solid or liquid core made of rock, ice, or highly pressurized fluids such as liquid metallic hydrogen, deep beneath its dense atmosphere. These giant planets are also known as "Jovian" planets ("Jove" is a Latin variant of Jupiter) because Saturn, Uranus, and Neptune are much more like Jupiter than they are like Earth. Let's find out more about these GIANTS:

Jupiter,

http://www.windows.ucar.edu/tour/link=/jupiter/interior/J_int_compo_overview.html)

Saturn,

(<http://www.windows.ucar.edu/tour/link=/saturn/discover.html>)

Uranus,

http://www.windows.ucar.edu/tour/link=/uranus/interior/U_evolution_contraction.html)

and Neptune

(http://www.windows.ucar.edu/tour/link=/neptune/lower_atmosphere.html) !

There is also the 9th planet, Pluto, which is the farthest planet from the Sun

and also the smallest. Pluto, which is a bit of an oddball, is even smaller than seven of the solar system's moons. Lets find out more about little PLUTO too!
(http://www.windows.ucar.edu/tour/link=/pluto/pluto_discovery.html)

In the last few years, numerous minor planets (sometimes called Plutinos!) have been found in orbits similar to Pluto's. Recently, an object that may actually be larger than Pluto was discovered, and some astronomers have dubbed it "the 10th planet". We'll have more on the "is Pluto a planet" debate in next month's newsletter.

The source of this material is Windows to the Universe, at <http://www.windows.ucar.edu/at> the University Corporation for Atmospheric Research (UCAR). Copyright 1995-1999, 2000 The Regents of the University of Michigan; 2000-05 University Corporation for Atmospheric Research. All Rights Reserved.

HAZARDOUS MATERIALS?

Rising costs of hazardous materials shipping fees are a growing concern of many science teachers. If you order your supplies from Flinn Scientific – they will pay your hazardous materials shipping fee to help you afford the chemicals and supplies you need. Contact Flinn Scientific – P.O.Box219, Batavia, IL 60510; 1-800/452-1261 or email flinn@flinnsci.com

GLOBAL WARMING 2006: AN ACTIVIST'S PRIMER

Saturday March 25, from 10:00am to 3:00 pm a workshop sponsored by PennFuture and co-sponsored by Felician Sisters of Our lady of the Sacred Heart Province will be held at the Felician Sisters site at 1500 Woodcrest Avenue, Coraopolis, PA 15108.

Registration is free, with lunch included, Space available for organizations to distribute printed materials. Space Limited!!!

Call PennFuture before March 22 at 717/321-7775 or register online with www.pennfuture.org

PLANT CONSERVATION

Did you know there are 100,000 plants at risk of extinction. Many threatened plants are those collected from the wild for sale in the nursery trade. We need to be especially cautious with purchasing: orchids, cacti and succulents, bulbs, carnivorous plants, native wildflowers and cycads. Purchase only nursery-propagated plants.

Botanic Garden Conservation International has a rich website at www.bgci.org with information and a Plant Conservation Checklist for Gardeners.

AIR QUALITY

CEC Secretariat recommends factual record for Coal-fired Power Plants submission

Montreal, 13/12/2005 – On 5 December 2005, the Secretariat of the Commission for Environmental Cooperation (CEC) of North America issued a [notification](#) recommending to the CEC Council that a factual record be developed for the [SEM-04-005 \(Coal-fired Power Plants\)](#) submission.

In the submission, filed with the CEC Secretariat on 20 September 2004, Sierra Legal Defence Fund and Waterkeeper Alliance, on behalf of Friends of the Earth Canada, Friends of the Earth-US, Earthroots, Centre for Environmentally Sustainable Development, Great Lakes United, Pollution Probe, Waterkeeper Alliance, and Sierra Club (the Submitters), assert that the United States is failing to effectively enforce the federal Clean Water Act (CWA) against coal-fired power plants with respect to mercury discharges to air and water. The Submitters claim that emissions from power plants in ten states—Alabama, Illinois, Indiana, Kentucky, Michigan, North Carolina, Ohio, Pennsylvania, Texas and West Virginia—represent almost 60 percent of U.S. mercury emissions from coal-fired power plants and that the alleged failure to enforce the CWA in those ten states is "reflective of the broader problem in the U.S." In its [response](#), filed on 25 April 2005, the United States contends that the relevant facts and law do not support a conclusion that it is failing to effectively enforce its environmental legislation and that pending domestic judicial proceedings preclude further Secretariat review of this matter.

To deal with the bad air from Allegheny County's Liberty-Clairton area, environmental officials have decided to separate are forecasts from this area - some of the worst air in the nation - from the rest of the 7 county Pittsburgh region. The Monongahela River Valley creates weather inversions that trap pollution from the area's coke, chemical, and powerplants. This separation will allow officials to give the rest of Western PA a more accurate forecast.

Under a court order to adopt new rules to co troll the fine dust and soot in the air, EPA proposed making no changes in the annual limits, but EPA did propose a reduction of the allowed levels during any 24 hour period. It is this fine particle pollution that scientists say cause more than 4,700 premature deaths every year in just nine major cities. Most fine-particle pollution – made of bits of dust and soot less than 2.5 millionths of a meter I diameter- comes from motor vehcle exhausts or smokestacks of coal-burning power plants.

BIODIESEL – SMELL IT?

Biodiesel is a clean-burning fuel made from vegetable oil and methanol and used instead of diesel fuel, sometimes blended with regular diesel and home heating oil. The National Biodiesel Board reports about 25 million gallons were sold in the U.S. in2004. From the Midwest it is made from corn (ethanol) and soybean oil. Today much comes from soybeans, canola and mustard seeds.

One student researcher's car smells like doughnuts...using oil from a bakery. A Wilkinsburg resident – founding partner of the fledgling non-profit operation “Steel City Biofuels” – drives a Mercedes fueled by recycled vegetable oil – shades of fried foods!

A new fuel system has to be made, but the benefits are environmental – burning cleaner. By-products are water and glycerin. This company is partnering with soap-makers to market soap! Contact nathaniel@steelcitybiofuels.org for more information about this company.