

## Spotlight on Engineering

**Celebrate National Engineers Week, February 22-28**

Are your students considering careers in engineering? If so, they will likely find many opportunities, since the U.S. Bureau of Labor Statistics is predicting a high number of job openings in certain engineering fields. Teachers who open students' eyes to the role of engineering in our world – in everything from robot-

ics to medicine – can help set them on the road to a rewarding future.

National Engineers Week (NEW) is an opportunity to make engineering come alive for students of all ages. Hands-on engineering activities and field trips to engineering-related sites are just a few ways to introduce students to the achievements of engineers and to opportunities in the engineering world. The NEW web site, [www.eweek.org](http://www.eweek.org), offers ideas, resources and links to assist in planning age-appropriate classroom activities.

### **Bringing Engineering into the Classroom**

Opening a classroom to an engineering professional can be a great way to engage students' interest. The NEW Web site offers ways to identify a local engineer who might volunteer.

The site also features a section on "50 Engineers You Should Meet" that spotlights professionals in fields ranging from forensics to the music industry. Students can read about – and send their questions to – engineers like Oksana Wall, one of the designers behind Disney's Splash Mountain and Fantasmic! rides, and Dr. Larry Hench, who is both a children's author and the discoverer of the first man-made material to bond human tissue in repairing bones, joints and teeth.

Creative problem-solving activities can be the highlight of NEW. Students in grades K-12 can get a taste of what it means to be an engineer by participating in group and individual projects. Visit the NEW web site for ideas on activities and projects that use inexpensive materials, including "The Lemon Battery

### **What Do Engineers Do?**

**"Scientists discover the world that exists; engineers create the world that never was."**

– Theodore von Karman, aerospace engineer.

*Aerospace Engineers* design and test aircraft, spacecraft, satellites and missiles and study how objects from golf balls to high-speed trains move. They find jobs in aviation, defense systems and space exploration and help improve the fuel efficiency of cars.

*Ceramic and Materials Engineers* explore how common and unusual materials can be used to develop the technologies of the future. Recent breakthrough technologies in medicine, sports and computing have arisen from work in this field.

*Chemical Engineers* work in factories, labs, consulting firms, law offices and government agencies. They help improve plastics, paints, fuels, medicines, semiconductors and other everyday objects. They also help protect the environment by tracing the fate of the chemicals we use.

*Civil Engineers* design, build and maintain the infrastructure: highways, pipelines, railroads, bridges and other structures we use. They play a crucial role in city and regional planning.

*Electrical and Computer Engineers* design consumer electronics, computer and network equipment, power generation and distribution systems, and communications devices like cell phones.

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FirstEnergy Corp.  
Community Support Dept.  
76 South Main Street  
Akron, Ohio 44308  
(330) 384-5022

Electric Operating Companies:

- Ohio Edison
- The Illuminating Company
- Toledo Edison
- Metropolitan Edison
- Pennsylvania Electric
- Penn Power
- Jersey Central Power & Light

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Challenge," "Build an Air-Powered Car" and "Wetlands: Nature's Water Filters."

### Real and Virtual Field Trips

A trip outside the classroom helps students grasp the numerous ways engineering impacts our daily lives. The NEW web site offers "A Sightseer's Guide to Engineering" with links to field-trip sites across the U.S.

Students in grades 6 to 9 can take a virtual field trip by clicking on "Discover Engineering Online" and following links to activities, contests and cutting-edge engineering news. To help girls develop an interest in engineering, the site includes information on women inventors and their patents, the contributions of women engineers, and a link to the National Academy of Engineering's "Engineer Girl" site.

A variety of posters, videos, bookmarks, brochures and stickers is available. Click on "product catalog" in the NEW web site at [www.eweek.org](http://www.eweek.org) or contact National Engineers Week Headquarters, 1420 King Street, Alexandria, VA 22314; 703-684-2852.

## What Do Engineers Do?

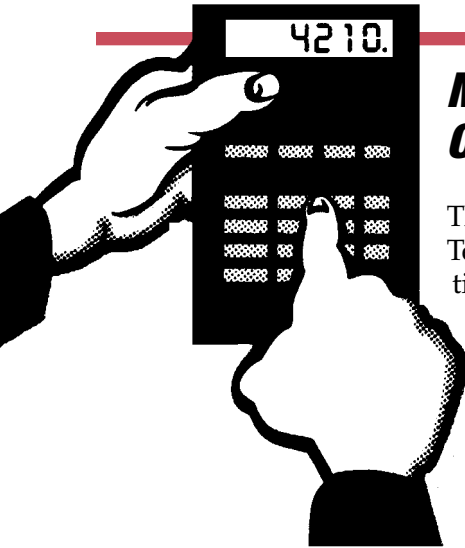
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*Environmental Engineers* work in industry to design equipment and systems that control pollution and protect the environment.

*Industrial Engineers* work in almost all industries designing facilities and work processes that improve efficiency and productivity.

*Manufacturing Engineers* help direct and coordinate the processes for making things. They often design automated manufacturing systems using robotics.

*Mechanical Engineers* work in a range of industries from biomedical to automotive, creating anything from microscopic parts to giant gears. They help design vehicles and engines, pumps and compressors.



## More Math and Science Opportunities Coming Your Way

This year's Excellence in Science, Technology, and Math Education Week is March 15-20. Visit [www.ESTME.org](http://www.ESTME.org) for information and resources. Participating organizations offer ideas and activities for students, parents and teachers. In addition, the U.S. Department of Education and the National Science Foundation have compiled a national directory of volunteer groups that will support ESTME week in the classroom.

Now is also the time to start planning classroom curriculum and projects to apply for FirstEnergy's 2004-2005 Mathematics, Science and Technology Education Grants. The deadline for the 2004-2005 school year is October 1.

These grants of up to \$500 for creative projects dealing with mathematics, science or technology are available to educators and youth leaders in our service areas and in the communities where we have facilities. For more information and an application, visit our web site, [www.firstenergycorp.com/education](http://www.firstenergycorp.com/education), and click on "educational grants."



## **Microfluidic Technology Suggests Alternative to Batteries**

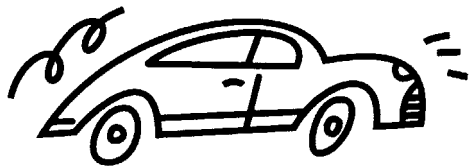
Researchers at the University of Alberta, Canada, have designed a new form of electrokinetic generator. The new generator makes use of the fact that when an electrolyte solution flows over a solid surface, a tiny current results from electrostatic interactions between the ions and the surface. In the past, this effect was too small to be significant. But the Canadian team has turned to microfluidics – a technology that depends on channels just a few millionths of a meter in diameter – to make the electrostatic interaction more productive. Using a glass filter riddled with microscopic pores, Daniel Kwok and his team increased the solid surface area compared to the volume of electrolyte solution flowing over it, thus enhancing the electrokinetics to measurable levels. The researchers hope that the current can be boosted by such means as pressurizing the fluid and using a liquid richer in electrolytes so that the technique can eventually become an alternative to chemical batteries.

*The Economist*, October 23, 2003

## **Partnership Working on Prototype of Photovoltaic Cell**

In an unusual public-private partnership, the Department of Energy's National Renewable Energy Laboratory is working with HelioVolt Corp. of Austin, Texas, to produce a prototype of a new photovoltaic cell with the aim of later initiating commercial production. The patented technology bonds paper-thin solar cells made of Copper Indium Gallium Diselenide to sheets of glass or other surfaces. If the project is successful in establishing mass production of thin-film photovoltaic cells, solar generation will become cost-competitive in a variety of applications.

[www.nrel.gov/news](http://www.nrel.gov/news), November 12, 2003



## **Adventurers Hope to Break Round-the-World Record**

In 1986 a propeller-driven aircraft designed by Burt Rutan was the first to circle the globe on a single tank of gas. Now Rutan is working on another craft – the Virgin Atlantic *GlobalFlyer* – that aims to make the trip in just 80 hours and with a solo pilot. Steve Fossett, who already holds several flight records, is to be that pilot, and Richard Branson, who is funding the project, will be his back-up. However skilled the pilot, the secret to this attempt lies in the technology – specifically in what is called the fuel fraction. While a long-range conventional aircraft can carry up to 45 percent of its weight in fuel, the *GlobalFlyer* will be carrying 84 percent of its weight in fuel at takeoff. By riding the jetstream, the craft will complete the 24,000-mile trip as if it were just 21,300 miles. The attempt is scheduled for mid-2004.

*Popular Science*, October 23, 2003



## **Japanese Carmakers Roll Out Alternative-Fuel Concept Cars**


The Tokyo Motor Show saw the unveiling of alternative-fuel cars from several automakers. The hybrid Toyota Fine-N, with its fuel-cell stack,


lithium-ion battery and hydrogen tanks housed under the floor, has a spacious interior and can run 125 miles per charge. Nissan's Effis, described as a "commuter car," has its lithium-ion battery, fuel-cell stack and inverter under the floor and a hydrogen tank under the rear seat. Suzuki's Mobile Terrace boasts a four-wheel-drive system based on a separate electric motor for each wheel. The RX-8 Hydrogen RE from Mazda runs on either hydrogen gas or gasoline.

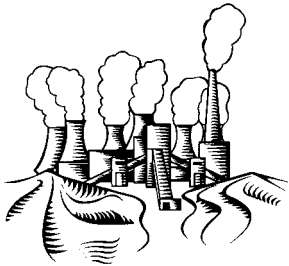
*The Hydrogen and Fuel Cell Letter*, November 2003


Visit our website at  
[www.firstenergycorp.com/education](http://www.firstenergycorp.com/education)

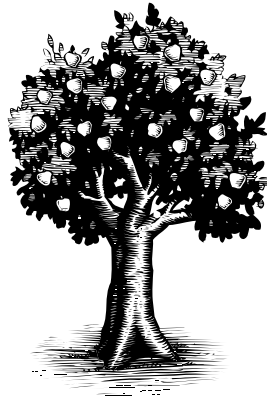
## Educational Resources Available


 Energy, force and motion, light and sound are the topics of NSTA's *Stop Faking It!* books by Bill Robertson. Written for teachers, these books explain science topics so that educators can teach them confidently and comfortably. Priced at \$12.76 for NSTA members and \$15.95 for non-members, the books are available at <http://store.nsta.org>.


 The Ohio Geological Survey publishes a free fact sheet on how coal is used to provide electricity. Write Ohio Department of Natural Resources, Division of Geological Survey, 4383 Fountain Square Drive, Columbus, OH 43224-1362 (phone 614-265-6576) and ask for GeoFacts No. 16, or download this and other fact sheets at [www.ohiodnr.com/geosurvey](http://www.ohiodnr.com/geosurvey).





 To prepare for Arbor Day in April, write for a free guidebook or video to the National Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410 (phone 402-474-5655) or visit their Web site at [www.arborday.org](http://www.arborday.org).

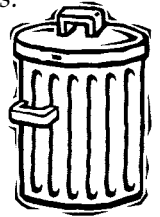



 British Columbia-based Engaging Science provides a lesson plan exchange on its Web site, [www.engagingscience.org](http://www.engagingscience.org). Topics include balloon propulsion and conservation of electricity.


 Weekly brain teasers for grades 3-4, 5-6 and 7-8 are online at [www.eduplace.com/math/brain/index.html](http://www.eduplace.com/math/brain/index.html). A new teaser – with the answer to the previous week's question – appears each Wednesday.


 The Mineral Information Institute publishes teacher packets on natural resources. The packets can be downloaded at [www.mii.org](http://www.mii.org), or you can order a free copy from MII, 501 Violet St., Golden, CO 80401 (phone 303-277-9190). Titles include *Everyday Uses of Minerals* and *A Study of the Earth – Everything Comes from Our Natural Resources*.

 The Consumer Handbook for Reducing Solid Waste describes practical steps kids and families can take to minimize garbage. Visit [www.epa.gov/epaoswer/non-hw/reduce/catbook/](http://www.epa.gov/epaoswer/non-hw/reduce/catbook/) to view the handbook and for answers to questions such as "What's in America's Garbage?"



 High school students can participate in a nationwide air-quality survey using lichens as bioindicators. For more information, visit [www.pathfinderscience.net/so2/index.cfm](http://www.pathfinderscience.net/so2/index.cfm).

 *Science Is Elementary* is a series of inquiry-based activities for K-6 classrooms from Boston's Museum Institute for Teaching Science. Some back issues are currently on sale at \$4.50. Find out more at [www.mits.org/science\\_is\\_elementary.htm](http://www.mits.org/science_is_elementary.htm).

 A kaleidocycle – a geometric moving sculpture made from paper – is just one of many easily-made toys offered at [www.scitoys.com](http://www.scitoys.com). Each toy demonstrates a scientific principle, and all are made from everyday objects.

*He who dares to teach must never cease to learn.*

– Richard Henry Dana