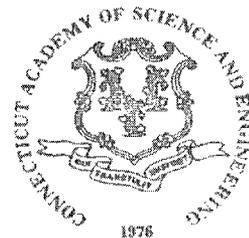


Bulletin *of the*

CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING



Volume 16,2 / Spring 2001

Activities of the Academy

The Academy replies to formal requests for advice or information through Statements of Inquiry to which Responses are provided. The Response to a given Statement of Inquiry is written by one or two experts (members or non-members of the Academy) or by a committee. Larger Responses are converted into Reports. Following are brief summaries of reports that have been issued by the Academy since January 2001.

"Study of Radiation Exposure from the Connecticut Yankee Nuclear Power Plant"

This study was conducted at the request of the Nuclear Energy Advisory Council, a Legislative Task Force of the Connecticut General Assembly. Released in January 2001, the study concludes that atmospheric radiation emissions from the now-closed Connecticut Yankee Nuclear Power Plant in Haddam have had no detectable effect on cancer incidences in communities near the plant or in any other part of the state. It is one of the first studies to use scientific modeling techniques to estimate exposure dosages from normally operating nuclear power plants, then correlate those dosages with specific cancer incidences.

➤ For full Summary of Response, see www.ctcase.org/reports/cyn_sum.html

"A Study of Bus Propulsion Technologies Applicable in Connecticut"

Conducted at the request of the Connecticut Department of Transportation and CTTRANSIT.

(See Activities, page 2)

A New Name ... A New Look!

CASE Reports is now the *Bulletin of the Connecticut Academy of Science and Engineering*

You may register to receive the Bulletin in either an online or a print version. Please see page 8 for complete subscription details.

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You are reading the first edition of the new version of *CASE Reports*—now known as the *Bulletin of the Connecticut Academy of Science and Engineering*.

Why are we changing? Because we sense two significant trends in Connecticut:

- A growing appetite for objective, fact-based information on technology related topics delivered from a non-aligned source; and
- Significant growth in both the breadth of science, engineering and technology topics and the number of individuals interested in receiving this information—interests which we are simply unable to serve with our existing publication and delivery formats.

The Academy has spent much of the last year planning ways to modernize its communications vehicles and channels to better serve the lifestyles, needs and interests of its constituencies. The basic design and

(See New Name, page 2)

News from the National Academies

The following is excerpted from *News Report Online*, a news resource of the National Academies which can be found at www.nationalacademies.org/onpi/newsrpt/

◆ Agricultural Biotechnology

Agricultural biotechnology holds great promise for alleviating world hunger and poverty, according to a recent white paper prepared by a working group of members of seven national academies of science, including five from developing countries. However, public concerns about the effects on the environment and human health of genetically modified crops must be addressed before the technology gains widespread acceptance.

The white paper urges governments to base decisions regarding biotechnology on sound science. It also calls on private corporations and research institutions to share their technology with scientists and farmers in developing countries, and urges organized, concerted efforts on a global scale to quickly identify any potential health and environmental risks. Each country should establish public health regulatory systems to identify and monitor any potential human health effects of transgenic plants, and environmental concerns should be examined systematically and assessed against the agricultural technologies currently in use that cause

(See National Academies, page 7)

Activities (continued from page 1)

this study reviewed, analyzed and recommended new bus propulsion technology for CTTRANSIT's 400-bus fleet, most of which will be replaced over the next decade with vehicles that meet both transportation and environmental needs.

The study was based on extensive literature review of salient bus technology, surveys of and visits to manufacturers; meetings with transit operators; and discussions with representatives of various groups such as the Northeast Advanced Vehicle Consortium and the Clean Cities Coalition. Diesel, electric trolley, compressed natural gas, methanol, liquefied natural gas, liquefied petroleum gas, ethanol, diesel-electric hybrid, and fuel cell propulsion systems were examined. Based on comparisons of costs and emissions, the study committee recommended the purchase of clean diesel buses with an early phase-in of ultra low sulfur fuel and Continuously Regenerating Technology (CRT) exhaust filter units. They recommended purchasing an increasing number of hybrid diesel-electric buses as the technology proved itself to be reliable, fuel efficient and very low in emissions.

► The full Summary of Response is available on the Academy web-site at www.ctcase.org/reports/bus.html.

The Connecticut Academy of Science and Engineering

The purpose of the Academy is to "provide guidance to the people and the government of the State of Connecticut, upon request, in the application of science and engineering to the economic and social welfare."

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New Name (continued from page 1)

delivery format of *CASE Reports* has remained unchanged since it was first introduced nearly 20 years ago. During that time, it has had to meet the demands of several distinct readership groups within a single format, delivered via traditional postal service.

Modern technology provides an opportunity to customize the Academy's publications to meet the needs and interests of our different audiences, and to deliver the information by whatever means—whether traditional mail or electronic transmission—individual readers find most desirable and efficient.

With this in mind, the Academy's governing Council, acting on the recommendation of its ad hoc communications committee, has taken the bold step of entering the age of electronic communications with the following three objectives:

- to package information more effectively for quick, easy access and use by targeted recipient communities;
- to provide a broader scope of information in an easy-to-use, interactive format; and
- to provide a greater number of individuals with access to the information, in a cost-effective manner.

The new *Bulletin*—formerly *CASE Reports*—is designed for Connecticut's lay professional public. The popular "In Brief" section will continue, delivering timely information on science and technology activities in Connecticut. A new column will provide information about studies conducted by the Academy; another will highlight those activities of the National Academies (the National Academy of Sciences, the National Academy of Engineering, the Institute of Medicine, and the National Research Council) which have potential relevance for Connecticut. Feature articles will occasionally be included, with a synopsis appearing in the *Bulletin* and the article itself available in full on the Academy's web site (www.ctcase.org).

Every attempt will be made to embrace the latest technology as we start an orderly five-year transition from paper to electronic communication. Through this means, we hope to be able to serve a readership many times the size of our existing one. We would very much welcome your comments by telephone or fax at 860-527-2161, or via email at acad@ix.netcom.com.

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IN BRIEF

Science and Engineering Notes from Around Connecticut



Communication

MONEY TALKS. Fleet Bank plans to equip its ATMs with special headsets that will provide spoken directions to the visually impaired. While Fleet already provides Braille instructions for its machines, only 10% to 15% of the visually impaired rely on Braille, according to **Nandita Bakhshi**, FleetBoston director of self-service/ATM banking. Sixteen of the new "talking ATMs" have already been tested in pilot locations, and Fleet plans to install 150 machines in New England by the end of the year, including some in Connecticut.

LIGHT SPEED. A growing number of Connecticut businesses are working in the field of optical networking technologies, which may be the fastest growing sector of the state's technology industry. Driven by increasing demand for high-speed data connections, the field is taking advantage of advances that have vastly increased the ability of optical fibers to carry data. For example, instead of carrying a single beam of white light, each fiber can now carry multiple beams, each of slightly different color. Light pulses can also now be sent over longer distances. "It's really one of the biggest success stories in the state," said Academy member **Fred Leonberger**, of **JDS Uniphase** in Bloomfield.

SPEAK TO ME. Communications software currently under development by Middletown-based start-up **Axiom8**, will allow users to track down a person no matter where he or she is. As a kind of "super address book," the product will store profiles of people and their communication devices. If a user wishes to contact someone, the software will be able to open a connection by whatever method will work: pager, telephone, cell phone, email, or instant message. The still-unnamed device will also allow users to see each other's computer desktops, share documents, view video feeds, and more. The device, which entered its final testing phases last November, is expected to be released in mid 2001.

HEALTHY SIGN. A device used to monitor the health of climbers on Mount Everest could also be used to track patients in their own homes, according to a study done by a **Yale** researcher and collaborators. The Vital Signs Monitor (VSM) uses sensors and a telecommunications system to monitor heart rate, temperature, respiratory rate, and other signs. The VSM can be a lightweight wearable device strapped across the chest or wrist, or it can be swallowed in pill form. "This is the first time that there has actually been documentation of long distance monitoring of vital signs in real time," said **Richard Satava**, professor at the **Yale School of Medicine** and an investigator on the project. The system, he says, is commercially viable because of its low-bandwidth requirement, and because it uses commercial off-the-shelf products.



Education & Cognition

ADVANCED LEARNERS. By noting how long infants looked at objects, **Yale** psychology professor **Karen Wynn** was able to show that babies are able to distinguish different numbers of objects, and that, by the age of five months, they are able to do simple addition and subtraction. Wynn, who was recently awarded the Troland Research Award from the National Academy of Sciences, studies the development of early numerical understanding in humans. Wynn's research takes advantage of the fact that babies look longer at something that they don't expect. In her studies, the babies were shown first one object, and then a second, placed behind a screen. When the screen was removed, they expected to

see two objects appear. If an incorrect number of objects—such as one or three—was shown, the babies looked longer. Wynn is interested, she said, "in the fundamental mechanisms in the human mind that enable us to hold numerical concepts and represent mathematical knowledge."

DEGREES OF LEARNING. With grants from the **Connecticut Distance Learning Consortium**, five state schools are among those who will develop degree programs that can be completed entirely online, and will be available to students anywhere in the world. **Capital Community College, Teikyo Post University, Northwestern Connecticut Community College, Eastern Connecticut State University, and Teikyo Post & Charter Oak State College** plan to award degrees in early childhood education and business administration as well as more technological areas. The Consortium, a partnership of state and private colleges and universities, is funded by the General Assembly, which awarded it \$2 million in the current fiscal year. The state hopes to encourage distance learning as a way to spur the Connecticut economy.

SPEAK UP. Youngsters need more than just a good memory to learn the meanings of words, according to **Yale** researcher **Paul Bloom**. "Children learn word meanings," he says, "by utilizing cognitive skills that are normally used for other purposes, such as social reasoning, concept acquisition, and appreciation of syntactic structure." While others have linked some of these abilities with learning word meaning, Bloom was the first to show that youngsters must use all these skills to acquire a vocabulary. He points to the complexity of learning number words. While many two-year-olds can count up to three, he says, it took them nearly a full additional year to learn which words referred to which numbers. "It's not enough that children hear 'the three dogs'; they have to hear it in a situation where they can be certain that the word 'three' applies to the numerical property of threeness," says Bloom.

SHOCKING SUCCESS. Anti-depressants can lead to new cell growth in an area of the brain known to atrophy as a result of depression and stress, according to research performed at **Yale**. "The findings of our study are that chronic administration of anti-depressants increases the number of neurons in the adult hippocampus," said **Ronald Duman**, professor of psychiatry and pharmacology. Anti-depressants tested included electroconvulsive seizure (ECS) therapy, and a serotonin-selective reuptake inhibitor, as well as three other drugs. ECS increased the number of neurons in the hippocampus by 50%, while the chemical antidepressants augmented the number by 20 to 40%. Changes were only seen after treatment lasting 14 to 28 days.

SCIENCE SUPPORT. **St. Joseph College** has received a \$500,000 grant from the **Northeast Utilities Foundation** to promote science education. The grant, the largest corporate gift in the college's history, will be used to renovate two biology laboratories for the school's new environmental science program. In addition, the grant will be used to establish a statewide Fresh Water Institute to promote environmental education among high school science teachers and students; to help fund summer science camps for urban middle and high school students; and to support the existing Adventures in Science Program for Hartford elementary school students.

Items that appear in the In Brief section are compiled from previously published sources including newspaper accounts and press releases. For more information about any In Brief item, please call the Academy at (860) 527-2161, write the editors at 179 Allyn St., Suite 512, Hartford, CT 06103-1422, or e-mail us at acad@ix.netcom.com

IN BRIEF

Science and Engineering Notes from Around Connecticut



Energy

POWERFUL ALTERNATIVE. A device to "store" power generated by alternative energy sources is under development by Rocky Hill-based **Proton Energy Systems**. The UNIGEN, a regenerative fuel cell, can use alternative energy sources, like solar or wind power, to produce hydrogen from water; this hydrogen can be stored, and, when needed, used by a fuel cell to produce electricity. This provides alternative energy companies with the much needed ability to "store" the energy generated during peak production, allowing solar energy companies, for example, to continue producing power even when the sun goes down. Idaho Power and NASA are among the customers who have contracts to buy and test a UNIGEN box.

WASTE NOT. **FuelCell Energy Inc.**, of Danbury, has joined with King County, WA, in a two-year field trial that will use municipal wastewater digester gas to operate a 1-megawatt power plant. The project, which is expected to generate electricity with less air pollution and greenhouse gases than conventional systems, takes advantage of the methane-rich gas produced by a wastewater treatment system; the system uses an anaerobic digester process to stabilize solids and reduce pathogenic microorganisms. The trial is financed in part through an Environmental Protection Agency grant.

DOWN TO EARTH. Generators based on jet turbines and capable of producing 600 megawatts of electricity are being sold by **Pratt & Whitney Power Systems** to an independent power producer in Minneapolis. The contract, one of Power Systems' largest, is for 12 FT8 Twin Pac units; the FT8 is a derivative of Pratt's JT8D aircraft engine, in which two of the turbines are joined together in the twin-pac configuration. The natural gas-fired units can deliver 55 megawatts each. An advantage of the process, said Power Systems president **Ellen Smith**, is that "we can manufacture and install these units far more quickly than it would take to build a conventional power plant."

SEPARATION OF POWER. A breakthrough technology could help **International Fuel Cells (IFC)**, based in South Windsor, take advantage of the increasing market for distributed power, in which small generators are used to provide a reliable source of electricity on or near the site where it is used. IFC is focusing on "proton exchange membrane" technology. In this system, the hydrogen molecules are separated into protons and electrons. The protons pass through the fuel cell membrane, while the electrons create an electric current by traveling around it. This new technology is expected to produce smaller, more affordable fuel cells for the residential and vehicular markets. The company hopes to sell 1,000 fuel cells a year by 2005.



Environment

CLIMATE CHANGE AND SOCIETY. Abrupt climate change has, throughout history, repeatedly caused societal collapse, according to **Yale** anthropologist **Harvey Weiss**. Working with Raymond S. Bradley at the University of Massachusetts in Amherst, Weiss analyzed recent archaeological and paleoclimatological research. "These data force a change in some general social science understandings," says Weiss. Often, the social sciences attribute societal collapse solely to social, economic, and political forces. The data also, says Weiss, emphasize the difference between past climate change, which was not provoked by anthropogenic forces, and current/future climate change, which, in part, may be. The climactic changes described in Weiss' study disrupted societies because they

were abrupt, produced conditions that were unfamiliar to the inhabitants of the regions, and persisted for decades or even centuries. Weiss believes that we may now be able to predict the societal effects of climate change.

HEALTHIER DEER. Controlled hunts have successfully reduced the size of the deer herd at **Bluff Point** in Groton, resulting in healthier animals that are less destructive of the area ecosystem, according to a study by the state **Department of Environmental Protection**. The study found that, since the hunts were instituted, the deer have experienced a gradual improvement in health, body weight, and fertility. In 1996, the average adult buck at the park weighed 109 pounds, compared to a statewide average of 140 pounds. Last year, the average weight for bucks rose by about 10 pounds; however, the Bluff Point deer are still 8 to 20% skinnier than other Connecticut deer.

HEALTHY COYOTES, TOO. **Uma Ramakrishnan** at the **Connecticut Agricultural Experiment Station** has begun researching white-tailed deer at **Lake Gaillard** in North Branford. In some areas around the lake, there are more than 125 deer per square mile. Deer have companions here: coyotes. Coyotes at Lake Gaillard weigh 50 to 60 pounds, which is substantially larger than their western counterparts, and their glossy coats show their good health. Coyotes caused much of this year's winter mortality of deer, an inference gathered by tracking hoof prints in fresh snow. White-tailed deer alone contribute 70% of the coyote diet at Lake Gaillard.

SHAKE, RATTLE AND ROLL. A minor earthquake jiggled inhabitants of **Guilford, Madison, Killingworth, and North Branford** on February 3, at about 1 p.m. The quake was assessed variously at magnitudes that ranged from 1.8 to 2.8; typically, earthquakes start to cause damage after a magnitude of about 5. **Yale** geologist **Jeffrey Parks** believes that the quake was centered around Guilford. "In northern Guilford, there's an old fault that was active about 100 million years ago. It still has tremors and now I would guess that this tremor would eventually be found to be right on top of that [fault]." An earlier tremor was reported in the state in Danbury in August. It registered a magnitude of about 2.5.

MEASURING SUSTAINABILITY. The United States ranks 11th in environmental sustainability among 122 nations studied, according to a model developed at **Yale University**. The rankings are based on the Environmental Sustainability Index (ESI), which examines 22 factors that contribute to environmental performance, such as urban air quality and environmental regulation, and measures them against 67 quality of life variables, such as levels of sulfur dioxide in urban air, and infant mortality rate. "The ESI represents a first step toward a new approach to pollution control and natural resource management where decision-making will be substantiated by data, facts, and analytic rigor rather than emotion and rhetoric," said **Daniel Esty**, who designed the methodology used to construct the index. Esty is the project director of the World Economic Forum and director of the **Yale Center for Environmental Law and Policy**.

POOLING RESOURCES. With a grant from the **Rockfall Foundation**, a private group based in Middletown, the **Westbrook Conservation Commission** will map and delineate the town's vernal pools. Vernal pools, which form on the forest floor in spring, but dry up in the summer, provide breeding grounds for such species as spotted salamanders and wood frogs. The project, which will locate pools in the coastal area of Westbrook, "is particularly important to making informed decisions about preservation of natural resources and development," said **Stan Watson**, of

IN BRIEF

Science and Engineering Notes from Around Connecticut

the Rockfall Foundation. The Westbrook project will provide one of six maps that will be used by the town to make decisions about open-space preservation.



Food & Agriculture

RETURN OF THE OYSTERS. Last year's cool weather has helped to kill off the deadly shellfish parasite MSX which attacked oysters in Long Island Sound, cutting Connecticut's oyster harvest by 76%. According to **John Volk**, director of the state's **Bureau of Aquaculture**, the parasite had spread so quickly because of the recent spate of warm winters and low rainfall. But this year, he explained, the oysters faced a more traditional New England winter. In 1995, before the parasite appeared, 751,876 bushels of oysters were gathered, with about 200 oysters to a bushel. By 1998, only 179,562 bushels were produced. But, with MSX largely gone, Volk is predicting a bumper crop of oysters in the near future: because oysters take three or four years to mature, a full harvest will probably take place in 2002.



Health

SILENT NIGHT. Physicians at **Yale** have developed a technique to cure snoring by using radiofrequency technology to shrink extra tissues in the nose and throat. Snoring results when floppy tissue in the back of the nose and throat relaxes and vibrates, during sleep. The new technology, somnoplasty, treats the problem by reducing the size of the tissue. The procedure, which cuts down on the bleeding and pain resulting from other types of snoring cures, relies on a device that produces a low-level radiofrequency. After 3 to 6 weeks, the treated tissue is "sloughed off" and reabsorbed by the body, resulting in a reduction in tissue volume. The outpatient procedure can be performed in a doctor's office in less than ten minutes, and requires only local anesthesia.

ESTROGEN ONCE AGAIN. Research conducted on monkeys shows that estrogen deprivation causes the death of dopamine cells in the brain. The studies, conducted at **Yale**, may help explain why men, who have less estrogen in their bodies, develop Parkinson's Disease more easily than pre-menopausal women, and why postmenopausal women are then more likely to develop the disease, said **D. Eugene Redmond, Jr.**, a Yale professor and a co-investigator of the study. The study found that the cells can be regenerated if estrogen is administered within 10 days, but by 30 days, the cells do not appear to return. These results may provide another reason for estrogen replacement in postmenopausal women, but Redmond cautioned women not to base treatment plans on these initial results.

A DOSE OF EXERCISE. Doctors have long urged the benefits of a program of long-term, regular exercise. But, says **University of Connecticut** professor and exercise physiologist **Linda Pescatello**, a single session of aerobic exercise helps as well, significantly lowering blood pressure for up to sixteen hours, an effect that could be used to treat high blood pressure. Pescatello's work focuses on the effects of physical activity on cardiometabolic disease, a cluster of disorders that occur together, and lead to heart disease, stroke, and Type II diabetes. The disorders include: glucose intolerance, high blood pressure, and obesity. Cardiometabolic disease is the major cause of disability and death in the industrialized world, said Pescatello, who is currently examining the effects of different amounts of aerobic exercise on high blood pressure.

MOVING ALONG. Last year, researchers at **Yale** identified the Nogo protein, which blocks the regeneration of nerve cells after central nervous system injury. Now, they have made a key discovery in understanding how that protein works, and their work could be used to heal spinal cord injuries. Neurologist **Stephen Strittmatter** and his colleagues have identified the receptor on the axons to which the Nogo protein binds. It is this receptor, said Strittmatter, that inhibits the ability of the axon to regenerate. "The importance of the discovery is that by having both the ligand and the receptor molecules in hand, it greatly simplifies the search for inhibitors of that interaction, and for therapeutic possibilities."



High Technology

PLANET FORMATION. Stars may be able to form planets in about 10 million years, far more quickly than previously thought, according to the preliminary results of a study conducted in part by astronomers from **Yale**. Using software designed by Yale graduate student **Katharine Vivas**, and a large CCD Mosaic digital camera developed jointly by Yale and Venezuelan institutions, astronomers were able to discover 168 young stars in a region called the Orion star forming complex. The stars were all between one and 10 million years old. According to one researcher, variations in the dusty disks surrounding the younger and older stars may be evidence of planet formation around the older stars.

DNA CHIPS. Using a new DNA chip technology developed at **Yale**, researchers have been able to identify all the gene targets of some key proteins in yeast. The proteins, known as transcription factors, control cell reproduction in yeast, telling the cell when and whether to turn on the particular genes that cause a new cell to be made. Previously, only a few of the gene targets for these proteins had been identified. But the new technology, which involves using DNA chips, allows researchers to find all of the targets simultaneously; that is, the researchers were able to determine all of the genes to which the proteins were able to bind. "Our method takes advantage of genomics and all of the targets in one simple experiment," said Yale professor **Michael Snyder**. The Yale researchers, in collaboration with researchers at Stanford, found almost 250 genes that were turned on by the proteins, many of which had not been associated with cell reproduction before.

NOT ALL GONE. Finding missing people has just become easier, with a high-tech system put in place by state police last February. Aimed at those who are at risk of wandering, such as Alzheimer's patients, **Project Locate** provides participants with a small transmitter than can be worn just like a watch. If the person wearing the transmitter becomes lost, he or she can easily be traced via a hand-held antenna and a small receiver. If necessary, a helicopter can be used to narrow down the search area. The transmitter and charging system cost about \$300, and about 30 units are available free to those unable to pay. Currently, the state has about 69,000 residents with Alzheimer's, and over 65,000 with other brain impairments that can cause dementia.

DIGITAL DETAIL. Software developed in the early 1990s at the **University of Connecticut (UConn)** by former **UConn Health Center** researcher Klaus Peters provides "a fundamentally new way of extracting detail from an image," says **Barbara Williams**, of Glastonbury, who has secured the worldwide rights to the program and uses it as the basis for her company, **Image Content Technologies**. The Lucis program takes advantage of the fact that computers can perceive far more subtle levels of contrast than the human eye. In a digital image, Lucis can enhance this contrast to

IN BRIEF

Science and Engineering Notes from Around Connecticut

very fine levels, revealing much greater detail, without inserting elements that were not originally there. The software can be used to better diagnose diseases or bone fractures, and it has been used by the state police to compare bite marks and to correct underexposed crime scene images.

VIRTUALLY FEARLESS. Fear of flying can be cured by a virtual reality treatment developed by **University of Connecticut (UConn)** researchers in conjunction with **Argus VR International**, a Farmington virtual reality studio. The treatment is based on the concept that controlled encounters with the source of certain phobias can desensitize sufferers to the experience, according to UConn researcher **Nicholas Maltby**, who worked on the project. The patients wear headsets that simulate the sight and sound of air travel; the treatment, while not identical to reality, is close enough to provoke the fear response needed by therapists to defuse the phobia. About 4 out of 10 people who used the treatment were later able to take flights. Argus VR hopes to expand, by treating spider phobias and by developing "relaxation pods," a virtual reality way to treat anxiety.



Industry & Business

RECYCLING SUCCESS. A recycling technology that mixes several grades of plastic provides **Obex Inc.**, of Stamford, with the potential to buck the odds against manufacturing start-ups. Obex uses the unique method developed by its founder, **Celeste M. Johnson**, to manufacture Novawood Products: gardening necessities such as composting bins, landscape garden tiles, and landscape ties. While many companies design for gardens using plastic, very few limit themselves to recycled plastic. Historically, plastic recycling technologies have been restricted to only certain grades of plastic, which has often hampered companies by limiting supplies. However, Johnson's technology helps to mitigate this problem.

BUSINESS AS USUAL. Incubator space for start-ups is in the works at the **University of Connecticut (UConn)**. The university plans to spend \$7.7 million to build a 12,500-square-foot addition to an agricultural biotechnology laboratory already on campus; the new structure will provide lab and office space for four to five companies. This move allows UConn to join the many universities nationwide that already offer space to new businesses; the practice helps to attract faculty and aids in commercializing new technologies. The university will also use the money to help finance an 11,000-square foot greenhouse, part of which will be available to the start-ups. Locating incubator space on campus is key, because it allows for easy contact between the researchers and the companies. The new facility is expected to be completed within two years.

DRUG PARTNERSHIP. A \$1.5 billion deal between **CuraGen Corp.** of New Haven, and **Bayer** links the two companies in a partnership to develop drug treatments for obesity, adult onset diabetes, and other conditions. The companies will use CuraGen's technologies, including computer modeling and gene analysis to attack the diseases on the molecular level. CuraGen will aid Bayer in developing "small molecule" drugs. These drugs, unlike proteins and antibodies, do not occur naturally in the body, and they must undergo extensive testing before winning federal approval, a process that can take over ten years. However, a successful product can bring in over \$1 billion annually. Aspirin is an example of a drug derived from a substance originating outside the body.

STATE OF THE WORLD. Programmers in Ghana could ease the information technology labor shortage here in United States,

through the efforts of high-tech start-up company **AQSolutions**. Founded by **Awo Quaison-Sackey**, the firm recruits information technology professionals in Africa to develop customized software for US businesses. Because the programmers remain in Ghana, they receive lower wages than would workers here in America, saving labor costs for American companies. AQSolutions provides local supervisors to manage the employees in Ghana. Financing comes from **Next Generation Ventures**, which supplies seed money and management counsel to state start-ups.

INDUSTRIAL ECOLOGY. To encourage communication among those interested in ways in which environmental and economic concerns can be better integrated, an **International Society of Industrial Ecology** has been formed. It will be based at the **Yale School of Forestry and Environmental Studies**. "Industrial ecology," said Academy member **Tom Graedel**, a Yale professor and one of the field's founders, "is a powerful way of finding innovative solutions to complicated environmental problems." Industrial ecology studies the way energy and materials move as products are created, used, and abandoned, and it looks to nature for clues to creating industrial processes that are more efficient, less wasteful, and, ideally, have recycling built in. The society, which will hold its inaugural meeting in the Netherlands in November, has its website at www.yale.edu/is4ie



Transportation

SUNNY SKIES. The economic impact of **Bradley International Airport** has tripled since 1993, increasing far faster than projected, according to a study recently released by the state **Department of Transportation**. Its regional impact has reached \$2.5 billion, a figure it was not expected to achieve until 2015. Passenger traffic alone grew almost 20% in the year 2000. Transportation infrastructure is central to the economic performance of a region, says **Fred Carstensen**, director of the **Connecticut Center for Economic Analysis**. The airport is currently undergoing \$200 million of improvements, including the addition of a new passenger concourse and a 3,500 space parking garage.

DAY TRIPPERS. Fourteen-year-old **Ariel Faulkner**, of Wallingford, and her father, John, plan to head out to Alaska—in an airplane they're building themselves. The two have been flying in home-built aircraft since Ariel was an infant. Made from kits, these planes require about two to three years of work, and often produce machines that are both faster and more efficient than ready-made craft. At about \$40,000, they cost around half the price of a manufactured plane. The Faulkners are building an all-metal RV-6 capable of flying at 180 miles per hour. They expect the plane to be completed by the time Ariel is old enough to obtain her student pilot's certificate at age 16.

BRIDGE BUILDERS. Coast Guard cadets will redeck an iron railroad trestle bridge to close the gap along the **Air Line Trail** in **Colchester**. The work will be performed as part of a senior design project, said **Lt. Commander Joel Dolbeck**, assistant professor of engineering at the Coast Guard Academy. As part of the course, which offers project management, logistics, and hands-on design, the cadets will deck the 110-foot span, and put in a boardwalk and railing. Dolbeck called it the largest project the cadets have done so far. The refurbished bridge, which crosses the **Black Ledge River**, will permit hikers and bikers to travel from the old cranberry bog in **East Hampton** to Route 85 in **Hebron**.

— Compiled and edited by Karen Miller

National Academies *(continued from page 1)*

environmental problems. (See *Transgenic Plants and World Agriculture* at <http://www.nap.edu/books/NI000227/html/>)

◆ Global Warming

A new report from a panel of the Research Council concludes that, despite an apparent incongruity between surface and upper-air temperatures, global warming is a real phenomenon. Surface temperatures in the past two decades have risen at a rate substantially greater than average for the past 100 years, although data collected by satellites and weather balloons since 1979 show that temperatures in the upper atmosphere have changed very little. The panel cautioned that this surface temperature increase is not necessarily representative of how the atmosphere is responding to long-term, human-induced changes, such as increasing amounts of carbon dioxide and other greenhouse gases. And while a combination of human activities and natural causes has contributed to rising surface temperatures, other human and natural forces may actually have cooled the upper atmosphere, the panel said.

The differences between surface temperature and upper-air temperature records also may be partially attributed to uncertainties in temperature measurements. The nations of the world should establish a better climate monitoring system to ensure continuity and quality in data collection, the panel said. Measurements should include not only temperature and wind, but also ozone, water vapor, clouds, and aerosols. (See *Reconciling Observations of Global Temperature Change* at <http://www.nap.edu/books/0309068916/html/>)

◆ The Evolution of the Internet

A new report from the National Research Council finds that, while the Internet is fundamentally healthy, it faces several challenges, including the need to keep pace with demands for growth and reliability. And because the Internet is a dynamic, constantly evolving environment, the current policy of not regulating the Internet's infrastructure is appropriate; caution should be used when contemplating any regulatory measures, the report urges. A period of watchful waiting is needed, with close attention to several areas, including services such as telephony, or voice service, which pits the unregulated Internet against a regulated industry, as well as the interconnection agreements that link the Internet's many thousands of networks together.

The report provides a set of principles to guide policy-makers; most important of these is a reminder that any new laws or regulations should focus on specific online activities and behaviors, and avoid mandating changes to the Internet's architecture. (See *The Internet's Coming of Age* at <http://books.nap.edu/catalog/9823.html>)

◆ Choosing the Right Science Education Tools

Low student achievement in science has led many states to embrace higher academic standards and, in turn, create new tests to measure student performance against those standards. But efforts to boost learning will have little success if books, lab kits, and other supplies used in science courses are not aligned with the tougher measures, concludes a new guide

from a National Research Council committee. The guide offers teachers, administrators, parents, and others a proven method to evaluate and select K-12 science instructional materials that will help all students meet higher standards in any school district. It also provides districts with a training plan to help educators or community members systematically sift through materials. (See *Selecting Instructional Materials: A Guide for K-12 Science* at <http://www.nap.edu/books/030906533X/html/>)

◆ The Vaccine Challenge

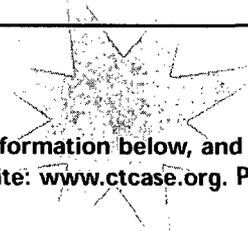
The structure that supports vaccination programs in the United States is weakening in spots, and the **immunization system** may be unprepared to handle future large-scale disease outbreaks or the addition of new vaccines, according to a report from the Institute of Medicine. The report recommends that federal and state governments spend an additional \$875 million over five years to strengthen the management of the immunization system. Two-thirds of this money would come from the federal government in the form of grants, with the remainder coming from the states. The report also urges Congress to develop a formula that ensures that states with the greatest need receive extra funding.

As new vaccines become available for widespread use, federal and state governments will likely need additional money to provide vaccines to the poor and uninsured. Congress should anticipate such needs in the near future, the report says. It also recommends that the federal government spend an additional \$50 million per year to purchase vaccines for poor and uninsured adults. Collectively, the states ought to share in these costs by spending an extra \$11 million to buy vaccines for adults. The report also recommends that variations in reporting systems, which make tracking difficult, be standardized. (See *Calling the Shots: Immunization Finance Policies and Practices* at <http://www.nap.edu/books/0309070295/html/>)

◆ Stateside Smokeout

In reviewing 10 years of regulatory experience, the National Cancer Policy Board—a joint program of the Institute of Medicine and the National Research Council — found that states which have mounted substantial tobacco-control programs have seen greater drops in smoking. The Board issued a report that assesses actions that states can take to reduce smoking, including special advertising and public-education campaigns, the establishment of smoke-free zones, and raising the price of tobacco products through taxation — one of the fastest and most effective ways to discourage children and teens from starting to smoke, and to encourage smokers of all ages to quit. States can help support treatment efforts by running public health campaigns alerting smokers that help is available, and by ensuring that state-funded insurance programs such as Medicaid cover the costs. The report notes that a balanced state program also will include school-based prevention efforts, as well as vigorous enforcement of laws outlawing sales to those under 18. To ensure that control efforts improve and that money is well-spent, states should include a budget for evaluation and monitoring so that programs can be carefully assessed and state officials held accountable.

(See *State Programs Can Reduce Tobacco Use* at <http://books.nap.edu/catalog/9762.html>)



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