

# Bulletin of the

CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING



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## CLIMATE CHANGE AND CONNECTICUT

### *New Legislation Mandates Action on Global Warming*

//The immediate future is fraught with dangers ... today we are poised on the threshold of an era that is a threat to the human species." These words were spoken by CASE member Thomas Malone in October 1970, when he was dean of the Graduate School at the University of Connecticut addressing the California Institute of Technology conference on Technical Changes and the Human Environment. Today, his words sound prophetic as they express the urgency needed for implementing programs to address climate change.

The November 2007 report issued by the Intergovernmental Panel on Climate Change (IPCC), co-recipient with Al Gore of the 2007 Nobel Peace Prize, states "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level." The report includes information on the dire consequences of the recorded observations, including "changes in arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones." The report also identifies the most vulnerable people on the planet, including the poor, the young and the elderly.

*"The immediate future is fraught with dangers ... today we are poised on the threshold of an era that is a threat to the human species."*

— CASE Member Tom Malone speaking in October 1970

Additionally, the InterAcademy Council representing the world's leading academies of science, engineering, and medicine, appointed a fifteen-member panel of international

(Climate Change, page 2)

## A Progress Update on the Connecticut Science Center

Progress on the construction of the Connecticut Science Center is nothing short of extraordinary. On the exterior, the most obvious visual developments are the installation of glass and wall paneling. The building itself is nearly enclosed, with wall paneling and glass expected to be fully installed by early September. Site work also continues, with the construction of retaining walls and the connection of storm drains. On the plaza level, crews continue to construct permanent garden planters.



*The new Science Center rises along the Hartford skyline.*  
(Photo: CT Science Center)

(Science Center, page 8)

## News from the National Academies

The following is excerpted from press releases of the National Academies and from Infocus Magazine ([www.infocusmagazine.org](http://www.infocusmagazine.org)), a news resource of the National Academies.

### ◆ Local Emergency Plans Need to Address Role of Transit Systems

Few urban area emergency plans have focused on the role of transit systems in an emergency evacuation, according to a new report from the National Research Council's Transportation Research Board. These systems—defined in the report as bus and rail systems, paratransit and demand-responsive transit, commuter rail, and ferries—could play a significant role in transporting individuals without cars as well as those with special needs in times of emergency, but are inadequately addressed in most local emergency plans.

Emergency managers should be realistic in their expectations for the use of transit during an emergency, the committee said, noting that transit systems' capacity to assist depends on the nature of the incident and its location. The report also notes that evacuating special needs populations by transit poses a major challenge that requires advance planning, working with nonprofits and social service agencies to identify groups that need assistance, and a targeted public information campaign and sheltering strategy.

Local governments are required by law to develop emergency plans for evacuations and mass departure routes, and, since 2006, for populations with special needs, such as people with disabilities. They also have the primary responsibility of responding to emergency incidents and ordering an evacuation, if necessary. The committee recommends that the US Department of Homeland Security provide guidance and funds to state and local governments on regional evacuation planning that includes transit and other public transportation providers.

[[http://trb.org/news/blurb\\_detail.asp?id=9264](http://trb.org/news/blurb_detail.asp?id=9264)]

(National Academies, page 7)

energy experts to “detail a scientific framework for securing economic growth and climate protection.” Their report, *Lighting the Way Toward a Sustainable Energy Future*, also issued in 2007, notes that the challenge is to develop sustainable energy systems and resources that are “not only capable of supporting long-term economic and human development needs, while preserving the underlying integrity of essential natural systems...[but] extend basic energy services to the more than 2 billion people worldwide who currently lack access to modern forms of energy, reducing the security risks and potential for geopolitical conflict that could otherwise arise from an escalating competition for unevenly distributed oil and natural gas resources.”

Now, nearly forty years after his 1970 warning, Malone suggests that “our greatest challenge will be to move from fossil fuels to non-fossil fuels—a change that is admittedly dramatic, but must be made as we reconcile humanity with our climate capacity.”

According to Nancy Cole, the director of Climate Outreach with the Union of Concerned Scientists, most people understand that global warming is under way, but remain uncertain regarding the impact from human activity. She is concerned that if we don’t believe we are creating the problem, then we can’t think about appropriate solutions. This misconception, she states, needs to be tackled head on.

The IPCC agrees that “carbon dioxide (CO<sub>2</sub>) is the most important anthropogenic greenhouse gas (GHG). Its annual emissions grew by about 80% between 1970 and 2004.” Furthermore, the panel asserts that “Global increases in CO<sub>2</sub> concentrations are due primarily to fossil fuel use.” Twenty-five percent of the fossil fuel used in the world is consumed by the United States, which represents less than 5% of the world’s population. Although countries like China, India and parts of South America are moving towards greater fossil fuel use, per capita, the United States uses more than these highly populated, developing nations.

CASE member Edward Monahan, a professor emeritus at the University of Connecticut whose work on marine aerosols has been cited in several IPCC reports, believes neither social scientists nor physical scientists can afford to be complacent, and since Americans have been such vital contributors to the problem, it “behooves us from a moral point of view” to do something about it. And while reducing emissions is at the forefront of combating climate change, there is, as Nancy Cole points out, a quantity of carbon in the atmosphere that has been built up from industry and personal consumption over the past 100 years. We cannot readily remove that carbon, but we can, she says, “avoid the unmanageable and manage the unavoidable. If, on the other hand, we continue emitting at the same rate, the planet will be a changed place with tremendous consequences for humans and other species.”

According to CASE member Gary Yohe, an economist at Wesleyan University in Middletown and a senior lead author for the IPCC, “Indeed, we must do both. The IPCC has made it clear that adaptation and mitigation are both required because the capacity to adapt will be overwhelmed by unabated climate change even in the world’s most developed economies.”

### *Connecticut Legislation Mandates Reductions*

In an effort to avoid the unmanageable, Governor Jodi Rell signed into law in June 2008, *An Act Concerning Connecticut Global Warming Solutions* (HB-5600). This bill mandates “reductions in state greenhouse gas emissions and changes designed to help the state achieve the reductions.” According to Dennis Schain, the communications spokesperson for Connecticut’s Department of Environmental Protection (DEP), this act is particularly noteworthy because a similar bill, the Lieberman-Warner Bill, failed on the US Senate floor.

In the absence of federal policy, Connecticut and nine other states, from the Mid-Atlantic to Maine, along with the Eastern Canadian Provinces, have initiated a program to address GHG emissions using a cap-and-trade agreement. The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort initially covering carbon dioxide emissions from power plants in the region. This is the first plan in the United States to cap greenhouse gas emissions from the power sector, and Connecticut was one of the first states to sign it into law. In the future, RGGI may be extended to include other sources of greenhouse gas emissions, and greenhouse gases other than CO<sub>2</sub>. Looking forward, at the federal level, to further debate and climate change legislation, Connecticut will be well placed to benefit from federal programs

(Climate Change, page 7)

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# IN BRIEF

## Science and Engineering Notes from Around Connecticut



### Business & Industry

#### ACUTE CARE HOSPITALS SHOW FINANCIAL IMPROVEMENT.

According to the state **Office of Health Care Access**, the overall financial condition of Connecticut's 29 acute care general hospitals has improved, with a statewide average total margin of 3.6% in FY 2007 as compared to 2.64% in FY 2006.

**FARMINGTON FIRM OPENS LASER FACILITY.** Farmington-based **TRUMPF Inc.** has opened an 86,000 square foot, \$29 million building for research and production of lasers. The building includes a 6,000 square foot clean room designed for the manufacturing and testing of CO<sub>2</sub> and solid-state laser resonators. Approximately 120 employees will staff the new facility.

**HIRING SURGE FOR ELECTRIC BOAT.** **Electric Boat** of Groton has filled about 150 of 300 engineering jobs created this year. Together with a program to hire 400 designers, this will be the biggest hiring year since the 1990s for Electric Boat.

#### DEREGULATION HAS LITTLE IMPACT ON UTILITY CHOICES.

Despite 10 years of deregulation, only 7% of **Connecticut Light & Power** and about 10% of **United Illuminating** customers have signed on with alternate suppliers through the end of June.

#### LAW REQUIRES STAFFING ACCOUNTABILITY IN HOSPITALS.

A new law signed by **Governor M. Jodi Rell** will hold licensed hospitals more accountable for staffing decisions. Beginning July 1, 2009, hospitals must, upon request, provide the state **Department of Public Health** with nursing staffing plans that outline the minimum nursing skill mix required to properly monitor each patient care unit, the minimum amount of administrative staffing needed to ensure nurses are focusing on patients, and the hospital's use of temporary or traveling nurses to bolster staff.

#### CRRA TO STUDY ACQUISITION OF WALLINGFORD PLANT.

The Board of the **Connecticut Resources Recovery Authority (CRRA)** has approved \$390,500 to study the feasibility of acquiring a waste-to-energy plant in Wallingford before its contract expires with private operator Covanta of New Jersey. CRRA must notify Covanta on or before December 30, 2008 as to whether it intends to buy the plant at market price. After the deadline, Covanta has the option to purchase the facility for \$1.

**NIH GRANTS BOLSTER STATE'S ECONOMY IN 2007.** The \$476 million in research grants and contracts received from the National Institutes of Health during FY 2007 by Connecticut researchers generated 5,503 new jobs and \$988 million in business activity according to Families USA, a health care advocacy nonprofit.

**CALIFORNIA CITY ORDERS UTC FUEL CELL SYSTEMS FOR BUSES.** **UTC Power**, a subsidiary of **United Technologies**, has received an order for eight fuel cell systems from the Oakland, CA, bus system. The bus system currently operates three buses powered by UTC fuel cells. Three other fuel cell-powered buses are in use in Hartford, Palm Desert, CA, and Belgium.

**NU EXPLORES PROJECTS TO TRANSPORT POWER.** **Northeast Utilities** is exploring projects to transport power generated by

wind, hydro and other renewable energy sources from northern New England and Quebec to southern New England. The projects include transmission lines connecting Quebec and central New Hampshire and a partnership for an undersea high-voltage cable between the New Hampshire coast and the Boston area. No timetable has been given.



### Communication

**NEW SYSTEM BOOSTS INTERNET EFFICIENCY.** **Yale** computer scientists have devised a system to make internet usage more efficient. Professors **Avi Silberschatz**, **Y. Richard Yang**, and PhD candidate **Haiyong Xie** have helped develop the system, called P4P, which allows internet service providers and peer-to-peer sites to maintain their independent functions while making the process of downloads more efficient and less costly. In a test with the popular software Pando, P4P reduced inter-internet service provider traffic by an average of 34%, and increased delivery speeds to end users by up to 235% across US networks and up to 898% across international networks.

#### STATE LAUNCHES INTERNET-BASED PRESCRIPTION MONITORING SYSTEM.

The **State of Connecticut Department of Consumer Protection's** Prescription Monitoring Program has launched a new, internet-based system to help prevent abuse of controlled substance prescription drugs. The system, which allows doctors and pharmacists to electronically share patient information in a matter of minutes, replaces the current fax and mail process.

#### NEW ONLINE ENVIRONMENTAL MAGAZINE LAUNCHED.

**Yale Environment 360**, a new online magazine dedicated to commentary and reporting on crucial environmental issues, has been launched by the **Yale School of Forestry & Environmental Studies**. The web address is <http://e360.yale.edu>.

#### CIGNA TO DEVELOP ONLINE VIRTUAL HEALTH COMMUNITY.

**CIGNA** has announced development of a virtual health community situated on a popular virtual online community known as Second Life where seminars, interactive displays, educational games, and virtual health consultations help foster real and sustainable behavior change that improves health. For example, the nutrition zone helps participants develop their nutrition knowledge, learn how to make healthier food choices, manage their weight and understand portion sizes and food labels. Plans call for development of stress, physical activity and sleep zones within the community.

#### STAMFORD INSTALLS DIGITAL RADIO SYSTEM FOR CITY SERVICES.

The **City of Stamford** has installed a new digital radio system connecting police, fire, public works, and other city services on one network, replacing a 20-year old analog system. The system, which transmits encrypted signals, took four years to complete at a cost of \$15.3 million. No calls in any of the city's 1,300 sectors failed during tests. Using the old analog system, about one in five calls failed.

**'TIP711' TEXT MESSAGE CRIME TIPS SYSTEM DEBUTS.** The **State Police** have installed a system to help citizens send tips anonymously to police departments across the state using text

*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 CASE Bulletin, 179 Allyn St., Suite 512, Hartford, CT 06103-1422, or email us at [acad@ctcase.org](mailto:acad@ctcase.org)*

# IN BRIEF

## Science and Engineering Notes from Around Connecticut

messaging. The State Police will forward tips to local police departments. **Bridgeport, Stamford, Hartford, New Haven and Waterbury** will receive tips directly. Residents text "CRIMES" or 274637 and once in the message field, enter a code for the State Police or a city, leave a space, and type the message. The message first goes to a server that is not associated with a law enforcement agency, which removes identifying information before delivering the message to the police. The code for the State Police is TIP711.



### Education & Cognition

**TUTORING FOR TRAUMATIZED CHILDREN.** The **Clifford Beers Guidance Clinic** in New Haven has begun a program to give traumatized children free, intensive, one-on-one tutoring to help them overcome related educational problems. The tutoring will be done by **Raging Knowledge Educational Services** of Westport, whose staff specialize in holistic learning in math, science, and language. The clinic has expanded educational testing of children and hopes to do the same with neurological testing.

**TEACHERS FROM INDIA HELP FILL MATH, SCIENCE GAP.** Last year, **Bridgeport** was the only Connecticut urban school district to take up an offer from the state to hire teachers from India to help make up a shortage of math and science teachers. Of the 14 teachers from India who began the year in Bridgeport schools, one returned to India and one requested a transfer to another district.

**AFTER-SCHOOL ROBOTICS TO BE AVAILABLE STATEWIDE.** The **Connecticut Department of Education** is partnering with Innovation First, Inc. to make after-school robotics programs available statewide in the 2008-2009 school year. In the program, students collaborate with their teachers and industrial mentors using their skills and knowledge in science, math, engineering, and technology to configure high-tech robots to meet a preset series of tasks. The program will culminate in the **First Annual Connecticut State Vex Robotics Championship** to be held at **Central Connecticut State University** on April 4, 2009.



### Environment

**YALE RESEARCHER FINDS RARE SHRIMP IN STATE POOL.** A **Yale** scientist recently rediscovered in a woodland pool a rare shrimp that hadn't been seen in Connecticut for more than 50 years. Biologist **Eric Lazo-Wasem** found *Eubranchipus holmani*, a type of fairy shrimp, in a wooded area in Groton.

**NEW OZONE STANDARD WILL INCREASE UNHEALTHY DAYS.** The federal Environmental Protection Agency put into effect new regulations reducing the standard for ozone from 0.08 parts per million to 0.075 ppm on May 27. The new standard will lead to more "unhealthy" air days reported. Under the old guidelines, Connecticut experienced 17 days of dangerous air days during 2007. If the new standard had been in place then, there would have been 43 unhealthy air days reported.

**NEW LAW MANDATES ELECTRONICS RECYCLING.** A new law which took effect July 1 requires the **Department of Environmental Protection** to create a recycling program for electronics equipment, such as computers and televisions, which is scheduled to begin in 2009.

**NEW HAVEN SCHOOLS GO GREEN.** New schools in **New Haven** have been receiving energy-efficient design awards this

year. Four New Haven schools were among the five buildings recognized in New England with US Environmental Protection Agency Energy Star Awards. The **Sheridan Communication and Technology Middle School, Bishop Woods Elementary School, Christopher Columbus Family Academy, and Metropolitan Business Academy** are all in various stages of construction. Earlier this year, **Barnard Environmental Magnet School** became the first public school in Connecticut to receive gold certification from the US Green Energy Council's Leadership in Energy and Environmental Design green ratings.

**CRRA TO SIMPLIFY RECYCLING.** The **Connecticut Resources Recovery Authority (CRRA)** has approved \$3 million to retrofit its regional recycling facility in Hartford to receive single stream recycling materials from the 70 towns that make up the **Mid-Connecticut Project**. The towns will receive a \$10 rebate for every ton of recyclables delivered to the Hartford plant. The system is expected to employ 64-gallon barrels rather than the 14-gallon bins currently in use. It will be easier for customers to recycle more materials because they can put paper, cardboard, bottles, cans, and other recyclables into one container.

**ENVIRONMENTAL JUSTICE LAW WILL INCREASE PUBLIC PARTICIPATION.** **Governor M. Jodi Rell** has signed an environmental justice law that will provide a mechanism for public participation in plans for many projects that are significant new sources of pollution. The law applies to new or expanded landfills, solid waste facilities, medical waste incinerators, and other major sources of air pollution. A public participation plan will have to be developed for approval by the state **Department of Environmental Protection** and the **Connecticut Siting Council** prior to consideration of applications.

**CARBON EMISSIONS, MODERATED.** Carbon emissions, feared for their climate-changing potential, are the product of population multiplied by affluence, energy use per dollar, and carbon emission per energy production. For decades, people have moderated carbon emissions by increasing energy use more slowly than their affluence rose and also emitting less per unit of energy produced. Despite fears that these beneficial trends were ending, CASE emeritus member **Paul Waggoner of The Connecticut Agricultural Experiment Station** with Jesse Ausubel of Rockefeller University have just reported in the *Proceedings of the National Academy of Sciences* that the trends are persisting.

**YALE LAB RENOVATION EARMARKED FOR 'GREEN' RATING.** New Haven architectural firm **Svigals + Partners** recently completed a state-of-the-art green laboratory renovation at the **Yale School of Medicine** for the **Laboratory for Surgery, Obstetrics and Gynecology (LSOG)**. Part of Yale University's Ob-GYN department, the LSOG occupies 25,864 square feet and serves as a research and academic center for the department. The \$9 million project, which has been earmarked for Leadership in Energy and Environmental Design (LEED) gold certification, features a variety of sustainable technologies and design elements.



### Energy

**NATURAL GAS-FUELED TURBINE POWER PLANTS UNDER CONSTRUCTION.** Connecticut's nominal electric power demand runs about 6000 MW. In recent years, efficient and clean-burning natural gas-fueled gas turbine power plants have supplemented or replaced existing units. Currently, two such plants are under construction, one in **Middletown** and one in **Waterbury**. Providing 620 MW of electrical power, the new

# IN BRIEF

## Science and Engineering Notes from Around Connecticut

Middletown facility is a combined cycle gas turbine plant with a net efficiency of 55-60%. At 100 MW output, the Waterbury plant will be powered by a GE new advanced intercooled gas turbine with an efficiency of 45-47%.

### CL&P SUBMITS TRANSMISSION LINE UPGRADE PLANS.

**Connecticut Light & Power (CL&P)** has presented plans for a \$714 million upgrade to replace 115-kilovolt transmission lines between Bloomfield and Ludlow, MA, with 345-kilovolt lines. No new paths would be added. CL&P has to seek approval from the **Connecticut Siting Council**, which will have up to a year to reach a decision. CL&P hopes to begin construction in 2010.

### DPUC APPROVES THREE PEAKING GENERATION PROJECTS.

The **Department of Public Utility Control (DPUC)** has finalized the selection of three projects to provide Connecticut with peaking generation over the next two or three decades. The selected projects—360 MW in **Bridgeport**, expected to be in service in December 2010; 194 MW in **Devon**, expected to be in service by June 2010; and 130 MW in **New Haven**, expected to be in service by June 2012—will use natural gas as the primary fuel. The projects will be built at existing generating facilities. Once the plants come online, it is estimated that customers will save \$30 million per year and the development of the plants may result in closing of older, dirtier, less efficient plants.

### STATE RANKS HIGH ON POLICIES TO REDUCE OIL

**DEPENDENCE.** The Natural Resources Defense Council has rated **Connecticut** third best in the nation when it comes to policies that help reduce oil dependence. Connecticut earned a high rating for hybrid car incentives, greenhouse gas emission standards, idling restrictions, grants for research into clean fuels and cars, incentives for biofuel stations, coordinated public investment in development, and using efficient vehicles in the state's fleet. Connecticut had the lowest percentage, 3.1%, of personal income spent on gasoline, including state and federal taxes.

### NEW METERS FOR VARIABLE USAGE RATES.

**Connecticut Light & Power** will begin marketing 2,000 advanced meters to commercial customers in Hartford and Norwalk and to 2,000 residential customers in Hartford and Stamford this year. Using the meters, the customers will pay varying rates depending upon the time of day. The meters will allow lower rates at night when the cost of delivering electricity is cheaper because demands on the system are lower. Customers will still have the option of keeping the current flat-rate billing system.



## Food & Agriculture

**WEST NILE MAKES EARLY APPEARANCE.** West Nile virus was identified on June 11 in **Stonington**, earlier than in any of the 10 years the state has been testing mosquitoes. **Theodore G. Andreadis**, chief medical entomologist who oversees the testing program at **The Connecticut Agricultural Experiment Station** in New Haven, said the find, in an area of the state where West Nile is infrequently found, was made a few weeks earlier than in previous years. Connecticut was the first state in the Northeast to report the virus in mosquitoes this year.

### RECORD YEAR FOR STATE'S MAPLE SUGAR INDUSTRY.

**Connecticut** maple syrup producers enjoyed the best maple-sugaring season on record in 2008. According to New England Agricultural Statistics, Connecticut produced 15,000 gallons of maple syrup, the highest production since tracking began in 1992. In 2007, the state produced 8,000 gallons.

**UCONN LAUNCHES HONEY OF A PROJECT.** As part of a program to serve more locally grown food, the **University of Connecticut Dining Services** has populated 10 hives with bees, hoping to produce more than 2,000 pounds of honey for use each year in marinades, sauces and baked goods. It cost \$5,000 to start the apiary. It is hoped the cost will be recovered in a year and the facility can be used for education and research in the future.

### AGRICULTURE GRANTS OFFER SEED MONEY FOR FARM

**UPGRADES.** Seventeen producers have been awarded a total of more than \$586,000 in matching grants through the **Connecticut Department of Agriculture's Farm Reinvestment Grant Program**. The grants provide seed money for projects that enhance existing agricultural operations and are available to a variety of businesses, including dairy farms, greenhouses, and oyster and fish farms in Connecticut. The grantees have up to one year to complete the project, according to the terms of their contract. The Department of Agriculture's share of the budget is capped at \$40,000, and the applicant must provide matching funds that meet or exceed the grant award. The seventeen projects range from a new calf barn to a composting facility to greenhouses and a wine tasting barn.

**RADIO SEGMENT TO PROMOTE FARMERS' MARKETS** Twenty-one new farmers' markets opened in 2008, bringing the total number of farmers' markets in Connecticut to over 100. To help promote the markets, the **Connecticut Department of Agriculture** has joined with WTIC radio 1080 to help create a farmers' market of the week segment aired every Tuesday at 8:20 am.

### WEBSITE LINKS CONSUMERS WITH LOCAL PRODUCERS.

**CitySeed**, a New Haven nonprofit, has launched a website that connects consumers with producers and retailers of locally-grown and produced foods and informs users about where they can find specific products at farms, stands, and even restaurants. The website, [www.buyctgrown.com](http://www.buyctgrown.com), can also send emails to users every time a specific crop or event of interest comes up.



## Health

### NEW LAW REQUIRES LIST OF HAZARDOUS TOYS, PRODUCTS.

A new law will take effect October 1 that requires the state to compile a list of children's toys and products that contain hazardous substances, including lead and asbestos. The list will be posted at the **Department of Consumer Protection's** website. State officials will also develop a "certificate of deposition" intended to keep track of any children's products that are subject to recalls. The department's website is [www.ct.gov/dcp/](http://www.ct.gov/dcp/).

**STUDY FINDS LYME DISEASE HAS EUROPEAN ROOTS.** A study by **Yale** and University of Bath researchers has found that Lyme disease in the United States is caused by a bacterium of European ancestry. Professor of epidemiology and public health **Durland Fish** of Yale was the principal investigator of the study, which examined 64 different samples of bacterial DNA from ticks collected in the field and from infected human patients across Europe and the United States. A computer-generated evolutionary tree shows that European strains are more closely related to a common ancestor than are the North American strains, indicating a European origin for the Lyme disease bacterium in the United States.

**YALE RESEARCH MAY EXPLAIN METASTASIS PROCESS.** **John Pawelek**, a researcher at the **Yale Cancer Center**, has published a theory and evidence in the journal *Nature Reviews Cancer* which may explain how a cancer can spread to other parts of the body, a process called metastasis. The theory involves macrophages—large

# IN BRIEF

## Science and Engineering Notes from Around Connecticut

immune system cells—which circulate throughout the body consuming pathogens and dead cells and are also attracted to tumors. More than 99% of the time cancer cells are consumed, but occasionally a macrophage combines with a tumor cell to produce a hybrid cell which is mobile like a macrophage but has the tumor's uncontrolled replication. If such a cell becomes wedged in a capillary and multiplies, it spreads the cancer.

**THERAPEUTIC TOUCH.** A study by surgery professor **Gloria Gronowicz** of the **University of Connecticut Health Center** found that therapeutic touch performed by trained energy healers significantly stimulated the growth of healthy bone and tendon cells in laboratory dishes. One group of cell cultures was treated by a trained healer holding hands over a petri dish clamped in a stand for 10 minutes twice a week. A second was treated by untrained students who were instructed to hold their hands over a petri dish twice a week. A third received no treatment. Gronowicz found cells treated by trained therapeutic touch practitioners grew faster and stronger than those that received the untrained treatment or none at all. Unlike healthy cells, cancer cells did not appear stimulated by the touch therapy, she found. The results were published in the *Journal of Orthopaedic Research* and the *Journal of Alternative and Complementary Medicine*.

**YALE TEAM FINDS CRITICAL MOLECULE.** Yale researchers have found a crucial molecule that helps axons migrate to form the synaptic connections between neurons that carry out all functions of the nervous system from thought to movement. A team led by **Elke Stein**, assistant professor of molecular, cellular, and developmental biology and cell biology, showed that a gene linked to the mental retardation phenotype in Down Syndrome is essential for these axons to make their way across the midline of the spinal cord.



### High Technology

**FRENCH FIRM TO SURVEY METRO-NORTH LINES.** **Metro-North Railroad** is turning to a high-technology solution to reduce delays caused by failure of catenary lines used to power trains. Wire problems caused 247 delays or shutdowns in 2007. A contract for a \$400,000, two-year survey of catenary lines has been signed with Gerken SAS, a French firm. Gerken will survey the lines by attaching equipment to a railroad car to take detailed images of the wires and the mechanical arm that brings power to the train. The technique will pinpoint overloads or misalignments so they can be fixed before they cause an interruption in service. The **Connecticut Department of Transportation** is currently replacing the catenary system. It is expected to be finished in 2017.

**YALE SCIENTISTS DEVISE NEW CODE FOR LASERS.** Researchers at **Yale University** and the Institute of Quantum Electronics at ETH Zurich have devised a new set of nonlinear equations that fit both conventional and non-conventional lasers such as nonstructured lasers. The computer code can predict all important properties of any kind of laser from simple inputs. Senior author and CASE member **A. Douglas Stone**, the Carl A. Morse Professor of Applied Physics at Yale, hopes the code can be used as a design tool for new classes of micro- and nano-lasers.

**NEW TECHNIQUE FOR ISOLATING NANOTUBES.** CASE member **Fotios Papadimitrakopoulos** and his graduate students in the **College of Liberal Arts and Sciences at the University of Connecticut** reported in the journal *Nature Nanotechnology* that they have found a way for a biological molecule—a form of Vitamin B<sub>2</sub>—to wrap around a single-walled nanotube, enabling

them to isolate a particular type of nanotube from a sample that contained 50 different kinds. Nanotubes that are alike can be interlocked to create a material that is extremely strong, even if each nanotube is as small as one micron.

**NEW TECHNOLOGY FOR CELL PHONES.** Wilton's **iCard Forensics** has introduced its Trace technology, which allows it to recover a variety of information from all of the over 1,300 cell phone models on the market. Trace has the ability to legally collect information from a cell phone, including outgoing and incoming calls, text messages, pictures, or anything else needed in a criminal investigation.



### Transportation

**STATE ORDERS REVIEW OF NEW HAVEN RAIL PROJECT.** The state **Office of Policy and Management** has hired Hill International, Inc. to review the **New Haven** railroad maintenance facility project, which was originally estimated to cost \$300 million and now is expected to cost over \$1 billion. The project, planned for completion by 2019, is designed to meet the needs of the new M8 rail fleet which will begin to arrive next year.

**STAMFORD OKAYS TROLLEY STUDY.** The **City of Stamford** has approved a \$141,000 study to determine if it would be feasible to bring back trolleys to link residents and workers in the area south of Interstate 95 to the Metro-North station and downtown. The light rail system would cost about \$100 million and would be built in 10 to 12 years. The study is the first step toward securing federal funding.

**SHORELINE EAST ADDS WEEKEND, HOLIDAY TRAINS.** Starting in July, the **Shoreline East** rail service between New Haven and Old Saybrook began operating on weekends and holidays. The weekend schedule includes four westbound trains to New Haven from early morning to early afternoon and five eastbound trains from mid-afternoon to late evening. The new service will allow customers to depart Grand Central Terminal as late as 8:07 pm, connecting in New Haven with a 10:05 pm Shoreline East train.

**I-95 BRIDGE PROJECT BREAKS GROUND.** Ground was broken in June for a \$137 million portion of the I-95 **New Haven Harbor Crossing Project** which will replace the I-95 **Pearl Harbor Memorial Bridge** over the Quinnipiac River. The project includes the first phase of the main river pier foundations for the new 10-lane bridge, the northbound I-95 approach structure and local road reconstruction including roadway, drainage and traffic signal improvements. In late July, the DOT gave the existing bridge an emergency declaration to allow a contractor to be hired to do repairs without going through the bidding process after 12 floor beams and stringers were found to be weakened. The **Department of Transportation** said the structure is safe and that the critical rating concerns the condition of the bridge and not its safety.

**NEW THAMES RAILROAD BRIDGE OPENS.** During a four-day suspension of rail traffic between New Haven and Boston in late June, a new bridge was installed across the **Thames River** between New London and Groton. The 188-foot long, 35-foot-wide vertical lift span replaced a drawbridge which had been in operation for almost 90 years. According to Amtrak, upgrading the bridge was one of its largest-ever engineering projects. It cost \$89 million and took several years to complete.

— Compiled and edited by Paul Gough

because of the state legislation that is already in place. The Governor's Steering Committee on Climate Change has been directed to assess the impact of climate change on the state and to recommend to the governor and legislature ways in which the state can adapt to harmful impacts. Yohe remarks, "It used to be that talking about adaptation was seen as giving up, but it has now become clear that we are committed to a certain amount of climate change that we have to adapt to."

While Connecticut is just beginning to contemplate what adaptation might look like across the state, there are numerous measures spanning a wide horizon of industry, transportation, infrastructure, and public health that *An Act Concerning Connecticut Global Warming Solutions* outlines for mitigation. Some specific actions include further reductions in acceptable emissions standards, requiring the state to reduce its GHG emissions to at least 10% below 1990 levels by January 1, 2020 and at least 80% below 2001 levels by January 1, 2050. The law now states that the DEP "in consultation with the Department of Public Utility Control, shall auction all emissions allowances and invest the proceeds on behalf of electric ratepayers in energy conservation, load management and Class I renewable energy programs."

### *DEP Identifies Five Major Focus Areas*

Gina McCarthy, the DEP's commissioner has, based on the Connecticut Climate Change Stakeholders' Dialogue Report, identified five focus areas including: (1) cleaner electricity generation, (2) cleaner transportation and smarter land use, (3) more efficient energy use, (4) reduced emissions from agriculture, forestry, and waste management and (5) public education.

The new law also requires the state Department of Transportation to investigate ways of expanding high-speed and light-rail passenger service and freight rail service within the Northeast region, including new rail corridors. Over \$3 billion has been allocated for public transit improvements in the state. Other "cleaner transportation initiatives" include

- Over 140 hybrid vehicles in the state fleet
- Over 170 businesses participating in Telecommute CT
- Ride Share, CT Transit, Metro North, Bike to Work
- Bike racks on Greater Hartford buses

State building codes are being revised consistent with the Leadership in Energy and Environmental Design (LEED) Green Building Rating System, which requires buildings and building materials to be designed to provide cost-effective energy efficiency over the life of the building. Further, this new law requires the Secretary of the Office of Policy and Management, in consultation with the DEP commissioner, to develop a smart growth code that municipalities may adopt, encouraging open space preservation, mixed land uses, compact building design, and availability of public transit and other low-carbon emission transportation alternatives, thus bridging the gap between future systems and current infrastructure in order to use what we have and build what we need.

As Dennis Schain suggests, "This issue is so much about our lifestyle. We can't point a finger at one thing. It is about all of us and how we live and how we can think differently."

### *OneThing Campaign Helps Citizens Make a Difference*

To that end, Governor Rell has spearheaded the OneThing Campaign which "builds on the momentum that can be achieved if everyone in Connecticut takes one small step, every day, to make a real difference on issues such as consumption,

(Climate Change, page 8)

### ◆ **Study Urges Continued Government Support for Hydrogen Vehicle Research and Development**

A new congressionally mandated report from the National Research Council finds that a transition to hydrogen vehicles could greatly reduce US oil dependence and carbon dioxide emissions, but warns that while the development of fuel cell and hydrogen production technology has been impressive, vehicle costs are high and the United States currently lacks the infrastructure to produce and widely distribute hydrogen to consumers. The report concludes that these obstacles could be overcome with continued support for research and development and firm commitments from the automotive industry and the federal government.

The report estimates the maximum number of hydrogen vehicles that could be on the road in the coming decades, assuming that practical technical goals are met, that consumers want hydrogen cars, and that government policies are in place to help drive the transition from oil to hydrogen fuel. The findings therefore represent potential best-case scenarios rather than predictions. The committee also calculated the investments, both public and private, that would be needed to make a complete transition from oil to hydrogen fuel. These costs include research and development, vehicle deployment, and establishing infrastructure. According to the committee, government support via strong policy initiatives as well as funding would be needed until at least 2023.

The greatest possible reductions in oil usage and greenhouse gas emissions would occur under a "portfolio approach" with biofuels, fuel-efficient conventional vehicles, and hydrogen vehicles all pursued simultaneously. If accompanied by government policies driving a transition toward reduced oil use and low-carbon fuels, this could reduce greenhouse gas emissions from cars and trucks to less than 20% of current levels and could nearly eliminate oil demand for these vehicles by 2050, the committee concludes.

[[http://www.nap.edu/catalog.php?record\\_id=12222](http://www.nap.edu/catalog.php?record_id=12222)]

### ◆ **Restoration of Climate Sensors Urged**

To continue the study of long-term climate change, NASA and NOAA need to restore a number of sensors that were previously planned for future Earth-observing satellites but cancelled, according to a new report from the National Research Council (NRC). The report provides recommendations for a recovery strategy and stresses the need for a clearer national policy toward acquiring long-term climate records.

Since the 1970s, NOAA has operated geostationary weather satellites that provide images and data on atmospheric, oceanic, and climatic conditions over the continental United States and Hawaii from ~22,000 miles above the equator. NOAA's next generation of satellites will commence with the launch of GOES-R in 2015. Originally, plans for this series included four satellites. However, in September 2006, following significant cost growth and estimates that the total program cost would nearly double, NOAA reduced the scope of the program, removed a key instrument on the spacecraft, the Hyperspectral Environmental Suite (HES), and revised the procurement process so that only two satellites are guaranteed. These events prompted NASA and NOAA to ask that a committee of the NRC "prioritize capabilities, especially those related to climate research, that were lost or placed at risk following recent changes to NPOESS and the GOES-R series of polar and geostationary environmental monitoring satellites." This report reflects their findings.

[[http://www.nap.edu/catalog.php?record\\_id=12254](http://www.nap.edu/catalog.php?record_id=12254)]

## Climate Change (continued from page 7)

conservation and the use of clean and renewable energy." Some suggestions posted on the OneThing website (<http://onethingct.com/>) include: drying clothes on a clothesline, exclusive use of compact florescent bulbs, unplugging appliances when not in use, carpooling, biking, composting and telecommuting. These suggestions are posted by Connecticut residents using a link that invites visitors to post things they do to conserve energy. The state has also launched a website dedicated to climate change at [www.ctclimatechange.com](http://www.ctclimatechange.com). This site includes information about recent legislation, news and events, awards and publications.

Monahan compares the campaign for energy conservation to the anti-smoking campaigns of the 1960s and 1970s, when "we made great progress towards weaning kids away from cigarette smoking." He believes the best way to change the public view towards energy consumption is to start with the youth, without polemics, but in units taught in school, since "altruism exists for a ten-year old."

## CT Science Center Update (continued from page 1)

Interior progress is equally dramatic. Walls are going up throughout the building, with sheetrock being taped and painted. Installation of ductwork, piping and plumbing for heating systems and electrical wiring is well under way. Two of nine elevators are being worked on. Scaffolding fills the interior of Science Alley, the main lobby area, in order to apply finishing to the underside of the Magic Carpet Roof.

Fabrication of nearly 150 exhibits, that will fill 40,000 square feet of exhibition space, is 80% complete. These exhibits will comprise the Science Center's 10 unique galleries: Forces in Motion, Planet Earth, Exploring Space, Picture of Health, Smart Energy, Sight and Sound Experience, Sports Lab, Invention Dimension, A River of Life, KidSpace and a traveling exhibit gallery that will change at least twice a year. Producers of the interactive media components, such as video and touch screens, are also completing their work.

The Science Center will begin taking reservations in early 2009 for field trips in the spring. In the meantime, check out the Science Center's resources for educators and schools on its website, [www.CTScienceCenter.org](http://www.CTScienceCenter.org).

***"Good social policy is good climate policy"***

*— Wesleyan professor Gary Yohe*

Although change might be difficult to implement at first, great opportunities abound for those businesses and individuals using renewable energy and reducing greenhouse emissions, including lower energy costs, and profits from developing new energy-saving technologies for home and abroad.

There are many promising signs that progress is under way. Green is in. The rise in oil prices has spurred a change in driving habits. In another sign of change, last October Wal-Mart announced that it had reached its goal of selling 100 million compact fluorescent light bulbs nationwide by the end of 2007.

Gary Yohe states that, "Good social policy is good climate policy" and Nancy Cole would agree, contending that focusing on climate change will yield a "much cleaner, more humane society that is focused on community." **—Wendy Millstein, freelance writer**

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