

Bulletin of the

CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING



1976

Volume 24,1 / Spring 2009

Science is for Everyone . . . at the New Connecticut Science Center

Science is for everyone. And, although this may seem obvious, scientific knowledge and information has not always been considered essential for the public to understand. This perception is about to change since the basic, driving force behind the creation and design of the Connecticut Science Center is, indeed, the belief that science belongs to each and every one of us.

"The Connecticut Science Center's mission is to inspire interactive learning that explores our changing world through science. One of the key strategies to draw people into science is to enable individuals, families and groups to discover how science belongs in

all of our lives," states Matt Fleury, incoming president & CEO of the Connecticut Science Center.

On a cold November afternoon, CASE was invited to tour the Science Center and witness firsthand the development of this spectacular addition to Hartford. After six years of planning and building, the Connecticut Science Center showcases the genius of architect Cesar Pelli & Associates' design—a design that communicates the excitement of science to all who see the dramatic structure, with its soaring "Magic Carpet" roof, overlooking



An artist's rendering of the new Connecticut Science Center, with the Connecticut River in the foreground. (Graphic: CT Science Center)

ing Connecticut's capitol city. The Science Center will house 150 exhibits in ten galleries, a traveling exhibition hall, four educational labs, a community room, a 3D digital theater, a plaza and rooftop garden, a gift shop and a café, where many locally grown and organic foods will be served. The Science Center will work with organizations around Connecticut to focus on teaching science and related fields. Working together with these groups, the Science Center expects to play an important role in increasing interest and achievement in the sciences.

The excitement was palpable on a recent tour through nearly completed exhibition halls and learning labs featuring the exploration of space, health and sports, the planet Earth, energy, sight and sound, motion and the Connecticut River watershed.

The major audiences that the Science Center will serve are students from pre-kindergarten to twelfth grade; families that visit and want to participate in an educational experience; community youth groups, including the Boys and Girls Club of Hartford, the YMCA and after school programs; and educators. In fact, the Science Center has already

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News from the National Academies

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

◆ A Key to Treating Lyme Disease

A research team led by the La Jolla Institute for Allergy & Immunology and Albany Medical College illuminated the important role of natural killer (NK) T cells in Lyme disease, demonstrating that the white blood cells are central to clearing the bacterial infection and reducing the intensity and duration of arthritis associated with Lyme disease. "Our findings are that the NK T cells are critical to preventing the chronic inflammatory infection that causes Lyme arthritis and they participate in clearing the bacteria which cause it," said Mitchell Kronenberg, the La Jolla Institute's president & scientific director and co-senior author on the study, which used a mouse model of Lyme disease. "This offers the possibility that we can exploit that knowledge therapeutically and potentially develop immunological agents that can trigger more NK T cells to aide in fighting this disease, said Timothy J. Sellati, an associate professor at Albany Medical College and co-senior author on the study.

<http://www.pnas.org/content/105/50/19863.abstract?sid=397ce9e8-d744-4840-bd87-6043b58fcb24>

◆ Report Urges Major Overhaul of US Forensic Science System

A congressionally mandated report from the National Research Council finds serious deficiencies in the nation's forensic science system and calls for major reforms and new research. Rigorous and mandatory certification programs for forensic scientists are currently lacking, the report says, as are strong standards and protocols for analyzing and reporting on evidence. There is a dearth of peer-reviewed, published studies establishing the scientific bases and reliability of many forensic methods. Moreover, many

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served almost six hundred teachers in the past four years with an inquiry-based education program designed to enhance classroom teaching methods. As part of the Institute for Inquiry, Connecticut teachers have attended week-long summer workshops on topics such as "Science Notebooking" and "Integrating Language Arts and Science." These workshops are geared toward improving teaching techniques in specific content areas. Follow-up programs include two-day workshops where participants are invited to share their experience and its application to their professional practices and student learning. The Science Center's website includes the Science Frameworks Resources database, part of the AT&T Learning Connection, designed to assist educators with developing lesson plans, and discovering enrichment opportunities.

Currently, there is a major emphasis on science education in American schools based, in part, on recent findings that show American students lagging behind in science and math performance compared to their peers in other industrialized nations. In October 2007, the National Science Board (NSB) created an

action plan to address this issue, urging local and national reforms, and making science education a priority. Furthermore, the No Child Left Behind act requires states to test students in science starting by the beginning of the 2007-08 school year. Science tests are required at least once in grades 3-5, grades 6-9, and grades 10-12. In response, Connecticut has enhanced its curriculum and assessments to include science testing as part of the Connecticut Mastery Tests (CMTs) at the fifth and eighth grade level. In an effort to assist with this goal, the Science Center has created exhibits and supplementary program packages that reflect the skills being taught and reinforce the content and process of the core science curriculum in Connecticut's public schools. Located on street level, the Pfizer Foundation Science Discovery Center features four educational laboratory rooms and, each year, the Science Center expects visits from over 100,000 school children across the state.

In addition to offering 40,000 square feet of exhibits closely coordinated with the state's school science curriculum, the Connecticut Science Center will launch, as early as fall 2009, outreach programs for schools and community groups. In a multi-step process, teachers are first encouraged to participate in workshops at the Science Center in preparation for their classroom visit. Science Center staff will then visit schools to make presentations to individual classrooms or assembly-style programs, laying the groundwork for the field trip and thereby enriching the value of the exhibits when they are viewed. The educational experience will not stop with viewing an exhibit, but will continue on the gallery floor, where scientists will carry the conversation further, answering questions, gathering opinions and making learning relevant to what is being taught in schools and what is occurring within their communities and around the world. Follow-up will be available online in the form of PDF resources, pod and video casts and career links. A longitudinal model like the one described is designed to enhance the science proficiency of students and result in higher scores on standardized tests such as the CMTs.

Every aspect of the Science Center is considered for its educational value, including the Center's architectural design and the accompanying program, The Science of Building, supported by AT&T. Using a digital video, this program demonstrates how science and math are applied to create an efficient, yet beautiful, building. Science is also evident in the art work and sculptures, like the kinetic sculpture by artist Tim Prentice located in the Science Center lobby and, of course, the Center's proximity to the Connecticut River, which allows for learning about the relationship between humans and the Connecticut River and its watershed. The exhibit—River Over Time—is an interactive program that explores industry, navigation, food, pollution and energy, helping visitors to understand how they can contribute to sustaining the life of the river well into the future.

When it opens its doors in late May/early June, the Science Center will boast the state-of-the-art Maximilian E. and Marion O. Hoffman 3D movie theatre. Films will be selected to support and integrate with other learning programs both at the Center and in schools. For example, a film on the sun is tied into elementary school science curriculum content, with active participation extending to the Science Center's patio, where visitors can observe and document sunspot activity.

Drawing lessons from both the successes and weaknesses of other science centers and museums, the Connecticut Science Center is uniquely positioned to develop programs based on the latest pedagogy, including recognition that learning takes place through multiple modalities and social interactions. One prime example of this understanding is reflected in the Forces in Motion exhibit that looks at the physics of motion through a variety of interactive activities. One aspect of the exhibit examines magnetic levitation and ways

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The BULLETIN of the Connecticut Academy of Science and Engineering is published by the Connecticut Academy of Science and Engineering, Inc., 179 Allyn Street, Suite 512, Hartford, CT 06103-1422. Telephone and fax: (860) 527-2161. E-mail: acad@ctcase.org. Web site: www.ctcase.org. To subscribe to the Bulletin, contact us by phone or email or subscribe on our web site. The Connecticut Academy of Science and Engineering is a private, nonprofit public-service organization established by Special Act No. 76-53 of the Connecticut General Assembly.

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Science and Engineering Notes from Around Connecticut



Business & Industry

PFIZER ACTIVITIES. **Pfizer Inc.**, announced in January it would lay off up to 800 scientists this year in an effort to cut overhead ahead of an anticipated drop in revenue. Last fall, the company announced a narrowing of its research focus to six disease areas—Alzheimer's, cancer, schizophrenia, pain, inflammation and diabetes. Pfizer is also looking at purchasing the rival Wyeth in a deal that could be valued at more than \$60 billion. The move would bolster Pfizer's array of products and help the company deal with expiring patents and diminishing returns on research.

PRATT'S PUREPOWER ENGINE GOING INTO PRODUCTION DESIGN. **Pratt & Whitney Co.** begins production design on its PurePower PW1000G engine, featuring its revolutionary "geared turbofan," after successfully completing testing. The engine proved cheaper to operate, quieter and lower in emissions than previous generation engines. The PW1000G will be produced for the Mitsubishi Regional Jet and the Bombardier CSeries mainline aircraft, both of which are scheduled to enter service in 2013.

ELECTRIC BOAT TO HIRE 650 WORKERS. Groton submarine maker **Electric Boat** plans to hire 200 engineers and 450 tradespeople in 2009 to help with the construction of the new Virginia-class Missouri sub and other projects, EB president **John Casey** said in his annual legislative briefing. It is unclear how many of the new hires will be in Groton. Workforce requirements for 2010 are lower but the company says it will try to fill the decline with repair or other work.

CI INVESTS IN LAB AUTOMATION COMPANY. **Connecticut Innovations** announced its investment of \$300,000 in **FMP Products Inc.** (FMP) through its Eli Whitney Fund. With operations in Greenwich and New Milford, FMP is developing laboratory automation equipment and software to help improve the productivity of researchers in the pharmaceutical, industrial, educational, and governmental arenas.



Communication

DEPARTMENT OF PUBLIC UTILITY CONTROL SUBMITS BROADBAND LEGISLATION. The **Department of Public Utility Control (DPUC)** has submitted legislation entitled, "An Act Providing The Deployment of High Speed Broadband Access and Closing the Internet Divide in Connecticut." The legislation calls for a public-private partnership to implement a statewide high-speed Internet deployment plan ensuring that all residents and businesses in Connecticut have access to affordable broadband service, with a goal of increasing technology literacy and computer ownership. The bill specifically provides for an immediate investigation to identify gaps in broadband service through geographic information system (GIS) mapping.

POCKET WIRELESS EXPANDS IN NORTHEAST. **Pocket Wireless**, with regional headquarters in Bloomfield, launched its Hartford-

New Haven communications service at the end of January as part of an \$80 million expansion into the Northeast. Pocket provides flat rate, unlimited use wireless voice and data services. The expansion is to include 60 retail locations, Pocket Wireless said, with an estimated total of 80 locations employing about 400 workers by the end of the first quarter.

HARTFORD-NEW HAVEN READY FOR DIGITAL TV. Citing Nielsen Media Research data, the **Connecticut Broadcasters Association (CBA)**, said that Hartford-New Haven is the second best digital-television-ready market in the nation. Nielsen data also showed roughly 30,000 Connecticut households are still using rabbit ears and rooftop antenna and are unprepared for the switch. Congress extended the nationwide DTV transition deadline to June 12, 2009 to give consumers additional time to prepare. The transition began February 17.



Education & Cognition

SITE LICENSE TO DISCOVERY EDUCATION. **Connecticut Commissioner of Education Mark K. McQuillan** announced a new resource for grades 6-8 through a statewide license to Discovery Education Science. The award-winning, standards-based, multimedia resource powers any middle-school science curriculum with virtual laboratories, simulations, interactive videos, reading passages and more, coupled with a real-time assessment component that measures students' progress. For more information visit www.discoveryeducation.com, or contact karen.kaplan@ct.gov or arthur.skerker@ct.gov.

SUSTAINABILITY VIDEO GAMES IN THE CLASSROOM. A new generation of educational tools are hitting the classroom. IBM's PowerUP is one example. PowerUp challenges players to save a planet from ecological destruction by carrying out missions to supply solar, wind, and water power before severe storms wreak havoc. Students learn engineering and science principles by building solar towers or searching junkyards for parts to repair wind turbines. "Teaching through games and simulations is the way to engage tech-savvy students today," notes **Michael Mino**, director of the **Education Connection's Center for 21st Century Skills**. The Litchfield-based Education Connection is one of the state's six Regional Educational Service Centers—public education agencies created under state statute to promote "cooperative action to furnish programs and services" to public school districts. It's Center for 21st Century Skills helped IBM connect with students to test the game. Learn more at www.powerupthegame.org.

ONLINE EDUCATION TASK FORCE AT UCONN. A new task force on online education at the **University of Connecticut (UConn)** hosted Fedro Zazueta, director of academic technology and online education at the University of Florida (UFL), at a recent event. Task force co-chair and CASE member **Doug Cooper**, a professor of chemical, materials, and biomolecular engineering, said the goals are to understand online education, develop a mission for the university, create a framework, and work with the

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

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administration to make it happen. Zazueta said online course enrollment at UFL doubles every couple of years, with a faster growth rate among on-campus students than distance learners. The task force includes a representative of each school and college at UConn and is scheduled to report to the provost in April.

BUSINESSWEEK RECOGNIZES SEVERAL CT HIGH SCHOOLS.

BusinessWeek.com recently published a list of the best high schools in each of the fifty states in three key categories. Schools were selected based on most recent available state mathematics, reading, and science standardized test scores. Connecticut's winners were **Staples High School** in Westport (Best Overall Academic Performance), **Sports and Medical Sciences Academy** in Hartford (Best Low-Income) and **Northwestern Regional High School** in Winsted (Best Improved).



Energy

CT REGULATORS OPPOSE UI RATE HIKE. Connecticut regulators voted against a 4.1% rate increase proposed by **The United Illuminating Co.** (UI) for 2009. New Haven-based UI serves more than 320,000 homes and businesses in the New Haven and Bridgeport areas. A Panel of Commissioners determined that UI did not prove that its \$51.4 million request was necessary for it to provide safe, adequate and reliable service.

ENERGY-EFFICIENT WATER PURIFICATION MADE POSSIBLE.

Yale doctoral student **Robert McGinnis** and his advisor, CASE member **Menachem Elimelech**, chair of the chemical engineering department and director of the program in environmental engineering, designed engineered osmosis systems to harvest freshwater from non-potable sources and generate electricity from low-temperature heat sources. The approach requires one-tenth the electric energy used with conventional desalination systems. Their process uses "forward osmosis," which exploits the natural diffusion of water through a semi-permeable membrane, drawing pure water from its contaminants to a solution of concentrated salts, which can easily be removed with low heat treatment. Their desalination technology is being commercialized through a newly-established company, **Oasys**. Elimelech and McGinnis say that it is also possible to produce electricity economically from lower-temperature heat sources, including industrial waste heat, using a related method—pressure-retarded osmosis.

CT WIND COMPANY CLOSES VERMONT OFFICE

Essex-based **Noble Environmental Power**, a wind-power company that has been working to install a wind-power project on Grandpa's Knob in Castleton, VT, is closing its Rutland, VT office. The company reports that it has not abandoned plans for the wind farm in Vermont and will continue to gather data from meteorological towers installed on the ridge last year. In October, the company laid off workers in New York and stopped work at two wind farms in that state in connection with the failure of Lehman Brothers, one of its chief backers.

UCONN PROFESSOR RECEIVES NYSEDA FUNDING. With the goal of harnessing the energy-production capabilities of microscopic bacteria to produce power and clean wastewater, **Baikun Li**, an assistant professor of civil & environmental engineering at the **University of Connecticut**, and her industrial partners (Connecticut-based firm **Fuss & O'Neill** and the main

contractor, New Jersey-based HydroQual) received funding from the New York State Energy Research & Development Authority (NYSEDA) to further her microbial fuel cell (MFC) research. The grant garnered matching funds from the Water Environment Research Foundation (WERF). The team's work centers on developing large-scale, efficient MFCs. In an MFC, carbohydrate-laden wastewater is fed into a vacuum-sealed cell, where embedded anaerobic bacteria dine on the fatty acids, glucose and other organic carbons in wastewater. The bacteria degrade the organic compounds, and generate protons and electrons. The electrons are transported to an electrode and conducted through a copper wire circuit to a second electrode. There the electrons and protons react with oxygen and electricity is generated.

CCEF PROGRAM HONORED. The **Connecticut Clean Energy Communities Program** of the **Connecticut Clean Energy Fund (CCEF)** won the State Leadership in Clean Energy Award from the Clean Energy States Alliance (CESA), a national nonprofit organization that works to advance markets for clean energy technologies. The CCEF's program rewards communities with solar photovoltaic systems when (1) a city or town commits to obtain 20% of its electricity from clean energy sources by 2010, (2) its citizens sign up through the **CTCleanEnergyOptionsSM** program, and (3) a city or town purchases clean energy. More than half of the state's 169 cities and towns have committed to obtain 20% clean electricity by 2010.

SPECIAL DELIVERY FOR FIRSTLIGHT WATERBURY PLANT.

A **General Electric** intercooler was delivered to Waterbury in late January—the first of four massive pieces of equipment destined for a **FirstLight** power plant that is scheduled to begin commercial operations there July 1. The 225,000-pound intercooler, assembled in Korea, traveled via barge up the Connecticut River and then on a 96-wheel tractor-trailer in a 6 mph convoy over Connecticut back roads to Waterbury. The intercooler increases the efficiency of the GE LMS100 (100MW) gas turbine generator by cooling the air prior to its introduction into the high pressure compressor, making it one of the most efficient (44-45%) simple cycle gas turbine plants.

GE ENERGY GETS \$1B SAUDI CONTRACT. Fairfield-based **General Electric Co.** announced in February that the Saudi Electricity Co. is to pay nearly \$1 billion for more than 30 gas turbines for its Riyadh Power Plant 10. GE Energy will supply 30 Frame 7EA gas turbines, boosting the plant's current capacity of 10,000 megawatts by an additional 2,000 megawatts. The first of the turbines will begin service next year, with the order completed by 2011.



Environment

"WASTEBUSTERS" PROVE IDLING VEHICLES CREATE WASTE, POLLUTION. The **Connecticut Department of Environmental Protection (DEP)** commissioned a team to show the degree to which idling vehicles waste fuel and pollute the air. The DEP production, "Wastebusters," based on the popular Discovery Channel TV show "Mythbusters," is part of the agency's low-cost strategy to educate the public about idling. Tests conducted by the Wastebusters team show that an hour of idling wastes one-fifth of a gallon of gasoline. Translation: If the 2.3 million passenger vehicles in Connecticut idled five minutes less each day, millions

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of gallons of fuel would be saved annually and greenhouse gases and toxic emissions would be reduced by more than 140,000 tons. The video is available at www.ct.gov/dep/idlingsfuelish.

POLLUTION OF THE SOUND IN BRIDGEPORT. Environmental groups, the **Connecticut Fund for the Environment** and the national organization Earthjustice, called upon the **City of Bridgeport**, Connecticut's **Department of Environmental Protection (DEP)**, and the federal Environmental Protection Agency (EPA) to take corrective action on the two **Bridgeport Water Pollution Control Authority (WPCA)** plants that are annually dumping 350 million gallons of untreated sewage into **Long Island Sound**. The organizations filed a 60-day notice under the citizen suit provision of the Clean Water Act. In a January 24 *Hartford Courant* story, DEP spokesman **Dennis Schain** said DEP has been working for several years to move the city forward, and it issued an order last August laying out a schedule for action.

METAGENOMICS YIELDS NEW INSIGHTS. Marrying genomics and geography, **Yale University** researchers were able to see in unprecedented detail how environment influences molecular changes within living organisms. Researchers used newly developed mathematical models to analyze huge amounts of data on physical characteristics such as temperature and salinity in different habitats and metabolic activity in marine micro-organisms. As the technology dubbed "metagenomics" progresses, scientists might be able to detect environmental change or toxic chemicals not simply by using mechanical sensors or monitoring sensor species, but by examining biological changes within tiny organisms, said **Mark Gerstein**, professor of biomedical Informatics and professor of molecular biophysics & biochemistry and computer science.



Food & Agriculture

YALE RESEARCHERS CREATE A GENETIC ATLAS OF RICE. Yale researchers published a cellular atlas of genetic activity in rice, documenting how and when genes are turned off and on. The data collected during the five-year project, published online in the journal *Nature Genetics*, chronicles the molecular differences and similarities among 40 cell types essential to the life cycle of one of the world's important crops. **Timothy Nelson**, professor of molecular, cellular & developmental biology and senior author of the study, said all crops will benefit from the rice atlas. Scientists hope to find networks of genes responsible for photosynthesis and those that produce food and also biomass for uses such as alternative energy, he said. The atlas is composed of cell-specific transcriptomes—huge datasets that document the relative activity of each of rice's 30,000 genes for a particular cell type.

BOND FUNDS TO PRESERVE STATE'S FARMS. The Connecticut **Department of Agriculture (DOAG)** reported that the **State Bond Commission** approved \$5,000,000 in funds in December 2008 for the department's **Farmland Preservation Program**, which purchases the development rights of qualified farms. Combined with \$10,000,000 from bonding in December 2007 and February 2008, the program is working through its list of over 50 priority applications—an estimated cost of over \$31,000,000. Of those 50, the program closed on the development rights to seven farms totaling 675 acres in 2008. Since the program's inception in 1978, 254 Connecticut farms on nearly 34,500 acres have been protected or are pending protection, constituting approximately 26% of the 130,000-acre goal.

SLOWING THE RISE OF ATMOSPHERIC CARBON DIOXIDE. Analyzing the quantities and cost of sequestering carbon dioxide in the northeastern United States, Winrock International of Arlington, VA, found a wide range of marginal costs. Although planting forests on farmland captures much carbon, the loss of productive farmland makes it a costly option. Restocking forests that now have insufficient trees offers the lowest marginal cost. Increased interest in slowing the rise of carbon dioxide in the atmosphere makes the recently published *Forest Regeneration Handbook*—designed to guide forest owners, foresters and officials—particularly timely. It is available from **The Connecticut Agricultural Experiment Station** at http://www.ct.gov/caes/lib/caes/documents/special_features/ForestRegeneration.pdf



Health

CT RESEARCHERS FIND NEW CLASS OF INFLUENZA VIRUS. Virologists at the **University of Connecticut** found that the influenza virus populations contained large subpopulations of virus particles that can kill cells even though the particles are not infectious. CASE member **Philip I. Marcus**, professor of molecular & cell biology, said they may play a heretofore unsuspected role in the pathogenesis of influenza by contributing to destruction of cells in the host.

"INVISIBLE INCISION" SURGERY AT YALE-NEW HAVEN. **Yale School of Medicine** and **Yale-New Haven Hospital** surgeon **Kurt Roberts** successfully performed an appendectomy through a small incision in the patient's vagina. "Without incisions in the abdomen, there is no opportunity to develop surgery-related hernias or wound infections. Patients who undergo procedures such as these are expected to recover and resume most normal activities within just a few days," explained Roberts.

KEY TO PREECLAMPSIA MAY BE IN MISFOLDED PROTEINS. Clues to the cause of preeclampsia, a common, but serious hypertension complication of pregnancy that has puzzled doctors and researchers for decades, point to proteins that misfold and aggregate, according to **Yale School of Medicine** researchers. These misshapen proteins can be easily detected in the urine, affording a new approach to early diagnosis of the disease, the Yale researchers report. Preeclampsia is one of the most common causes of death in pregnant women in the United States and a leading cause of preterm delivery. Delivery is the only reliable treatment for preeclampsia, and establishing a correct diagnosis can be difficult.

ANTI-CLOTTING DRUG LESSENS RISK TO PATIENTS WITH BLOOD DISORDER. Pregnancy and surgery patients with the blood disorder hereditary antithrombin deficiency, which causes excessive clotting, have responded well to treatment with a manmade anti-clotting protein. Results from a study by researchers at Yale School of Medicine and other institutions show that patients who received the protein recombinant human antithrombin reported no excessive clotting during treatment or seven days after treatment.

UMBILICAL CORD PROTEIN ANALYSIS DETECTS EARLY ONSET INFECTION. **Yale School of Medicine** researchers identified proteins associated with early onset neonatal sepsis (EONS), a stealthy bacterial infection linked to premature birth, illness and death. Using protein analysis, the researchers found

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the biomarkers that can provide key information on how EONS develops. "The biomarkers we identified have diagnostic value for infection and inflammation," said Yale assistant professor **Catalin Buhimschi**, senior investigator on the study.

NEW PIECE IN ALZHEIMER'S PUZZLE. Yale researchers have found that cellular prion proteins trigger the process by which amyloid-beta peptides block brain function in Alzheimer's patients—a key finding in the fight against the disease. "We have known that amyloid-beta is bad for the brain, but we have not known exactly how amyloid-beta does bad things to neurons," said Stephen M. Strittmatter, senior author and director of **Cellular Neuroscience, Neurodegeneration and Repair** at the **Yale School of Medicine**. The process involves cellular prion proteins that exist within all cells and are normally harmless, but on rare occasions change shape and cause disease. Amyloid-beta peptides latch onto these proteins and precipitate damage in brain cells. Strittmatter noted that study does not suggest an infectious agent in Alzheimer's disease. However, since the cellular prion proteins act at an early stage of disease, the receptors make a promising target new therapies, he said. The findings were reported in the Feb. 26 issue of the journal *Nature*.



High Technology

REVOLUTIONIZING NANODEVICES. Yale engineers created a process that may revolutionize the manufacture of nanodevices by exploiting a novel type of metal. The material can be molded like plastics to create features at the nanoscale, and yet is more durable and stronger than silicon or steel. The work is reported in the February 12 issue of *Nature*. Unlike most metals, "amorphous metals"—known as bulk metallic glasses (BMGs)—do not form crystal structures when they are cooled rapidly after heating. Although they seem solid, they are more like a very slow-flowing liquid that has no structure beyond the atomic level, making them ideal for molding fine details, said senior author **Jan Schroers** of the **Yale School of Engineering & Applied Science**

LIGHT FORCE. A team led by researchers at the **Yale School of Engineering & Applied Science** showed that the force of light can be harnessed to drive machines when the process is scaled to nano-proportions. The research, published in the November 27 issue of *Nature*, demonstrates a marriage of two emerging fields of research—nanophotonics and nanomechanics—which makes possible the extreme miniaturization of optics and mechanics on a silicon chip. Until now light has only been used to maneuver single tiny objects with a focused laser beam—a technique called "optical tweezers." Postdoctoral scientist and lead author **Mo Li** noted, "Instead of moving particles with light, now we integrate everything on a chip and move a semiconductor device."

HEARING A LASER'S PRECISION. Researchers at the **Laser Applications Laboratory (LAL)** of the **Connecticut Center for Advanced Technology's (CCAT) National Center for Aerospace Leadership** are using acoustic monitoring to monitor precision drilling with laser pulses. CCAT engineers use the technology to drill air holes in the hollow blades typically found inside a jet engine. Lasers represent a quicker, cheaper method to drill these tiny holes, but can cause problems if the pulse goes through the material and hits the other side of a cavity. Use

of too many pulses can also decrease the quality of the hole and impact performance. Using microphones with high-speed data acquisition systems, CCAT engineers have been able to instantaneously detect when a laser has drilled a complete hole through the material with no extra pulses. While acoustic monitoring has been used for other applications, like laser welding, this new use represents a breakthrough in how lasers can be incorporated into the manufacturing process.

UCONN RESEARCHERS CREATE NEW HUMAN EMBRYONIC STEM CELL LINES. Researchers at the **University of Connecticut's Stem Cell Core Laboratory** have created two new human embryonic stem cell lines and are making the lines available to academic researchers to study the therapeutic potential of the cells. The two new lines are a milestone in the state's pioneering stem cell program approved by the **Connecticut General Assembly** and signed into law by **Governor Jodi M. Rell** in 2005. The program commits \$100 million over 10 years to fund stem cell research and training programs. President Barack Obama is expected to lift restrictions on federal funding for human embryonic stem cell research. Connecticut's headstart could give it a major advantage in competing for federal research money.



Transportation

CONNDOT PERFORMANCE METRICS REPORT. The **Connecticut Department of Transportation (ConnDOT)** released a January 2009 Performance Metrics Report. **Transportation Commissioner Joseph F. Marie** writes that ConnDOT's new Performance Measures Program, "is a first step toward becoming a performance-driven organization, focused on results and accountability." Performance measurement is the use of statistical evidence to determine progress toward specific organizational objectives. The report includes sections on Safety and Security; Preservation; Efficiency and Effectiveness; Quality of Life; and Accountability and Transparency. The report is available online at www.ct.gov/dot

PRATT ABOARD FIRST BIOFUEL TEST FLIGHT. A single **Pratt & Whitney** engine powered by fuel refined partly from crops and algae aided in the first ever inflight test to demonstrate biofuel's commercial and performance potential. The 90-minute test on January 29 used a Japan Airlines Boeing 747-300, carrying only a cockpit crew and no payload. A 50-50 blend of biofuel derived from camelina, a type of flax, and algae and traditional jet kerosene fuel was tested in the No. 3 engine (middle right), one of the aircraft's four Pratt & Whitney JT9D engines. No modifications to the aircraft or engine were required for biofuel, which is a "drop-in" replacement for petroleum-based fuel.

WATERTOWN AUTOMOTIVE PLANT TO CLOSE. **DriveSol Worldwide Inc.**, a Watertown plant that makes steering column shafts for the automotive industry, plans to shut down and lay off 241 workers. The company, based in Troy, MI, is currently in the process of closing. **Plant Manager Gabe Rosa** says the facility is closing because of the severe downturn in the US automotive industry. Workers in Watertown make steering components, including intermediate shafts and column shafts, for General Motors, Chrysler, and other automotive customers.

—Compiled and edited by **Ann G. Bertini**

From the National Academies (from page 1)

forensic science labs are underfunded, understaffed, and have no effective oversight.

Strong leadership is needed to adopt and promote an aggressive, long-term agenda to strengthen forensic science, according to the report, which strongly urges Congress to establish a new, independent National Institute of Forensic Science to lead research efforts, establish and enforce standards for forensic science professionals and laboratories, and oversee education standards. Public forensic science laboratories should be made independent from or autonomous within police departments and prosecutors' offices, the report says. Noting that there are great disparities among existing forensic science operations in federal, state, and local law enforcement agencies, the report recommends mandatory certification for forensic science professionals. Accreditation for laboratories should be required as well.

http://www.nap.edu/catalog.php?record_id=12589

◆ Prevention of Mental, Emotional, and Behavioral Problems in Young People Should be US Priority

The federal government should make preventing mental, emotional, and behavioral disorders and promoting mental health in young people a national priority, according to a new report from the National Research Council and Institute of Medicine. These disorders—which include depression, anxiety, conduct disorder, and substance abuse—take a tremendous toll on the well-being of young people and their families, costing the nation an estimated \$247 billion annually, the report says.

The report urges the White House to create an entity that can coordinate agency initiatives in this area, set public goals for prevention, and provide needed research and funding to achieve them. The departments of Education, Justice, and Health and Human Services should align their resources and programs with this strategy, and should also fund state, county, and community efforts to implement and improve evidence-based programs.

The committee also urged continued research to build understanding of what interventions work for whom and when, and how best to implement them. The National Institutes of Health should develop a comprehensive 10-year plan to research ways to promote mental health and prevent mental, emotional, and behavioral disorders in young people. In addition, agencies and foundations should establish equality in research funding between ways to prevent mental and behavioral disorders and ways to treat these problems, the report says.

http://www.nap.edu/catalog.php?record_id=12480

◆ Role of Hydrogen Research for US Energy Future

Scientists from Pennsylvania State University and Virginia Commonwealth University have discovered a new way to produce hydrogen from water using minimal energy. Although the method has been demonstrated only on a small scale, the finding illustrates the importance of innovative scientific research in the evolution of America's energy future.

A 2004 report from the National Research Council (NRC) and National Academy of Engineering, entitled *The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs*, highlighted the potential of hydrogen as an alternative fuel, noting that "a transition to hydrogen...could fundamentally transform the US energy system" and outlining the challenges in such a transition, one of which is developing environmentally friendly and cost-effective methods for mass production of hydrogen. A subsequent 2008 NRC report, *Transitions to Alternative Transportation Technologies: A Focus on Hydrogen*, points out that the greatest challenge for

production of hydrogen from water splitting is cost. Discovery of an efficient, cost-effective technique to split water could enhance the likelihood of a successful transition to hydrogen fuel.

The National Academies' America's Energy Future project, a long-term initiative designed to stimulate discussion about US energy options, will release a series of reports in 2009 detailing the potential costs and benefits of energy efficiency technology, renewable energy, and alternative fuels.

<http://national-academies.org/headlines/20090211.html>

◆ HIPAA Privacy Rule Fails to Adequately Protect Patient Privacy and Hampers Health Research

A new report from the Institute of Medicine finds that the Health Insurance Portability and Accountability Act (HIPAA) Privacy Rule—which regulates what uses and disclosures of personally identifiable health information are permitted by health plans, health care providers, and other entities covered by the regulation—does not adequately protect the privacy of people's personal health information and hinders important health research discoveries. The report notes that the current HIPAA rule is difficult to reconcile with other federal regulations governing research involving people and their personally identifiable information, and recommends that Congress authorize the development of an entirely new approach, separate from the current HIPAA Privacy Rule, to protecting personal health information in research. This new approach should apply privacy, data security, and accountability standards uniformly to information used in all health-related research regardless of who funds or conducts the research, the report says.

If policymakers decide to continue relying on the current rule to protect privacy in health research, the committee recommends a series of changes to improve the rule and the guidance that the US Department of Health and Human Services (HHS) gives on how to comply with it. In addition, the report urges all institutions conducting health research to strengthen their data protection, including encryption for all laptops, flash drives, and other portable media containing such data.

http://www.nap.edu/catalog.php?record_id=12458

◆ Views on 'Dual Use' Research, Bioterrorism Studied

The National Research Council and the American Association for the Advancement of Science (AAAS) surveyed a sample of AAAS members in the life sciences to assess their awareness of and attitudes toward such "dual-use" research—studies undertaken for beneficial purposes that could also have harmful applications such as bioterrorism. The survey also explored actions the scientists might support to reduce the risk of misuse of research, as well as steps that scientists may already be taking in response to these concerns. The results of the survey are summarized in a new report from the Research Council.

The results suggest that survey respondents perceive a potential but not overwhelming risk of a bioterror attack in the next five years, a risk they believe is greater outside the United States, but most respondents do not believe it is likely that dual-use knowledge, tools, or techniques will facilitate such an attack. Survey results also indicate that some respondents have been so concerned about dual-use issues that they have already taken action to try to avert misuse of research in the life sciences, even in the absence of guidelines or government restrictions. Some reported that they had broken collaborations, not conducted some research projects, or not communicated research results. Most respondents favor their professional societies prescribing a code of conduct to help prevent misuse of life science research.

http://www.nap.edu/catalog.php?record_id=12460

Science Center (continued from page 2)

that this phenomenon can be used to make vehicles move. Visitors can discover how magnetic levitation works and interact with the exhibit to experiment, build and create, observing the direct effects of their own application of magnetic levitation.

Since science fun clearly isn't just for kids, the Science Center plans to offer in the future a series of monthly programs that will touch upon topical issues and encourage open dialogue among participants through the Science Café program. On Monday nights, interested visitors can come to the Center, dine in the café, or perhaps area restaurants, and hear lectures on relevant topics such as stem cell research. Following the lectures, visitors can remain for discussion sessions. The goal of this and similar programs is to help people become comfortable talking about science and looking at information on a deeper level. As Hank Gruner, vice president of programs at the Science Center, points out, approximately 50% of all policy decisions involve science, including, but not limited to, issues in the areas of genetics, food, land use, and pharmaceuticals.

The Science Center also plans to develop and support a Citizen's Science Program whereby community members and students can participate in sharing scientific findings. Citizen Science programs, which depend

upon the observations and data collection of community members to track changes in environmental conditions from bird migration to water quality, are already in place through various conservation groups. The Science Center will house a wet lab where visitors can use microscopes to examine water samples taken from the Connecticut River. This represents just one more way in which the Connecticut Science Center is a part of the important initiative to spark interest in science and enhance knowledge.

The Center summarizes its strategies for success by stating that it intends to

- develop a culture of inquiry and exploration;
- make science interesting, relevant and place-based;
- serve as a life-long learning resource;
- celebrate diversity, youth achievement, and positive attitudes in science;
- foster a sense of ownership with Connecticut scientific and business communities; and
- support exemplary science education for Connecticut schools.

In order to be informed global citizens, members of the public need access to the science information that impacts their lives

Informal Settings Can Boost Science Learning, Report Says

A new report from the National Research Council finds that learning about science in informal ways—by visiting museums and aquariums, attending after-school programs, pursuing personal hobbies, and watching TV documentaries—contributes to people's knowledge and interest in science.

The report, "Learning Science in Informal Environments: People, Places, and Pursuits," identifies six "strands" of science learning that can be supported through informal science education. The last section of the report focuses on how to organize, design, and support science learning in informal environments.

http://www.nap.edu/catalog.php?record_id=12190

and the lives of future generations. Connecticut residents will now have access to just such information right in downtown Hartford, in a stunning new science center that will enrich their lives and the lives of all who visit through its emphasis on science engagement, accessibility and education. — **Wendy Millstein**, freelance science writer.

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