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PERSONALIZED MEDICINE ... The 'Medical GPS' of the Future?

There's a revolution afoot in the medical field and Connecticut stands poised to play a leading role. Experts agree that personalized medicine, the use of genetic markers to help predict a person's likelihood of contracting illness or reacting badly to particular medications, will revolutionize the medical field. They also agree that integrating the technology of personalized medicine with traditional clinical assessments has the potential to be good for patients, doctors, insurers and pharmaceutical companies.

Personalized medicine is a topic of discussion throughout the medical community because of its potential to transform the way medicine is practiced. Lawrence J. Lesko, director of the Office of Clinical Pharmacology in the Center for Drug Evaluation and Research at the US Food and Drug Administration, recently addressed the subject during a seminar at the Annual Meeting of the Connecticut State Medical Society held September 24 in Waterbury. "Traditional medicine is a combination of art and science," he said. "Recent advances in genetic technology have made it obvious that prescribing medicine effectively depends in large part on the genetic disposition of a drug in a



Dr. Lawrence J. Lesko of the US Food and Drug Administration addresses the Connecticut State Medical Society in September. (Photo: CT State Medical Society)

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Progress Update from the CT Science Center ...

Installation of the exterior glass and metal wall paneling is just about complete and the finishing touches are being made to the Magic Carpet Roof. Attention is now turning inward to the completion of the interior of the building. Plumbing, heating and cooling, and electrical work are in progress. Three of the nine elevators are substantially complete. The tiling of the bathroom walls has started. Sheetrock walls are up in many places and are even being painted a rainbow of inviting colors. The Science Center is on target to open this spring.

Season Passes and Premier Memberships on sale now!

Memberships are good for one full year from when the Center opens this spring. Not only are they great gifts, but if you join before January 31, you'll receive two bonus months and one bonus month if you join before the end of March.

Season Passes pay for themselves in about two visits, and are good for unlimited general admission for the entire year. Each Season Pass holder receives their very own card and can choose among several designs—great for kids!

Premier Memberships offer free unlimited general admission, plus the flexibility to share each visit with different guests of your choice—your family one week and your friends the week after that. Premier Memberships allow you to experience more of what the Science Center has to offer with a 10% discount in the café, gift shop and digital theater, along with access to special exhibits and movie previews, as well as program discounts and special birthday rewards. To learn more, visit <http://ctsciencecenter.org/membership>.

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.

◆ Forest Management Important for Fresh Water Supplies

Forests process nearly two-thirds of the fresh water supply in the United States by cycling precipitation through the soil, eventually delivering water through streams and rivers to larger bodies of water. Research has already produced a solid foundation of knowledge about how water is connected to and moves through forests and how forest structure and composition can alter water quantity and quality.

A new report from the National Research Council recommends that future research include predictions about how future changes in landscape will impact forest hydrology.

Some effects of climate change on forests and water such as changes in the snow-melt and increases in wildfires are already evident, and future climate changes are likely to have major effects on forest hydrology. Research should explore the direct and indirect effects of climate change on water yield and quality, as well as the consequences of wildfires and disease. In addition, studies should examine how fire and insect outbreaks affect water quantity, quality, and flooding.

Manmade activities such as timber harvesting, chemical applications, and roads also have an impact on fresh water supplies. To better understand implications of human activities, the report recommends scientists develop a next generation of hydrologic models and use remote sensing. Most importantly, to ensure progress, the report urges watershed councils and citizen groups to work with agencies to better protect and sustain water resources.

[http://books.nap.edu/catalog.php?record_id=12223]

(National Academies, page 7)

specific patient. Personalized medicine allows us to use genetic information to treat the patient more optimally, reduce uncertainty, and minimize costs and adverse reactions."

Ineffective rates for several classes of pharmaceuticals are relatively high for large numbers of people and some can cause side effects, according to Lesko, who noted that adverse drug reactions are the fifth leading cause of death. "The number one reason patients don't take a prescription drug is because they are afraid that the drug will hurt them," he said. "Personalized medicine allows us to find out how the patient's body will process a given medicine before we even prescribe it. As a result, we get the dose right from square one, alleviating patient fears and inconvenience, reducing risks, eliminating the use of ineffective medicines and improving benefits to the patient."

Lesko says personalized medicine can increase the predictability of results by 50% in some cases compared with standard medical treatment. So, why isn't personalized medicine already

in widespread use? "The major impediments are awareness, fear, cost and insurance coverage," Lesko says. "Right now, in some studies, less than 10% of medical professionals have heard about the variety of genetic tests available and only some insurers reimburse for genetic testing."

Two Connecticut organizations are among those working to increase understanding and use of personalized medicine. CASE member Gualberto Ruaño, physician entrepreneur, is Director of Genetics Research at Hartford Hospital and president of Genomas. CASE member Marc Lalande is professor and chair of the Department of Genetics & Development Biology at the University of Connecticut Health Center (UCHC) in Farmington.

Ruaño and his staff, in collaboration with Hartford Hospital, are working with clinicians in cardiology and psychiatry to use gene variability information to help guide treatment decisions for patients who have previously been unresponsive to their medication or have experienced onerous side effects. "We only diagnose patients who have a clinically compelling reason to do DNA typing," Ruaño said. "In the last two years, we've helped to treat more than 500 patients and, because of our success in using personalized medicine in clinical practice, we are now known as a national leader in personalized medicine."

To date, Ruaño and his staff have focused their efforts on cardiology and psychiatry, two high-risk groups, because they know there is a huge opportunity to have a significant impact relatively quickly. "As a physician, I know the importance of having clinical data to build awareness and comfort within the medical community," he said. "As a result of our work, I am able to cite real cases about real people with real results. I can illustrate medical needs that can and are being addressed with personalized medicine."

He cites their work with the drug warfarin, a commonly prescribed blood thinner, as an example. "By conducting DNA typing before prescribing warfarin, we have the potential to avoid 85,000 bleeding events and 17,000 strokes annually, thereby improving treatment efficacy, while reducing annual medical expenses by approximately \$1.1 billion," he said. "This is just one example of how personalized medicine is good for the patient, the medical system, insurance companies and pharmaceutical companies."

Lisa Namerow, attending physician, child and adolescent psychiatry, at the Institute of Living/Hartford Hospital Mental Health Network, has referred patients to Genomas for treatment guidance. "For pediatric patients, it is especially important to choose the right medicine because parents are often (and understandably) skittish about medicating their children in the first place. If the medication is ineffective or isn't tolerated well by the child, the parent and patient can lose faith and be more hesitant to try another drug," she said.

According to Namerow, genetic testing can provide valuable information but testing alone doesn't eliminate all of the guesswork. "It's still complicated, but if we can take away the risk of not tolerating a particular medicine, that's a big deal," she said.

The human body processes medicines through either the liver or the kidney. "For years we've been able to monitor kidney function via a simple blood test," Namerow said. "As a result of new genetic tests, we now have a way for the first time to monitor liver function and specifically the gene contributors to the enzymes that metabolize medicines."

Namerow notes that there are times when using genetic information makes perfect sense and directs treatment very well

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IN BRIEF

Science and Engineering Notes from Around Connecticut



Business & Industry

NU TO MOVE CORPORATE HQ TO HARTFORD. Berlin-based **Northeast Utilities** will relocate its current corporate headquarters to an existing office building in downtown Hartford. The company signed a purchase agreement with The Phoenix Cos. for approximately 90,000 square feet of space located at 56 Prospect St. The relocation is expected to occur over the next 10 to 12 months.

CI RECRUITS TWO NY-BASED COMPANIES TO CT. **Connecticut Innovations (CI)**, the state's quasi-public authority responsible for technology investing and innovation development, announced \$1 million investments in two New York-based companies: ExeCue Inc., a data management company, and ShopText Inc., a mobile commerce and promotions company. Both companies are in the process of relocating to Connecticut.

CURAGEN CORP. MAY FACE NASDAQ DELISTING. The stock of Branford-based **CuraGen Corp.**, a biopharmaceutical company focused on oncology, dropped below the required minimum bid per share of \$1.00. The company faces delisting on the Nasdaq exchange unless it can regain compliance with the minimum bid price by March 23, 2009.

HUBBELL ACQUIRES THREE OUT-OF-STATE COMPANIES.

Orange-based **Hubbell Inc.**, acquired three out-of-state companies: USCO Power Equipment Corp., based in Leeds, Alabama; CDR Systems Corp., based in Ormond Beach, Florida; and Quebec-based ElectroComposites Inc. The companies will join Hubbell's Power segment. The product range includes electrical transmission and distribution products as well as construction materials.

EIGHT START-UPS AWARDED TECH INCUBATION GRANTS.

Eight start-up companies enrolled in the **University of Connecticut's Technology Incubation Program** received a financial boost through the **Connecticut Small Business Incubator Program (SBIP)**. The winners include **New Ortho Polymers** (polymer materials for orthodontics), **LifePharms** (biological products), **Evergen** (embryo and animal products), **Biorasis** (surgical and medical instruments), **MakScientific** (pharmaceutical preparations), **Agrivida** (agricultural biotech), **Conversion Energy Enterprises** (lasers and optoelectronics) and **MysticMD** (carbon nanotubes, lithium ion technology). The program provides space and services to early stage firms that have a technology link to the university. The SBIP grants are offered by the state **Department of Economic and Community Development** and administered by the **Connecticut Center for Advanced Technology Inc.**

PRATT & WHITNEY, AIRBUS TEST PUREPOWER PW1000G ENGINE.

Pratt & Whitney and Airbus launched joint flight testing of the PurePower PW1000G engine, with an Oct. 14 flight on an Airbus-owned A340 test aircraft in Toulouse, France. The flight tests follow a 250-hour ground test program and thousands of hours of development testing at Pratt & Whitney and with partner facilities around the world. The PW1000G engine features Pratt & Whitney's patented Geared Turbofan™ technology and targets double-digit improvements in fuel burn, environmental emissions, engine noise and operating costs.



Communication

TV CHANNELS TO BE OPENED UP FOR WI-FI. FCC regulators approved a plan to allow a new generation of mobile devices to use the empty airwaves between television channels for free Web surfing. The plan will offer free wireless Internet service across America and spur new systems for transmitting video and other data between devices in the home. The plan faced opposition from the entertainment industry due to concern over interference on TV broadcasts and wireless microphones.

NSF AWARD TO IMPROVE UNDERWATER COMMUNICATIONS.

A team of researchers from the **University of Connecticut (UConn) School of Engineering** and the marine sciences department at the Avery Point campus was awarded \$500,000 from the National Science Foundation (NSF) to improve their scalable autonomous underwater sensor network system. According to principal investigator **Jun-Hong Cui**, associate professor of computer science and engineering, the team will develop high data-rate acoustic modems, energy-efficient integrated underwater nodes, and lab- and field-based experimental underwater sensor network test beds. An improved sensor network will result in better monitoring of the marine environment for commercial exploration, coastline habitat protection and national security.

ATTORNEY GENERAL URGED DPUC TO BLOCK AT&T PLANS.

Connecticut Attorney General Richard Blumenthal sought an expedited order by the Department of Public Utility Control (DPUC) to block job cuts announced by AT&T, pending an investigative hearing. AT&T said in October it would lay off 60 employees and relocate those customer service functions to Michigan, despite complaints of deteriorating service cited by Blumenthal. DPUC opened docket 08-10-05 for investigation into the management and operation of AT&T Connecticut and the issue is pending.



Education & Cognition

NEW SCIENCE POSITION STATEMENT ADOPTED BY STATE BOARD OF EDUCATION. The **State Board of Education** adopted an updated Position Statement on Science Education that now includes new Guidelines for Policymakers. The document can be accessed at http://www.sde.ct.gov/sde/LIB/sde/pdf/board/Position_Statement_Science_Ed.pdf

CCAT EDUCATION PROGRAM WINS STATE AWARD. The **Connecticut Center for Advanced Technology (CCAT)** won a gold Connecticut Quality Improvement Award for its program, "Students in Space: Inspiring the Next Generation." The program uses commercial space flight as a platform for students to conduct scientific research, in a partnership with **UP Aerospace Inc.** Students design their own experiments that are then sent into space on a suborbital sounding rocket. CCAT funds the launches, helps form teams, and provides curriculum, resources, guidance, and logistical support to teachers and students.

ECSU'S NEW SCIENCE BUILDING. **Eastern Connecticut State University** opened its new Science Building in September. 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

IN BRIEF

Science and Engineering Notes from Around Connecticut

174,000-square-foot, six-story facility houses all of Eastern's science and mathematics departments, which had previously been scattered across campus. The building includes a 132-seat lecture hall; sophisticated audio-visual systems; a state-of-the-art greenhouse; and high-tech laboratories. It has been built to US Green Building Council (USGBC) certification standards.

YALE OFFERS THREE SCIENCE COURSES IN FREE ONLINE PROGRAM. Three popular science courses are now included among the undergraduate offerings **Yale University** is making freely available by Internet through the site Open Yale Courses (www.open.yale.edu/courses). They are "Frontiers of Biomedical Engineering" by **W. Mark Saltzman**, professor of biomedical engineering; "Frontiers and Controversies in Astrophysics" by **Charles Bailyn**, professor of astronomy and physics; and "Fundamentals of Physics" by physics professor **Ramamurti Shankar**. The courses are available in video and audio formats, with a closed-captioning option, as well as the complete searchable transcript, syllabus, reading assignments and problem sets.

YALE TO LAUNCH INSTITUTE FOR BIOLOGICAL, PHYSICAL & ENGINEERING SCIENCES. Leading researchers from the **Yale School of Medicine**, the **School of Engineering** and the faculty of Arts and Sciences will be brought together through the programs of the new **Sackler Institute for Biological, Physical and Engineering Sciences**, thanks to a gift from **Raymond and Beverly Sackler**. Each multidisciplinary group will address different aspects of a common quest: predicting biological behavior at the molecular, cellular and whole organism levels. The Institute will include graduate fellowships for students interested in pursuing PhD degrees that straddle the physical and life sciences, visiting scholars in interdisciplinary research, and intensive short summer courses to teach the multiple techniques that are used across the different disciplines.

HARTFORD SCHOOL EMPHASIZES STEM EDUCATION. **Hartford Superintendent of Schools Steven J. Adamowski** has championed a district-wide reformation, closing some underperforming schools, creating new ones and restructuring others. The changes include an **Academy of Engineering and Green Technologies** at **Hartford Public High School**. The new Academy emphasizes science, technology, engineering and mathematics, and utilizes partnerships with local engineering and industrial companies to help prepare students for the future. **United Technologies Corporation**, among the school's corporate partners, provided a \$89,000 grant through the **Connecticut Business and Industry Association** which is to be used toward professional development and a computer lab.



Energy

FIRSTLIGHT POWER ACQUIRED BY FRENCH GROUP. The French utility group GDF Suez Energy International announced in September it would acquire Hartford-based **FirstLight Power Enterprises, Inc.**, in a deal reportedly worth \$1.9 billion. FirstLight has 235 employees and operates 15 power plants, including one under construction, with a capacity of 1,538 megawatts in Massachusetts and Connecticut.

AQUARION WATER RATE INCREASE. The state **Department of Public Utility Control** approved a rate increase request for Bridgeport-based **Aquarion Water Co.**, a company that serves 36 towns and cities in Connecticut, mostly in Fairfield County. The rate approval will increase the company's revenue by just

over \$3 million. The company, which also increased rates last December, asked for another increase in March for repairing and upgrading dams and treatment plants.

SOLAR LEASE PROGRAM LAUNCHED. Governor **M. Jodi Rell** announced the **Connecticut Solar Lease Program**, an initiative designed to eliminate the high initial costs associated with the purchase and installation of residential solar photovoltaic (PV) systems. Through the **Connecticut Clean Energy Fund (CCEF)**, a combination of rebates and tax credits can be used to lower the cost of leasing solar systems, helping more residents obtain clean, renewable solar energy. This is the first time a ratepayer-funded organization such as CCEF has partnered with financial institutions to leverage federal tax credits in order to make renewable energy more affordable.

PSEG FOSSIL FINALIZES 30-YEAR DPUC CONTRACT. **PSEG Fossil**, a subsidiary of the Public Service Enterprise Group, finalized a 30-year contract with the **Connecticut Department of Public Utility Control** to add 130MW of peaking generation at its New Haven station. The contract calls for Fossil to install three dual-fueled units to begin service June 1, 2012. PSEG Fossil president **Rich Lopriore** said the units will "improve reliability during peak periods and decrease reliance on older, less efficient and less environmentally compatible units."

ENERGY AUDIT FOR HOMES WITH OIL AND PROPANE HEAT. Governor **M. Jodi Rell** announced a new program to help Connecticut residents who heat their homes with oil or propane save money by making their heating systems and homes more energy efficient. The program offers two separate components. One is a clean, tune and test of an oil or propane heating system to ensure that it is running at peak efficiency. The second is professional weatherization services through the **Home Energy Solutions Program** supported by the **Connecticut Energy Efficiency Fund**.



Environment

QUINNIPIAC DEDICATED TO SUSTAINABILITY. **Quinnipiac University** unveiled a \$4 million sustainability plan for the school's new York Hill Campus. The 250-acre campus will feature two major initiatives that use renewable energy. A wind garden composed of 42 vertical-axis wind turbines will generate about 84,000 kilowatt hours per year. The second initiative includes placing 1,232 photovoltaic solar panels on the roof of the 475,000-square-foot Crescent residence hall that will convert energy from the sun to electricity and generate about 250,000 kilowatt hours per year. The school is also taking steps to educate students, faculty and staff about environmental issues and encourage projects that help protect and preserve the environment.

GRANTS AVAILABLE TO CONTROL INVASIVE PLANTS. The state **Department of Environmental Protection (DEP)** announced the availability of funding through the **Invasive Plants Council** for invasive plant control and has requested grant proposals from municipalities for projects on publicly accessible lands and waters. An invasive species, as defined by the US Fish and Wildlife service, is a non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Some plants introduced in the 19th century from Asia as ornamentals spread aggressively and displace native plants. The introduction and spread of invasive plants in Connecticut poses a serious threat to native ecosystems, says

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DEP, and can affect the ecological, recreational, and economic interests of the state. The **Connecticut Nursery and Landscape Association** (http://www.flowersplantsinct.com/cnla_index.htm) and the **Connecticut Invasive Plant Working Group** (<http://www.hort.uconn.edu/CIPWG/>) list attractive alternatives.

WHITE-NOSE SYNDROME REMAINS A MYSTERY. The cause of “white-nose syndrome,” devastating bats in New England, remains a mystery. The syndrome is named for the white fuzzy fungal growth seen on the noses, ears, and wing membranes of affected bats which appear to be starving. Testing has not revealed links to pesticides, heavy metals, and other environmental toxins. The **Connecticut Department of Environmental Protection (DEP)** asks if the public sees ANY bats out and about in the late winter months of January and February, to report such sightings by contacting any DEP Wildlife Division office or the DEP’s Sessions Woods office at 860-675-8130.

ENVIRONMENTAL GROUPS REACH DEAL WITH MILLSTONE, STATE. The **Connecticut Fund for the Environment** and **Soundkeeper Inc.** reached an agreement with Virginia-based Dominion, owner of the Millstone nuclear power complex, and officials of the **Department of Environmental Protection** to expedite plans for reducing Millstone’s effect on **Long Island Sound**. Dominion agreed in late September to immediately begin studying measures that would better protect fish and other sea creatures drawn into Millstone’s cooling water system. Millstone currently pumps more than 2 billion gallons of water a day from Long Island Sound to cool and condense steam used to make electricity.

FIRMS COMMIT TO GREEN. **Stanley Works’** New Britain plant and **Covanta Mid-Connecticut of Hartford** are among seven New England companies that have signed on to the federal Environmental Protection Agency’s Performance Track program that encourages businesses to set standards higher than the minimum for curbing greenhouse emissions and other pollutants.



Food & Agriculture

STUDIES FIND HEALTHY FOODS SCARCER IN POOR NEIGHBORHOODS. Two studies by the **Rudd Center for Food Policy & Obesity** compared the availability and price of food in large and small food retailers across neighborhoods of varying income levels in New Haven. The studies found that low-income people face significant challenges in shopping for healthy foods. Research showed that stores in lower-income neighborhoods stocked fewer healthier varieties of foods such as low-fat/skim milk, whole wheat bread, and fresh fruits and vegetables, than ones in wealthier neighborhoods. The study also shows that average food prices are now comparable across income areas.

FIVE FARMS SAVED FROM DEVELOPMENT. The state **Department of Agriculture** closed on the acquisition of development rights to five farms, located in the northern and eastern parts of the state. The farms were acquired through the **Connecticut Farmland Preservation Program (FPP)**. The FPP has protected 239 farms on 32,676 acres in Connecticut.

MARKETING FUNDS AVAILABLE FOR CT FOOD BUSINESSES. **Governor M. Jodi Rell** announced small businesses in the state specializing in Connecticut-grown food products may be eligible for up to \$300,000 each in federal funds to help market their products internationally. The money is available through the Branding Program of the Food Export Association of the Northeast. Small

businesses using at least 50% agricultural products may qualify. Additional information about the program and a pre-qualification application are available online at www.brandedprogram.org or by calling the state **Department of Agriculture** at 860-713-2559.

ORGANIC FARMING ACCREDITATION COURSE. The Northeast Organic Farming Association announced its 8th annual accreditation courses in organic land care. The 30-hour course is designed for professionals—landscapers, designers, landscape architects, garden center employees, municipal employees, parks and recreation employees, land trust staff, conservation property managers, master gardeners and others—and will provide the education needed for an understanding of organic land care design and maintenance. The five-day Connecticut course takes place in New Haven at **The Connecticut Agricultural Experiment Station** on Jan. 27, 28, 29, 30 & Feb. 2, 2009. Visit www.ctnafa.org for more information.

MELAMINE IN CONNECTICUT. Analyses in the Department of Analytical Chemistry at **The Connecticut Agricultural Experiment Station** in New Haven in 2007 and 2008 detected trace amounts of melamine in samples of food, suggesting it may be at “background” levels in a range of foods. Melamine, which is nitrogen-rich, has been added to animal feed and human foods to impart a spurious protein enhancement. In 2005, the US Food and Drug Administration (FDA) selected The Station laboratory as a Cooperative Agreement partner in its Food Emergency Response Network. Following the discovery of melamine in pet food, The Station in 2007 analyzed 26 samples in cooperation with the FDA. In 2008, after reports of contaminated milk appeared in the press, The Station analyzed over 90 samples collected by Connecticut agencies and 26 from the FDA. The Station found traces of melamine or related compounds in four Connecticut samples and two FDA samples.



Health

SCHOOLS GRADED ON HEALTH PROMOTION. The state **Department of Education** released school wellness policy reports for Connecticut school districts participating in the US Department of Agriculture’s child nutrition programs. The report cards rate each district policy in seven areas: nutrition education; school meals; other school food and beverages; physical education; physical activity; communication and promotion; and evaluation. The measurement tool used was developed by **Yale University’s Rudd Center for Food Policy & Obesity**, in collaboration with other university researchers. Access the results at www.sde.ct.gov.

BACTERIAL EXPOSURE MAY PROTECT AGAINST DISEASE. Researchers at **Yale University** and the University of Chicago showed that mice exposed to common stomach bacteria were protected against the development of Type I diabetes. The findings support the “hygiene hypothesis” that a lack of exposure to parasites, bacteria and viruses in the developed world may lead to increased risk of diseases. The results also suggest that exposure to some forms of bacteria might actually help prevent onset of Type I diabetes, an autoimmune disease in which the patient’s immune system launches an attack on cells in the pancreas that produce insulin.

EPA LOWERS LIMIT OF AIRBORNE LEAD. The federal Environmental Protection Agency tightened the regulatory limit on airborne lead for the first time in 30 years, lowering the legal maximum from 1.5 micrograms per cubic meter of air to 0.15 micrograms per cubic meter. That figure aligned with recommendations of EPA staff and the agency’s independent Clean Air Scientific Advisory Committee, but the EPA’s Children’s Health Protection

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Advisory Committee had urged a sharply lower limit of 0.02 micrograms. The change was required by court settlement Preliminary review by the Connecticut Department of Environmental Protection indicates that the state may need to establish three or four lead monitoring sites to meet EPA's requirements.

DISCOVERY CHALLENGES BASIC TENET OF CANCER BIOLOGY.

Yale researchers identified an unusual molecular process in normal tissues that causes RNA molecules produced from separate genes to be clipped and stitched together. The discovery that these rearranged products exist in normal as well as cancerous cells potentially complicates the diagnosis of some cancers and raises the possibility that anti-cancer drugs like Gleevec could have predictable side effects. The work is reported in the journal *Science*.

MORE EVIDENCE THAT BPA IMPAIRS BRAIN FUNCTION.

Yale School of Medicine researchers reported that the chemical bisphenol-A (BPA), a building block for polycarbonate plastics found in common household items, causes the loss of connections between brain cells. This synaptic loss may cause memory/learning impairments and depression, according to study results published in the *Proceedings of the National Academy of Sciences (PNAS)*.

STATE TO BENEFIT FROM PFIZER SETTLEMENT. Attorney General **Richard Blumenthal** announced that Connecticut will receive \$1.7 million under a 33-state settlement with **Pfizer Inc.**, resolving an investigation into the company's illegal and deceptive promotion of Celebrex and Bextra. The \$60 million overall settlement, filed in Superior Court in Hartford, also imposes strict reforms to prevent deceptive promotion of Pfizer products.

NEW SOFTWARE FOR MANAGING MEDS. **Patricia Neafsey**, professor of nursing and a principal investigator at the **University of Connecticut's Center for Health, Intervention, and Prevention (CHIP)**, developed a user-friendly software program for older adults to learn more about their medications and potentially dangerous drug interactions. With the help of a \$1 million grant from the National Institutes of Health, Neafsey is now testing the software through a clinical trial involving 264 patients at 11 primary care practices across Connecticut. Neafsey says almost 60% of adults over 65 take five or more medications daily.

CANCER DATA AVAILABLE ONLINE. The **Connecticut Department of Public Health** announced an online database of cancer incidence and mortality rates for the state and each of its eight counties. The Cancer Incidence and Mortality in Connecticut resource produces tables with cancer rates for each of the state's counties, and county maps colored according to the range of cancer rates for each type of cancer. The website (<http://www.cancer-rates.info/ct/>) allows users to obtain maps and tables of data on cancer incidence and mortality rates.



High Technology

LARGEST GRANT IN YALE NURSING HISTORY. A **Yale School of Nursing** study to help nurses hone their heart-monitoring skills received a \$3.9 million grant, the largest in the school's history. The funding from the National Heart, Lung, and Blood Institute of the National Institutes of Health will enable Yale School of Nursing professor **Marjorie Funk**, and a co-investigator from the University of California-San Francisco School of Nursing, to conduct a five-year, 16-hospital clinical trial. The study's long-term goal is to improve nursing practices related to electrocardiogram (ECG) monitoring so that more accurate diagnosis and more timely treatments lead to better outcomes for patients.

VERUTEK NAMED GREEN TECH COMPANY OF THE YEAR.

Bloomfield-based **VeruTEK Technologies Inc.**, won the Energy, Environment, Green Tech Company of the Year award for 2008 from the **Connecticut Technology Council** and the **Connecticut Center for Advanced Technologies**. The company has developed remediation technologies to treat sources of soil and groundwater contamination at industrial, utility, commercial and government-owned sites.

COLLABORATION IMPROVES JET ENGINE PERFORMANCE.

CASE member **Baki Cetegen**, head of mechanical engineering at the **University of Connecticut**, and associate professor **Michael Renfro** are conducting research to improve flame stability in fighter jet afterburners, which are used to attain greater thrust during critical combat exchanges or during short-distance take-offs, such as those from an aircraft carrier. The research is made possible with funding from the National Science Foundation, paired with personnel and equipment support from **Pratt & Whitney Aircraft** and **United Technologies Research Center**.

NANO-SCALE INSTRUMENT AIDS IN TRANSFER OF GENETIC MATERIAL.

CASE member **Nejat Olgac**, head of the **University of Connecticut's Advanced Laboratory for Automation, Robotics & Manufacturing (ALARM)**, and his team are developing a microscopic device called the Ros-Drill[®] that can transfer genetic material into cells with greater accuracy and effectiveness than ever before achieved. The method guides a glass pipette of 5-10 microns in diameter into cells of 50-100 microns in diameter. It offers diverse medical applications, including uses in stem cell research, drug development, artificial insemination and in vitro fertilization.

CTC RECOGNIZES TECH TOP 40. The **Connecticut Technology Council** and **UHY LLP** honored the 40 fastest-growing technology companies in Connecticut. The list of winning companies, called the UHY LLP Tech Top 40, is compiled on the basis of revenue growth over the last four years. Recognized companies have at least \$3M in revenue and are grouped into six technology verticals: Software, IT Services, Life Sciences, Advanced Manufacturing, New Media/Internet/Telecom and Energy Environmental Technologies. Visit www.ct.org to view the list of companies.



Transportation

BRADLEY GETS HIGH RATING FROM FAA. **ConnDOT**-owned and operated **Bradley International Airport** achieved an excellent rating during the Federal Aviation Administration's (FAA) Annual Airport Inspection. The three-day inspection includes a review of the Airport Certification Manual, as well as personnel training files. FAA officials also inspect runways and taxiways, aircraft rescue and fire fighting equipment, and fueling facilities.

CONNDOT AND MTA AD CAMPAIGN. The **Connecticut Department of Transportation** and MTA/Metro-North Railroad kicked off a media campaign to promote expanded rail service on the Waterbury and Danbury branch lines. The new schedule began Oct. 5 with additional trains on weekdays and weekends. According to ConnDOT, Waterbury branch line ridership has increased during the past year from an average of 20,000 to 27,000 riders monthly and the Danbury line has increased from an average of 65,000 to 70,000 riders monthly.

—Compiled and edited by **Ann G. Bertini**
Assistant Director for Programs
Connecticut Academy of Science and Engineering

From the National Academies (from page 1)

◆ Increasing the Nation's Fresh Water Supplies through Desalination

With overall pressure on the nation's limited fresh water resources expected to continue to intensify, a recent report from the National Research Council explored desalination's potential for boosting future supplies.

Historically, the high cost and energy required for desalination confined its use to places where energy was inexpensive and freshwater was scarce, but advances in technology have reduced its costs and generated new interest in desalination in the United States, where desalination currently generates less than 0.01 percent of the water used despite the fact that plants exist in every state. Limited studies suggest that desalination may be less environmentally harmful than other ways to supplement water supplies such as diverting freshwater from sensitive ecosystems, but a definitive conclusion cannot be made without further research, the report found. Researchers should also examine the longer-term ecological effects of disposing of the salt concentrate that remains and develop cost-effective, environmentally sustainable disposal options. The report added that several detailed environmental evaluations of new desalination plants also should be conducted, including ecological monitoring before and after a plant begins operating.

Research and development are also needed to continue lowering desalination's financial costs and energy use, the report said. Even if costs are lowered, conserving water or transferring it from one use to another will, in most cases, remain a less expensive option than adding water through desalination, the report noted.

[http://books.nap.edu/catalog.php?record_id=12184]

◆ Are Board-Certified Teachers More Effective?

Every year over 11,000 American teachers apply to the National Board for Professional Teaching Standards (NBPTS) in hopes of becoming a board-certified teacher. Applicants take a computer-based exam and amass portfolios that demonstrate how their teaching meets NBPTS standards for good teaching—a demanding process that typically takes about 400 hours and spans a year or more. From 1993 through 2007, 99,300 teachers applied for certification and 63,800 of them earned it.

Congress asked the National Research Council (NRC) to examine whether the process actually identifies teachers who are better at helping students learn as well as whether the certification process itself makes teachers stronger in the classroom. The NRC was also asked to look at NBPTS' broader effects on the education system.

The report concluded that board-certified teachers do improve student learning—students taught by board-certified teachers make greater gains on achievement tests than students taught by other teachers—but the report recommended further research on the question of whether the process itself improves teachers' classroom performance.

Administrators could encourage board-certified teachers to teach in challenging schools or classrooms or to mentor their colleagues, yet there is little evidence that school systems are using board-certified teachers in these ways. The report concluded that board-certified teachers are unlikely to have the effects hoped for without broader endorsements by states, districts, and schools, and unless schools use them in leadership roles. The report also recommended that NBPTS devote extra effort to continuously evaluating and improving its tests.

[http://books.nap.edu/catalog.php?record_id=12224]

The following Connecticut scientists were elected to the National Academies in 2008:

NATIONAL ACADEMY OF SCIENCES

Peter Wilcox Jones, PhD
James E. English Professor of Mathematics &
Applied Mathematics, Yale University

For his work in the area of harmonic analysis, an area of pure math designed to identify and simplify patterns in functions.

INSTITUTE OF MEDICINE

Arthur Horwich, MD
Investigator, Howard Hughes Medical Institute and
Sterling Professor of Genetics and Pediatrics
Department of Genetics, Yale School of Medicine

Horwich is an expert on the molecular mechanisms of protein folding, a process crucial to the maintenance of life.

NATIONAL ACADEMY OF ENGINEERING

Vladimir Rokhlin, PhD
Professor of computer science and mathematics
Yale University

For the development of fast multipole algorithms and their application to electromagnetic and acoustic scattering.

◆ Booklet Explores National Plant Genome Initiative

The National Academies have released "New Horizons in Plant Sciences for Human Health and the Environment," a free booklet that explores the potential of the National Plant Genome Initiative—a federal multi-agency project that coordinates research in plant sciences to understand and ultimately harness plants' properties to help meet agriculture, nutrition, energy, and human health needs.

[http://dels.nas.edu/plant_genome/report.shtml]

◆ EPA Stormwater Program Needs Major Overhaul

Radical changes to the US Environmental Protection Agency's (EPA) stormwater program are necessary to reverse degradation of fresh water resources and ensure progress toward the Clean Water Act's goal of "fishable and swimmable" waters, said a new report from the National Research Council. The current regulatory framework for stormwater, which was originally designed to address sewage and industrial wastes, has suffered from poor accountability and uncertainty about its effectiveness. In light of these challenges, EPA asked the Research Council to assess its stormwater permitting program.

To provide meaningful regulation, all stormwater and other wastewater discharge permits should be based on watershed boundaries instead of political boundaries, the report found. Moreover, the program should integrate stormwater management and land management practices, and focus less on chemical pollutants in the stormwater and more on the increased flow of water. A watershed-based permitting system should encompass all discharges—including stormwater and wastewater—which could impact waterways in a particular drainage basin, rather than having many individual permits. Responsibility and authority for implementing watershed-based permits should be centralized with a lead municipality that would work in partnership with other municipalities. In addition, lead municipalities should receive enhanced funding to compensate for increased responsibility, the committee suggested. Stormwater management will be ineffective without also considering land use management, the report noted.

[http://www.nap.edu/catalog.php?record_id=12465]

Personalized Medicine (continued from page 2)

and other times when, in retrospect, it won't make perfect sense. "For example, we had a patient who came to us with a family history of Obsessive/Compulsive Disorder," she said. "The family didn't tolerate medicine well. We carried out analysis and selected a medication that we thought would work for him. Genetic test results indicate that he has a deficiency for the enzyme that metabolizes the particular medicine he is taking. In spite of that, he is doing okay on the medicine. The test results don't always mean that the medication won't work, but rather that there is a higher likelihood of side effects or ineffectiveness."

For Lalande, personalized medicine offers the opportunity for people to find out about their own genetic makeup, a feat he says would have been out of reach of the general public 10 years ago because of exorbitant testing fees. "For a relatively small fee, several companies now provide genetic information via a swab of saliva," he said, "making it possible for the first time for people to get detailed information about their genome outside the medical establishment. This will revolutionize clinical medicine."

The UCHC and the University of Connecticut in Storrs have invested heavily in DNA sequencing technology. "We have the tools in place to provide testing as we move forward," Lalande said, noting that he also sees academic professionals in genetics, like himself, serving as liaisons between patients and medical providers. "We are educating people about the availability of this information and helping medical professionals understand the potential impact of genetics on the practice of clinical medicine," he said.

Lalande's organization is educating clinicians about the potential infrastructure needs of personalized medicine. "We are conducting outreach to clinical departments in hospitals and private practice to help the medical community incorporate personalized medicine

into practice," he said. "There are many facets of genetic testing that need to be addressed. Physicians need to consider providing genetic counseling services for people who seek genetic testing to ensure that the information is correctly interpreted. It is the dawn of a new era in medicine and we are working closely with the medical professionals in Connecticut to ensure that information is shared and that the medical infrastructure is ready to support demand."

Currently, Hartford Hospital, through its affiliate Clinical Laboratory Partners, has a growing network of 40 locations in Connecticut that are authorized to perform blood draws for DNA typing at Genomas. What does the future hold? According to Lesko, "Personalized medicine will be successful if we make the business case for pharmaceutical companies. Pharmaceutical companies understand that if their drugs aren't effective, people will stop taking them. We need to change the traditional model. One of the ways we are doing that is by re-labeling drugs to include recommendations for genetic testing." As of this summer, certain pharmaceuticals prescribed for the treatment of AIDS and epilepsy now feature labels that advise physicians to perform genetic testing prior to prescribing the medication.

Ruaño envisions the growth of several new industries as a result of the implementation of personalized medicine. "The laboratory, testing and health services infrastructures will need to grow across the board," he said. "There also will be a new need for an information technology component that will yield a tool similar to the GPS systems used in vehicles today—as we add more medicines to the database, the 'medical GPS' could immediately lead physicians and patients to their ultimate medical destination, resulting in quicker and more effective treatment. We have numerous opportunities to turn genetic variability into a clinical asset rather than a complication." — **Karen Cohen is a freelance writer and owner of The Write Stuff, LLC, in Hebron, CT.**

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